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THE

CYCLOPÆDIA;

OR,

Universal Dictionary

OF

ARTS, SCIENCES, AND LITERATURE.

VOL. XIV.

Printed by A. Strahan,
New-Street-Square, London.

THE

CYCLOPÆDIA;

OR,

UNIVERSAL DICTIONARY

OF

Arts, Sciences, and Literature.

BY

ABRAHAM REES, D.D. F.R.S. F.L.S. *S. Amer. Soc.*

WITH THE ASSISTANCE OF

EMINENT PROFESSIONAL GENTLEMEN.

COLLEGE OF PHYSICIANS

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IN THIRTY-NINE VOLUMES.

VOL. XIV.

LONDON:
PRINTED FOR LONGMAN, HURST, REES, ORME, & BROWN, PATERNOSTER-ROW,
F. C. AND J. RIVINGTON, A. STRAHAN, PAYNE AND FOSS, SCATCHERD AND LETTERMAN, J. CUTHELL,
CLARKE AND SONS, LACKINGTON HUGHES HARDING MAVOR AND JONES, J. AND A. ARCH,
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J. DICKINSON, J. PATERSON, E. WHITESIDE, WILSON AND SONS, AND BRODIE AND DOWDING.
1819.

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OF

ARTS and SCIENCES.

EXTRINSIC, is applied, in the *Schools*, in various ſenſes.

Sometimes it ſignifies a thing's not belonging to the eſſence of another; in which ſenſe the efficient cauſe and the end, or ſcope of a thing, are ſaid to be extrinſic, or extrinſic cauſes.

Sometimes it implies a thing not being contained within the capacity of another. In which ſenſe thoſe cauſes are ſaid to be intrinſic, which introduce ſomething into a ſubject from without: as when fire introduces heat, &c.

Sometimes it denotes a thing added, or applied to another. Thus, accidents and adherencies are ſaid to be extrinſic to the ſubject; and thus viſion is extrinſic to the object ſeen.

Extrinsic *Argument*, *Service*. See the ſubſtantives.

EXTUBERANTIA, from *extubero*, *to ſwell out*, in *Surgery*, tumours ſituated under the ſkin.

EXUBERANCE, compounded of *ex* and *uber*, *plentiful*, of *uber*, *udder*, in *Rhetoric*, a redundancy. See Redundance, and Pleonasm.

EXUCONTIANI, a branch of Arian heretics. See Exoucontii.

EXVERRÆ, in *Antiquity*, a kind of bruſh uſed in cleanſing houſes, out of which a dead perſon had been carried.

EXULCERATIO, from *exulcero*, *to cauſe ulcers*, in *Surgery*, an incipient ulceration; an excoriation.

EXUMA, in *Geography*, one of the Bahama iſlands, ſituated on the eaſt of the Great Bank, between Stocking iſles on the S.W. and Long iſle on the E.; about 25 miles long and three broad. Although this iſland is almoſt uninhabited, it is one of the beſt of the Bahamas, on account of the fertility of its ſoil, and the excellence of its anchoring ground, in the ſound to which it gives name. N. lat. 24° 20′. W. long. 74° 30′.

Exuma *Sound*, a large channel among the Bahama iſlands, extending from N.W. to S.E., between Cat iſland or Guanabani to the eaſt, and a range of ſmall iſlands and rocks to the weſt and ſouth-weſt: the entrance is ſouth of the iſland of Eleuthera. In this ſound the whole Britiſh navy might ride in ſafety.

EXUMBILICATIO, from *ex*, *out of*, and *umbilicus*, *the navel*, in *Surgery*, a ſwelling in the ſituation of the navel.

EXUPERY, *St.*, in *Geography*, a town of France, in the department of the Correze; ſix miles S.E. of Uſſel.

EXUSTION, of *ex*, and *uro*, *I burn*, the act of burning with fire; uſed in ſome operations by ſurgeons. See Burn.

EXUVIÆ, formed from *exuere*, *to put off*, *to diveſt*, in *Phyſiology*, tranſient parts of certain animals, which they put off, or lay down, and aſſume new ones.

Such, eſpecially, are the ſkins or ſloughs of ſerpents, ſhells of lobſters, and the like; which are annually changed, and renewed in the ſpring.

The outer integument of the body, which in man and other large animals is ſo durably fixed on the body, is in many of the animals of the reptile kind much more looſely fixed, and is changeable ſeveral times during the period of their lives. The ſerpent kind all ſhift their ſkins ſeveral times in their lives, and the water-newt has been lately obſerved to do the ſame; but no creature in the world does it ſo often as the caterpillar, almoſt every ſpecies of theſe inſects throwing off their old ſkin once in ten or twelve days, or leſs; and this in ſuch a manner as is extremely worthy of an attentive obſervation. Malpighi obſerved that the common ſilk-worm changed its ſkin four times during its continuance in that ſtate; the firſt of theſe changes happening at eleven or twelve days from its appearance from the egg,

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and the others at the diſtance of five or ſix days each; and probably the reſt of the caterpillar kind obſerve nearly the ſame periods.

Neither is this change of the ſkin confined to the few creatures we have mentioned; but among the whole inſect claſs, the moſt numerous of that of all animated beings we know, there is ſcarcely one ſpecies, every individual of which does not throw off its ſkin, once at leaſt, before it arrives at its full growth. The term changing the ſkin is ſcarcely expreſſive enough for this operation in the caterpillar kinds; for the creature throws off the external covering of every the minuteſt part and organ of its body, and the ſkins they thus depoſit have ſo much the appearance of a complete inſect, that they are very often miſtaken for ſuch, preſenting us with every thing that we ſee in the external appearance of the living animal. Reaumur, Hiſt. Inſ. vol. i. part 1. p. 225.

Exuviæ, in *Agriculture*, the caſt-off parts of animals or their coverings, and likewiſe the ſhells and other marine productions which are met with in the bowels of the earth, when they have been depoſited for a vaſt length of time, probably from once living creatures. Theſe are ſometimes called Extraneous *Foſſils*, but more commonly Reliquia, which ſee. They are of conſiderable variety, and differ greatly in their appearances. All ſubſtances of this nature are capable of much uſe as manures, where they can be procured in ſufficient abundance, eſpecially upon all the heavier and more ſtiff deſcriptions of ſoil, as they ſupply the calcareous principle in ſome degree, while they have the effect of rendering them more light and open.

EY, in our *Old Writers*, the ſame with *inſula*, an *iſland*, from which comes *eyet*, a ſmall iſland or iſlet, vulgarly called *eyght*. Hence the names of places ending with *ey* denote them to be iſlands, as *Sheppey*, &c.

EYACH, in *Geography*, a river of Germany, in Wurtemberg, which riſes about 4 miles S. of Ebingen, and runs into the Neckar, three miles above Rothenburg.

EYASIORD, a bay on the N. coaſt of Iceland. N. lat. 65° 50′.

EYBACH, a town of Germany, in the territory of Nuremberg; five miles S. of Nuremberg.

EYBELSTADT, a town of Germany, in the principality of Wurzburg; three miles S.S.E. of Wurzburg.

EYBENS, a town of France, in the department of the Iſere; three miles S. of Grenoble.

EYBENSCHITZ, or Ewanice, a town of Moravia, in the circle of Znaym, formerly famous for an aſſemblage of very numerous religious ſects. The Huſſites and Lutherans worſhipped in the ſame church; the Calviniſts had two churches; the Jews had a ſynagogue; beſides which there were Anabaptiſts, Quakers, Holy Brethren of Switzerland, Photinians, &c. The inhabitants at preſent are chiefly Roman Catholics and Jews; 20 miles N.E. of Znaym. N. lat. 49° 8′. E. long. 16° 17′.

EYBENSTOCH, or Eybenstadt, a town of Germany, in the circle of Erzgeburg; 20 miles S.S.W. of Chemnitz. N. lat. 50° 25′. E. long. 12° 35′.

EYCHENFLIES, a town of Germany, in the principality of Wurzburg; 12 miles S. of Gemunden.

EYCK, Hubert Van, in *Biography*, a painter, born at Maaſeyk in 1366. He is regarded as the founder of the Flemiſh ſchool of painting, the Giotto of Flanders; and exhibited, for that early period of art, great genius and ſkill. In concert with his brother John, he was celebrated for many extraordinary and curious works, executed in oil, after the latter had made his diſcovery of that mode of painting.

He painted well alſo in diſtemper, but gave that up after he adopted the other. One work of his, painted in conconjunction with John, was preſerved in a chapel of the cathedral of Ghent. Sir Joſhua Reynolds ſaw it there, and ſays of it, (ſee his Journey to Flanders,) "it repreſents the adoration of the lamb taken from the Apocalypſe: it contains a great number of figures in a hard manner, but there is great character of truth and nature in the heads, and the landſcape is well coloured."

It is now among the ſpoils of the French in the gallery of the Louvre. While it was in Ghent, (at leaſt for a time after being wrought,) it was held in ſuch eſtimation as to be ſhut up from public view, except on feſtivals; and at other times was only ſhewn to ambaſſadors or princes themſelves who deſired to ſee it.

Philip I. of Spain wiſhed to purchaſe it; but that not being practicable, he employed Michael Coxis to copy it, who ſpent two whole years about it, and received four thouſand florins for his labour from the king, who placed it in the Eſcurial. This artiſt died in 1426, aged 60.

Eyck, John Van, younger brother to Hubert, was born at Maaſeyk in 1370, and ſtudied with his brother, though in the end he excelled him.

To him the world is indebted for the firſt uſe of oil in painting, which he diſcovered in the year 1410.

Painters before this wrought their works in diſtemper, (ſee Distemper,) and then to ſecure them from the action of air and dampneſs, they were accuſtomed to varniſh them; with what compoſition it does not appear. Vaſari (Part 2, page 213, ed. 1681,) relates that Giovanni di Bruggia (ſo he calls him,) "had painted a picture in the uſual way, and having varniſhed it, ſet it to dry in the ſun's rays, as was cuſtomary; but either from the wood being ill ſeaſoned and ill put together, or from the extreme violence of the heat, the picture was cracked and quite ſpoiled. He therefore deliberated how he ſhould in future beſt prevent accidents of this nature happening to his works, and endeavoured to make a varniſh which would dry in the ſhade, without the neceſſity of expoſing it to the ſun.

"After many experiments, he found at laſt that oil of linſeed and of nuts, were more ſiccative than any others he had tried. Theſe, when boiled with other ingredients, made the varniſh ſo much wiſhed for by him and other painters. He afterwards diſcovered that mixing theſe oils with his colours gave them a hardneſs, and in drying not only equalled the water colour, but gave them more brilliancy and force; and that, without the neceſſity of varniſhing afterwards: and he was ſurpriſed to find alſo, that they united far better in oil than in water."

The fame of his diſcovery ſoon ſpread over Flanders and into Italy, and when he grew old, but not till then, he imparted his ſecret to ſeveral painters, both Flemiſh and Italian. And it muſt be confeſſed the art of painting is very highly indebted to him for this foundation of the wonderful ſucceſs with which ſucceeding ages have profited by this very uſeful diſcovery.

As a painter he poſſeſſed very good talents, conſidering the early period of the art. He copied his heads generally from nature; his figures are ſeldom well compoſed or drawn. But his power of producing richneſs of poſitive colours is ſurpriſing, and their durability no leſs ſo. He paid great attention evidently to nature, but ſaw her in an inferior ſtyle. He laboured his pictures very highly, particularly in the ornaments which he beſtowed with a laviſh hand, but with all the Gothic taſte of the time and country in which he lived. In the gallery of the Louvre is a picture of the "Divine Being," as he choſe to call it, repreſented by an aged man with a long beard, crowned with the pope's tiara, ſeated in a chair with golden circles of Latin inſcriptions round his head, but without the leaſt dignity of character, or evident action or intention. It is the very bathos of the art. At the earl of Pembroke's, at Wilton Houſe, is a ſmall picture which does him more credit. It repreſents the nativity of our Saviour, with the adoration of the ſhepherds, and the compoſition conſiſts of four figures, beſides the Saviour and four angels, and has in the back ground the anomaly of the angels at the ſame time appearing to the ſhepherds. It is in oil, and the colours are moſt of them very pure, except thoſe of the fleſh. The garment of Joſeph is very rich, being glazed (ſee Glazing, in *Painting*,) thick with red lake, which is as freſh as if it were new. Almoſt all the draperies are ſo glazed with different colours, and are ſtill very clear, except the virgin's, which, inſtead of maintaining its blue colour, is become a blackiſh green. There is a want of harmony in the work, but it is more the effect of bad arrangement of the colours than the tones of them. The glory ſurrounding the heads of the virgin and child is of gold. We have been the more particular in ſtating theſe circumſtances of this picture, becauſe our readers will naturally be curious to know how far the original inventor of oil painting ſucceeded in his proceſs, and they will ſee by this account that he went very far indeed, in what relates to the perfection of the vehicle he uſed, which, if he had happily been able to employ as well as he underſtood, the world would not have ſeen many better painters. He lived to practiſe his diſcovery for 31 years, dying in 1441, at the advanced age of 71.

EYDY ENGLY, in *Geography*, a town of Hindooſtan, in Viſiapour; 14 miles S. of Galgala.

EYE, in *Anatomy* and *Phyſiology*, the organ of viſion. The eye-ball is the immediate agent in refracting the rays of light, and in collecting them into one point, ſo as to form an image of the object from which they are reflected. For this purpoſe we find in it a ſeries of perfectly tranſparent parts, which execute the various refractions; a nervous pulp, on which the rays of light thus refracted make an impreſſion to be conveyed to the ſenſorium by the optic nerve; and certain membranous opaque coverings, containing the abovementioned parts, and ſupporting them in their relative ſituations. The viſual organ, ſimple, when thus conſidered, becomes much more complicated, if we include in our definition all the apparatus added for the purpoſes of protection or aſſiſtance. The muſcles which move the globe in various directions, the eye-lids, which cover and protect it in front, and the parts which ſecrete the tears, and convey them into the cavity of the noſtril, are all ſo intimately connected in ſituation and function with the globe, that a regard to natural arrangement leads us to include them in the ſame article; in which we ſhall conſider, firſt, the anatomy of the whole apparatus, and afterwards the phyſiology of viſion.

The eyes are two in number, exactly ſymmetrical, placed in two bony cavities, called *orbits*, which are ſituated under the forehead, and ſeparated from each other by the noſe. The detailed deſcription of the orbits will be found under the article Cranium. The figure of theſe cavities is that of a pyramid with four unequal ſides, directed obliquely forwards, and outwards from the point to the baſe. The ſize varies but little in different individuals, and is uſually independent of general ſtature. It exceeds conſiderably that of the globe, which is ſupported by much fat and other ſoft parts, ſo that it can be moved with great quickneſs and facility in every direction.

The globe of the eye is ſituated in the anterior part of the orbit, nearer to the internal than the external ſide of the cavity, and is more or leſs prominent in different individuals. The baſe of the orbit being truncated obliquely, the eye projects beyond its edge on the external ſide, while it appears more deeply buried towards the noſe. It is ſupported in front by the moveable eye-lids; on the other ſides by its muſcles, which, as well the nerves and blood-veſſels of the organ, are enveloped in a ſoft fat, filling the reſt of the orbit, and keeping the eye on a level with the face. In the emaciation conſequent on age or diſeaſe, this fat is abſorbed, the eye loſes its prominent ſituation, and ſinks much deeper in the orbit; hence the angular edges of the bony cavity are rendered more evident, and the character of the face undergoes a marked alteration.

The ſize of the eye varies but little in different ſubjects; its apparent varieties depending in great meaſure on the larger or ſmaller opening formed by the eye-lids. It is ſmaller in the female than in the male, and proportionally larger in the infant than in the adult. The ſexual and national differences in the external proportions of the eye will be more minutely conſidered in the explanation of the plates, which follows the anatomical deſcription.

The figure of the eye repreſents two portions of diſtinct ſpheres, of different diameters, united towards the front. The ſection of the ſmaller ſphere is tranſparent, and occupies about the anterior fifth of the globe, projecting from the larger ſphere, which is opaque. By this diſpoſition, the axis of the eye exceeds its tranſverſe diameter in a ſmall ratio, of which we ſhall have occaſion to ſpeak more minutely hereafter.

The axes of the globe and the orbit are not the ſame; that of the latter is directed obliquely outwards, ſo that, if prolonged behind the apex of the pyramid, it would meet its fellow within the cranium: the axes of the two eyes are parallel, and point directly forwards. The ſtrong cylindrical chord, made up of the optic nerve and its firm inveſtments, enters the orbit in the direction of the axis of the latter, and is attached towards the inner ſide of the poſterior ſurface of the globe.

The globe or ball of the eye is compoſed of concentric membranous *coats* or *tunics*, inveſting tranſparent parts of different denſities, uſually called *humours*. The external covering, which gives the figure to the eye, is firm and thick, formed of two diſtinct portions; the anterior, which is tranſparent, is called the *cornea*; the poſterior, opaque and white, the *ſclerotica*. A certain portion of the front of the globe is covered by a membrane, which connects the ball to the lids, and is called the *conjunctiva*. The inner ſurface of the latter is lined by a thin opaque membrane, of delicate ſtructure, covered on both ſides by a dark coloured *pigment*, and called the *choroides*: this is plaited on the inner ſurface of its anterior part into projecting folds, the *ciliary proceſſes*, and it is connected by its front edge with another membrane, the *iris*, which floats tranſverſely at a ſmall diſtance from the cornea, and has a circular opening about its middle, termed the *pupil*. The *retina*, a ſoft tranſparent expanſion, commencing from the optic nerve, and nearly equalling the choroides in extent, lines the inner ſurface of that membrane. This embraces by its whole internal ſurface a pellucid body, occupying the greateſt portion of the globe, and named the *vitreous humour*. In front of this, and partly imbedded in it, is placed the *chryſtalline lens* or *humour*, another tranſparent body, nearly ſpherical in ſhape, and of greater comparative denſity. The ſpace left between the latter and the cornea, is divided partially by the iris, and filled with a clear watery fluid, named the *aqueous humour*. The rays of light paſs through the tranſparent cornea, the aqueous humour, the opening in the iris or pupil, the chryſtalline lens, and vitreous humour, undergoing various refractions in their paſſage, and are finally collected ſo as to form an image on ſome part of the concave ſurface of the retina, from which the impreſſion is conveyed to the ſenſorium.

The coats or membranes of the eye.—The *ſclerotic* coat (*die feſte haut*, Germ.) extends from the entrance of the optic nerve to the cornea, covering about four-fifths of the globe, and truncated in front for the reception of the cornea. The external ſurface is covered behind and in the middle by the muſcles of the eye and the ſurrounding fat, and in front by the conjunctiva. The inner ſurface, connected with the choroid by a delicate cellular ſubſtance, by blood-veſſels and nerves, is uſually tinged of a duſky colour by the pigment of that membrane; an effect produced after death by tranſudation, ſince the ſtain is not viſible in an eye examined in its moſt recent ſtate. This ſurface is pierced by numerous ſmall lobes, particularly about the entrance of the optic nerve, and near the origin of the cornea, by which arteries enter directly into the choroid coat; the openings are leſs numerous towards the middle, and give paſſage to veins, and to many ſmall nerves which run through the ſclerotica obliquely, for two or three lines, and lie in ſuperficial furrows of its inner ſurface in their way to the ciliary circle and iris. The ſclerotica preſents in front an aperture nearly circular, of which the tranſverſe is rather longer than the perpendicular diameter. The inner edge of this opening is bevelled off, and the outer paſſes over the oppoſite ſloping edge of the cornea, which is thus ſet in the ſclerotica. A ſmall round opening, appearing on the inſide as a circular ſpot, pierced by numerous ſmall holes, is placed nearly in the centre of the poſterior and thickeſt portion of the tunic, and tranſmits the medullary part of the optic nerve. This is equi-diſtant from the upper and lower parts, but nearer to the inner or naſal, than to the outer or temporal ſides of the globe. It grows gradually ſmaller from its commencement at the outer, to its termination on the inner ſurface of the ſclerotica, the nerve diminiſhing in diameter in the ſame proportion in this part of its courſe.

The ſclerotica is of a white colour. It is nearly a line in thickneſs at the back of the globe, but becomes conſiderably thinner at the front. Its thinneſt part is near the inſertion of the tendons of the recti, which is rather beyond the middle. Next to the cornea it becomes again ſlightly thicker. Its ſtructure is firm and denſe, conſiſting of ſtrata of fibres running parallel to and decuſſating each other in every direction, ſo as to complete a ſtrong fibrous membrane, not ſeparable into layers, at leaſt not in the adult, even after very long maceration. In the fœtus it may be divided into two laminæ throughout its whole extent, the union between them not being very firm. In this inſtance the external layer appears diſtinct, and totally independent of the ſheath of the optic nerve. The thin internal layer is manifeſtly continued from the fine membrane immediately inveſting the nerve. The diſpute, whether the firm ſheath of the optic nerve derived from the dura mater expands as it reaches the bulb, and conſtitutes the ſclerotica, is a point of little moment. The ſheath and the ſclerotica are evidently united moſt intimately, if the membrane is not continuous. Zinn deſcribes the outer layer of the vagina of the optic nerve as collecting, before it arrives at the ſclerotica, into numerous denſe, ſhining, firm fibres, which are inſerted into the poſterior, thick, prominent edge of that tunic, where it is pierced by the medullary part of the nerve. The inner layer, thicker than the external, paſſes deeper between the nerve and the ſclerotica, on the inner ſurface of which it gradually diſappears. The difference between the ſclerotica and the ſheath of the nerve is marked by the ſudden increaſe of thickneſs in the former, by its white colour, and by its denſe ſtructure, compoſed of fibres interlacing each other, the ſheath of the nerve being thin, and of looſer texture.

The brilliant white colour of that portion of the ſclerotica covered by the conjunctiva, has been attributed to a peculiar membrane, to which the name of *tunica albuginea* has been given: and it has been ſuppoſed that this coat was formed by the union of the tendons which terminate in front the four ſtraight muſcles of the eye; but theſe tendons are not extended to the cornea, are not broad enough to unite by their edges, and are always diſtinct from each other, and the intervals between them are of equal brightneſs with the parts covered by the tendons. No ſuch tunic in reality exiſts; the ſclerotica ſhining advantageouſly through the tranſparent conjunctiva is the only cauſe of the brilliancy and whiteneſs.

The ſclerotica is ſupplied by veſſels from the ciliary arteries and veins; they are few in number, and capillaries in ſize. We can obſerve in it no traces of nerves. It is elaſtic, and capable of undergoing very conſiderable extenſion, as obſerved in hydrophthalmia. The chief uſe of this tunic appears to be that of defending the delicate parts it contains, giving the figure to the eye, offering an inſertion for its muſcles, and ſupporting its veſſels and nerves.

In the fœtus it is comparatively thin and feeble, its colour is not ſo decided, and from its ſemi-tranſparency the colour of the choroid can be diſtinguiſhed through it. It is more particularly behind that the ſclerotica has a blueiſh tint from this cauſe; it is leſs evident anteriorly, the membrane being rendered more opaque by the tendons of the different muſcles.

The *cornea* (*horn-haut*) is the tranſparent ſubſtance encaſed in the opening left at the front of the ſclerotica; it occupies, therefore, about the anterior fifth of the eye. Its form is not quite circular, the tranſverſe diameter being rather longer than the vertical. Its convexity is greater than that of the ſclerotica, the cornea appearing as a ſegment of a ſmall ſphere placed on the truncated plane of a larger. Anteriorly, it is covered by the conjunctiva, which at this part is very delicate, and adheres firmly to the cornea, giving it a ſhining poliſhed ſurface. They are eaſily ſeparable by long continued maceration. The poſterior ſurface of the cornea is concave, and lined by the membrane of the aqueous humour, conſtituting the anterior limit of the anterior chamber of the eye. The circumference of the cornea, cut obliquely, ſlides under the edge of the ſclerotica, ſloped in the contrary direction, ſo that the two parts touch by a conſiderable extent of oblique ſurfaces; the ſclerotica advancing on the cornea anteriorly, while the latter paſſes under the ſclerotica in the oppoſite direction. The conſequence is, that the anterior circumference of the cornea is leſs than the poſterior: the chord of the ſegment formed by the external convexity is deſcribed by Petit as equal to five lines, that of the internal to five and a half.

The cornea and ſclerotica are united to each other ſo intimately, that the former was for a long time regarded as a tranſparent continuation of the ſclerotica; but the form, organization, and properties, as well as the diſeaſes of theſe tunics are ſo different, that we have no heſitation in conſidering them as diſtinct. Further, by long continued maceration, and then plunging the eye into boiling water, they come eaſily apart in a pretty regular line, the connection by cellular tiſſue being entirely deſtroyed. The line of ſeparation is not equally marked in every animal, neither is the figure of the correſponding ſurfaces the ſame as in man; in every inſtance, however, the cornea and ſclerotica are diſtinct, though the union differs in its manner and degree. The cornea poſſeſſes a middle thickneſs between thoſe of the anterior and poſterior portions of the ſclerotica: in this reſpect it is nearly uniform throughout, except at the edge, where it is fitted into the opening left in the ſclerotica. Here its margin is accurately defined by a double groove, marking the union between it and the ſclerotica. It is to this groove, diſtinguiſhable from the bordering part of the ſclerotica by its dark colour, that the anterior edge of the ciliary circle of the choroid coat firmly adheres.

The cornea is compoſed of an indeterminate number of concentric laminæ, connected by a fine tiſſue, the cells of which are filled by a tranſparent fluid; to uſe the words of Zinn, "areolæ aquâ pellucidiſſimâ ſemper ſunt ebriæ." The external layers are more eaſily elevated than the internal; they are often ſeparated by diſeaſes, an effuſion of pus or blood taking place between them, or lymph being depoſited ſo as to deſtroy the tranſparency of this membrane. The cornea has not, in its healthy ſtate, any veſſels carrying red blood, but is ſupplied by exhalants, which ſecrete the fluid of which we have been ſpeaking. No nerve has been traced into its ſubſtance. The pellucid fluid contained in this membrane does not exude in the living ſtate, but is conſtantly abſorbed and renewed. After or a ſhort time before death, it is ſuppoſed to ooſe out gradually, and form that obſcure film before the cornea which deſtroys its tranſparency. This is not viſible in ſubjects who die ſuddenly; but where the diſeaſe has been of long continuance, the obſcurity of the cornea begins ſometimes before death, the loſs of brilliancy being often regarded as one of its forerunning ſymptoms. The aqueous humour does not paſs through the cornea during life; after death it evidently does, the eye becoming flat and wrinkled; its tenſion may be ſoon reſtored by immerſing it in water. Zinn believes that the obſcure pellicle, obſerved on the cornea after death, conſiſts of the conjunctiva in an opaque ſtate, ſince it cannot be waſhed off, but may be removed by careful diſſection with the knife. The cornea is not ſo elaſtic as the ſclerotica, nor capable of undergoing equal extenſion; it will, however, recover its former dimenſions, after being ſtretched, as is proved by an experiment of Mr. Home. It gives no mark of ſenſibility when wounded, at leaſt in its healthy ſtate; it may when in a ſtate of inflammation, and its veſſels at ſuch time carry red blood.

In the fœtus it is rather more prominent than in the adult; and is deſcribed as being thicker, the interſtices of the laminæ being larger, and containing a greater quantity of fluid, ſo as to diminiſh the capacity of the anterior chamber, and to approach, by its concave ſurface, nearer to the iris. It can be reduced to half this thickneſs by compreſſion. Theſe obſervations have been made by Zinn and Petit: the deficiency of aqueous humour and this particular condition of the cornea was ſuppoſed by the latter to be one cauſe of the obſcure viſion of infants. It does not loſe its brilliancy after death to ſo great a degree as in the adult; which is attributed to its not allowing of tranſudation with equal facility. For the ſame reaſon it ſcarcely decreaſes in volume under the ſame circumſtances. The cornea has been ſometimes obſerved to be partly oſſified in old age; the occurrence is, however, extremely rare.

The choroides, or, perhaps more properly, the chorioides (gefaſs-haut) forms the ſecond coat of the eye, lying immediately under the ſclerotica. It extends from the entrance of the optic nerve to the circumference of the cornea. The external ſurface is every where connected with the ſclerotica by a fine cellular tiſſue, by numerous veſſels paſſing between theſe membranes, and by the ciliary nerves. This tiſſue is more abundant in the fœtus than in the adult, and more particularly ſurrounds the larger veſſels and nerves. It connects the two coats pretty cloſely, but is ſo delicate as to allow of their being eaſily ſeparated from each other by impelling air between, the connection being preſerved only by the veſſels, which have a greater degree of firmneſs. It is more abundant near the cornea, and forms the baſis of the ciliary circle. The internal ſurface of the choroid is in cloſe and accurate contact with the retina at all points; but the two parts are not united by the medium of veſſels, or cellular tiſſue. The poſterior part of the choroid preſents a ſmall round hole, through which the medullary fibres of the optic nerve paſs. It was long ſuppoſed that the choroid coat was continued at this ſpot from the pia mater, or the thin membrane immediately inveſting the optic nerve. More accurate examination, however, has proved that they are not continuous membranes. As the choroid approaches the entrance of the optic nerve it adheres more firmly to the inner ſurface of the ſclerotica by means of the numerous ciliary arteries, and the cellular tiſſue ſurrounding them. The pia mater of the optic nerve, after perforating with it the holes in the ſclerotica, is reflected on all ſides, forming a ſmall ring, and loſt on the inner ſurface of that tunic. At this part the choroid adheres to the pia mater very cloſely by cellular tiſſue, ſurrounding the riſing medullary papilla, from which the retina has its origin, by a circular and well defined margin. This is very evident by dividing the optic nerve longitudinally at its entrance into the eye. The choroid terminates in front by a wide aperture, nearly at the point of union between the cornea and ſclerotica. Juſt before it ends we obſerve it folded into the ciliary proceſſes, and forming on the outer ſurface, by its altered ſtructure and appearance, the *orbiculus ciliaris*, the anterior edge of which is intimately connected with the iris.

The choroid is very delicate, thin, and eaſily torn. It is of a reddiſh brown colour on each ſurface. On the outſide this colour is inherent in the ſtructure of the membrane, and does not depend on the depoſition of any colouring ſubſtance externally to its tiſſue. In the perfectly recent eye, the finger is ſcarcely ſtained by wiping it, neither does it tinge water, if ſuffered to remain in it for a few days. After that time the coloured tiſſue is ſoftened, and parts with ſome of the colouring matter. On the internal ſurface of the choroid this colour is more decided, and depends evidently on a dark kind of mucous ſecretion, called *pigmentum nigrum*, included in a fine cellular tiſſue, increaſing in quantity and intenſity as we approach the anterior margin, where it takes a blackiſh tint. Towards the entrance of the optic nerve the pigmentum is much thinner, the ſtructure of the choroid appearing through it. It ſeems to be a peculiar ſecretion from the veſſels of the membrane, occupying both ſides of the vaſcular tiſſue, but more particularly its inner ſurface. It is deſcribed by Hunter as a "ſubſtance approaching to the nature and appearance of a membrane lining the choroid coat; and ſomewhat ſimilar to the rete mucoſum which lies under the cuticle of the human body; there is alſo ſome of the ſame kind of ſubſtance diffuſed through the cellular membrane, which unites the choroid with the ſclerotic coat." When it has been waſhed away by maceration, the inner ſurface appears villous. The colouring matter is not altered ſenſibly by heat, nor by any chemical teſts of whatever nature to which it has been ſubjected: the colour is in ſome caſes deepened as to intenſity, but never changes.

The choroid is formed by almoſt innumerable arterial and venous veſſels, united by a fine cellular tiſſue, into the form of a membrane. On examining it from without, after carefully

fully removing the ſclerotica, we obſerve, firſt, the flat ciliary nerves, lying externally to the veſſels, running forwards on the convex ſurface. Beſides theſe nerves we can generally ſee two veſſels, rarely more, one on each ſide; which having penetrated the ſclerotica at its back part, run horizontally forwards, giving ſcarcely any branches to the choroid, and divide at the ciliary circle. They are the long ciliary arteries, and are frequently filled with blood. Under theſe arteries and nerves are numerous veſſels, about the middle of the choroid, arranged in a particular form, and called on this account *venæ vorticoſæ*. There are uſually three venous trunks from which branches are thrown off on each ſide, forming irregular parallel arches, meeting each other in the intervals between the trunks. In a recent eye theſe veſſels are filled with blood, and are very apparent. By immerſing the choroid in alcohol, they become of a white colour, and are then ſtill more readily diſtinguiſhable from the other veſſels. The intervals between theſe veins are occupied by the ramifications of the ſhort poſterior ciliary arteries, appearing as dark-coloured threads lying under the arches. Theſe arteries pierce the ſclerotic near the entrance of the optic nerve; in the firſt inſtance they are on the external ſurface of the choroid; but as they advance they dip under the branches of the venæ vorticoſæ, and approach the inner ſurface of the membrane. Theſe numerous branches are given off at very acute angles, and are directed immediately forwards, forming an extremely fine net-work on the inner ſurface, ſo that the angular meſhes are only viſible when conſiderably magnified. The diſpoſition of its veſſels gave riſe to an opinion that the choroid was compoſed of two layers, an external, formed by the veins, and an internal, by the arteries. The latter has been named tunica Ruyſchiana. This diſtinction is now completely rejected by the beſt anatomiſts, who agree in conſidering the choroid as a ſimple membrane. After long maceration it becomes almoſt tranſparent; and at this time the ſingleneſs of its ſtructure is ſufficiently evident: when held between the eye and the light it appears as a net-work of veſſels croſſing in every direction, and not ſeparable from each other. Parts of it have been occaſionally found oſſified.

At the diſtance of a line or more from the cornea, the external ſurface of the choroid begins to be enveloped in a grey, ſoft, ſhort, pulpy tiſſue, of moderate thickneſs, repreſenting a circular belt, to which different names have been attached. It is uſually called the orbiculus ciliaris, or ciliary circle; it is deſcribed alſo under the names of ligamentum ciliare and plexus ciliaris: Zinn calls it annulus celluloſus; Soemmerring, from its ſtructure made up "nervis ciliaribus, vaſiſque his intermixtis ſanguiferis," deſcribes it under the term of annulus gangliformis. It is more than a line in breadth; its anterior part thicker and cloſer in ſtructure than the poſterior: it adheres with ſome little firmneſs to the ſclerotica at the groove obſerved in the latter, cloſe to its inner connection with the margin of the cornea. It may be eaſily ſeparated by the finger, but is ſtrong enough to reſiſt the impulſe of air driven between the choroid and ſclerotic coats by the blow-pipe. Fontana has deſcribed a triangular canal as running along the circle of this ſpongy ſubſtance, intermediate to its connection with the ſclerotica. It has been noticed ſince by Soemmerring, and particularly by Murray, and is partly formed by the groove at the edges of the cornea and ſclerotica. It is filled by an aqueous fluid. The ciliary circle is united more cloſely with the choroid, and can ſcarcely be ſeparated from it without tearing the latter. It is always of a whitiſh, or grey colour, very diſtinct, therefore, from the dark-coloured choroid; and not ſo broad as the ciliary proceſſes within. It receives in its ſubſtance the ciliary nerves and arteries in great abundance in their paſſage to the iris. The ciliary circle marks the line of diſtinction between the choroid and iris.

The iris was for a long time deſcribed as a direct continuation of the external layer of the choroid; and the ciliary proceſſes of the internal. The ſimplicity of this membrane has neceſſarily deſtroyed that opinion; and it appears that the iris is a diſtinct membrane, both in its ſtructure and functions, ſeparated from the choroid by the orbiculus ciliaris, in the anterior margin of the ſubſtance of which it ſeems partially encaſed, the outer edge of this circle projecting forwards beyond that of the iris, as may be ſeen after the cornea and ſclerotica have been carefully removed.

The inner ſurface of the front of the choroid forms the ciliary proceſſes, which are thin plaits diſpoſed in the manner of radii round the chryſtalline lens, and lodged in correſponding depreſſions of the vitreous humour. The ring made by the union of theſe plicæ, conſidered as a whole, is called the corpus ciliare. On making a perpendicular ſection of the eye from right to left behind the middle of the ſphere, with an attention to diſturb the connections of the ſeveral parts as little as poſſible, we obſerve, on looking into the anterior ſection, through the pellucid vitreous humour, a dark ring, reſembling the diſk of a radiated flower, ſurrounding the chryſtalline lens. It is two lines in breadth, and rather narrower on the naſal ſide than on the temporal. It is terminated poſteriorly by a ſerrated, undulating, accurately defined and black margin. Nearer to the chryſtalline it preſents white ſtreaks with black intervals placed alternately, ſo that apparently two rings are formed, the poſterior and wideſt of an uniform dark colour, the anterior compoſed of white and black lines alternately. The white lines are the edges of the ciliary proceſſes, and the black interſtices the depreſſions between them covered by pigmentum nigrum. When the membrane is removed from the vitreous humour, eſpecially if the eye is not recent, a great portion of the pigment is left on the ſurface of the latter, giving an impreſſion correſponding inverſely to the oppoſite appearance of the proceſſes. In the eye of the new-born infant this is ſtill more remarkably the caſe. In the recent eye of the adult this dark varniſh remains deeply fixed on the ſubſtance of the intervals of the proceſſes, and requires much waſhing and maceration, in order completely to remove it.

After a careful abſterſion of the pigment it is very evident that the corpus ciliare is a direct continuation of the choroid. It is of a grey colour, lighter towards the iris from the white colour of the ciliary circle on its outer ſide. The corpus ciliare is concentric poſteriorly with the ſclerotica; farther on it gradually quits it by the interpoſition of the ciliary circle, and turns inwards towards the lens, correſponding more to the convexity of the vitreous humour than to the concavity of the ſclerotica. The projecting folds will now float freely from one ſide to the other, when immerſed in water, being reſtrained by no tranſverſe lateral connections. On a cloſe examination of theſe parts we may obſerve the ciliary proceſſes riſing from the inner ſurface of the choroid, about a line and a half from the iris, by two or more almoſt imperceptible ſtriæ "lineolæ tenuiſſimæ," which ſoon unite to form a ſingle fold, increaſing in depth the nearer it approaches the chryſtalline lens. The number of the ciliary proceſſes varies from ſixty to eighty, but is generally neareſt the former of theſe numbers and ſometimes below it. They are alternately longer and ſhorter. Of the three edges formed by the triangular fold, the poſterior is ſlightly denticulated, concave, and lodged in the oppoſite groove of the vitreous humour; the anterior, convex, is the baſe riſing from the choroid, the internal, not a line in length, meaſures the ſpace between the great circumference of the iris and that of the chryſtalline; it is evidently denticulated. Of the three angles, the one correſponding to the chryſtalline is rounded, paſſing a little in front of the anterior part of the capſule, without, however, forming any connection with it. Zinn, who appears to have inveſtigated this point with his uſual accuracy and minuteneſs of reſearch, is decidedly of opinion that the ciliary proceſſes are not adherent to the capſule of the lens; "non unicâ fibrâ, aut ullo vinculo capſulæ lentis adnectuntur." Haller believes that the ciliary proceſſes ſupport the chryſtalline lens in its ſituation, not by any immediate connection, but by the intervention of the vitreous humour, with which they certainly have a tolerably intimate connection. He agrees with Zinn in not allowing them to be muſcular. The angle correſponding to the great margin of the iris is joined to it, and to the round edge of the ciliary circle, by veſſels and cellular tiſſue: at the line of union ſeveral ſtraight lines are ſeen going off on the poſterior ſurface of the iris to the edge of the pupil. The poſterior angle is much elongated, and terminates in the fine ſtriæ we have mentioned on the inner ſurface of the choroid. The ſurface of the ciliary body, but more eſpecially the intervals of the proceſſes, is covered by a very dark mucus, much deeper in colour than that which lines the reſt of the choroid: it is nearly black. The poſterior edges of the proceſſes not being covered by it, appear of a light grey. When the pigment has been waſhed off, the ſurface of the corpus ciliare appears villous, like that of the choroid behind: it is generally rugous. The ſtructure is made up wholly of veſſels united by fine tiſſue, as the reſt of the choroid; we do not believe them to poſſeſs any muſcularity, or any power of motion. The arteries come from the ſhort ciliaries, which, after having run parallel to each other on the internal ſurface of that membrane, paſs into each ciliary proceſs to the number of twenty at leaſt. They run in a ſerpentine courſe along the fold, giving off numerous branches, which, by their multiplied diviſions and frequent anaſtomoſes, form an extremely fine net-work. When they have arrived at the floating edge they turn in one towards another, and anaſtomoſe, forming concentric arches. The veins of the ciliary proceſſes join the venæ vorticoſæ of the choroid.

The choroid in the fœtus, at the time of birth, is well formed: it may be detached eaſily from the ſclerotica and cornea, leaving on the firſt a reddiſh tint. Its outer ſurface is of the ſame colour as in the adult: the pigmentum on the inſide is black inſtead of brown; is leſs fluid, and more ſtrongly fixed. After it has been removed, the choroid retains a ſenſibly red colour, derived from its very vaſcular organization, and differing from that in the adult, under ſimilar conditions. Towards the optic nerve, where the pigmentum is in ſmaller quantity, the reddiſh choroid is very apparent. The ciliary circle is not ſo fully marked as in the adult, and adheres but weakly to the ſclerotica. The ciliary proceſſes are comparatively more developed, and are very diſtinct: they are of a reddiſh colour, but not ſo deep as the poſterior part of the choroid.

The iris, (regenbogenhaut, oder blendung,) ſo called from the variety of colours on its anterior ſurface, is a plane membranous ring, floating in the aqueous humour, ſubtending the ſegment of the ſphere, formed by the circumference of the cornea, and dividing the anterior from the poſterior chamber of the eye. It is perforated by a circular opening, called the pupil, (lichtloch, oder ſeheloch, Somm.) This aperture does not occupy the centre of the iris, but is rather nearer to the naſal than the temporal margin of its great circumference; hence the iris is broader, by about one-ſixth, towards the temple. than on the ſide next the noſe. The diameter of the opening varies very conſiderably, according to the quantity of light directed on the retina. The anterior ſurface of the iris correſponds to the poſterior concavity of the cornea, ſeparated from it by a ſpace called the anterior chamber, which contains by far the greateſt portion of the aqueous humour. This ſurface is flat, and very differently coloured in different individuals. It is brilliant, and we can diſtinguiſh in it an external wider circle of a lighter, and an internal narrower ring of a darker, often of a different tint. On this ſurface alſo we ſee a number of ſtriæ, more or leſs ſerpentine, or parallel, large or ſmall, converging towards the leſſer circle, on which the ſtriæ are not ſo numerous, or ſo conſpicuous. The diſtinction between them depends more on their colour than on any elevation above the ſurface; and they are more ſerpentine in proportion as the pupil is dilated, and the iris contracted. The poſterior ſurface of the iris is oppoſite to the anterior convexity of the chryſtalline, ſeparated from it by a narrow ſpace, the poſterior chamber of the eye, filled by the leſſer part of the aqueous humour. It is covered by a thick, dark coloured mucus, nearly black. Here alſo, when the colouring matter has been waſhed off, we obſerve ſtraight lines converging to the centre of the pupil, but very diſtinct from thoſe on the anterior ſurface. This ſurface was formerly known by the name of *uvea*. The great circumference of the iris is let into the thickneſs of the anterior edge of the ciliary circle, at the line where the cornea terminates internally. It may be ſeparated without any laceration by the finger, or more eaſily ſtill by maceration in water.

Although the appearance of the two faces of the iris is very different, we cannot in the human ſubject make any diviſion of it into two layers, though this is the caſe more or leſs in other animals. It appears as a ſimple membrane, made up of veſſels, nerves, and membranous fibres. When examined with the aſſiſtance of a magnifying power, the two circles on the anterior ſurface of the iris appear compoſed of numerous fibres, converging from the circumference of the iris towards the pupil, and diſtinguiſhed from each other chiefly by their colour. The longer ones are generally white; the ſhorter are finer, and of a darker colour. They are tortuous when the pupil is dilated, and nearly ſtraight when it is contracted. When they arrive at the circumference of the leſſer circle, the larger of theſe fibres divide into two branches, ſeparating at obtuſe angles, and inclining towards ſimilar branches with which they unite, to form an undulating or denticulated circular line, dividing the greater annulus from the ſmaller. From this margin there depart ſeveral delicate fibres, ſimilar in their courſe to the larger ſtriæ, which converge as radii towards the pupil, and form the leſſer ring of the iris, by which that opening is immediately ſurrounded. Haller, who minutely deſcribes the appearance of the iris under the magnifying power, agrees in the principal features of his account with the one here given. He ſays that ſeveral of the radiated ſtriæ are collected into flocculi, and that theſe united make a ſerrated arch, convex towards the pupil, at the margin of the leſſer circle, the flocculi being "varie in flammulas quaſdam introrſum euntes diſpoſiti." This radiated ſtructure is covered by a fine tranſparent membrane, of which we ſhall ſpeak below, as including the aqueous humour. When the pigment has been waſhed from the back of the iris, this ſurface appears of a whitiſh colour, and preſents a great number of riſing ſtraight lines, converging from the circumference to the pupil, appearing almoſt as continuations of the ciliary proceſſes. Theſe lines, totally different from the radiated and ſerpentine ſtriæ on the anterior ſurface, become more prominent, forming a kind of plait when the iris is extended, ſo as to augment its breadth. As they approach the pupil, they are gradually effaced, but with a highly magnifying power may be traced to the opening of the pupil. No circular fibres are in any caſe viſible. The regular diſpoſition here deſcribed is not viſible to the naked eye: we can obſerve irregular lines converging towards the pupil in the living ſubject, but cannot by any means diſcern their exact diſpoſition. After death they are ſtill leſs apparent.

The long ciliary arteries are the chief ſource from which the iris derives its ſupply of blood. Theſe veſſels, two in number, one on the naſal, the other on the temporal ſide of the eye, run between the choroid and ſclerotic coats, till they arrive at the ciliary circle. Here they divide uſually into two principal branches, going off at very obtuſe angles, which advance to the circumference of the iris, where the two branches of one artery anaſtomoſe with thoſe of the oppoſite, ſo as to form an arterial circle, correſponding nearly to this circumference. From this arterial ring, augmented by the acceſſion of the anterior ciliary arteries, are produced a great number of ſmall branches, more or leſs parallel, or tortuous, directed towards the pupil, and anaſtomoſing freely by lateral communications. On arriving at the leſſer ring of the iris, many of theſe bifurcate; their branches anaſtomoſe, and produce another vaſcular circle, correſponding to the circumference of the leſſer ring of this membrane, from which other radiated veſſels go to the margin of the pupil. This circle, however, is by no means ſo regular as that round the circumference of the iris; and many branches from the latter paſs on, without joining it to the leſſer ring, and to the pupil. With theſe arterial ramifications many veins are intermixed, which join, ſome the venæ vorticoſæ, others the veins accompanying the long, and the anterior ciliary arteries. The ciliary nerves, which we have before deſcribed as entering the ciliary circle, divide in that part into numerous fine threads, running towards the anterior ſurface of the iris, into which we can trace them but a very ſhort way: they ſoon become ſo confounded with the fibres before mentioned, as to eſcape all reſearch, even by the aſſiſtance of the microſcope.

The iris then appears as a membrane compoſed principally of arterial and venous branches and nerves, connected by membranous tiſſue. The fibres ariſe probably from the diſpoſition of the latter of theſe parts, and totally differ from thoſe of a muſcular kind both in ſtructure and functions. A ſuppoſed neceſſity of aſſuming their muſcularity, in order to account for the motion of the iris, has alone given riſe to that opinion, which is now rejected by the moſt eminent phyſiologiſts. Numerous membranous flocculi are deſcribed by Zinn on the anterior ſurface of the iris, plainly diſtinct from the veſſels; they in ſome meaſure float in the aqueous humour in the intervals of the radiated fibres before deſcribed, producing, in conjunction with theſe two, innumerable refractions of the luminous rays.

The various colours of the iris in the ſame, and in different individuals, eſſentially depend on the pigment which covers the poſterior ſurface of the iris, which gives the prevailing ſhade of the tint. For if this is removed, the iris is nearly tranſparent. The exact nature or immediate cauſe of theſe colours is unknown. Soemmerring obſerves, that the lighter the colour of the pigmentum and of the iris, the more delicate are the coats of the eye, and the converſe holds equally good; the darker the eye, the fewer are the ciliary plicæ. The colour of the pigmentum correſponds in ſome degree with that of the hair and ſkin. In the human ſubject it is moſt commonly dark. In many claſſes of animals, there is a difference of colour in the ſame eye; in the cow, or ſheep, for inſtance, there are, in the ſame eye, certain portions of a ſilvery white, and others of a fine green colour, the remainder being black. In the human ſpecies we ſee different ſhades from nearly black to nearly white; and we find theſe to correſpond in a ſtriking manner with the colour of the ſkin and hair, if we trace it from the black iris, and ſkin of the African negro, through the different races of men, to the fair ſkin and light eyes of the northern European. We ſometimes meet with perſons whoſe ſkin and hair are very white, and yet the iris is dark, which is a ſign of a dark pigmentum; but if we examine more carefully, we ſhall alſo find that the eye-laſhes are dark. The iris of one eye is often lighter in colour than that of the other, and ſometimes only one-half of the iris is white. Whether this difference in the ſame individual is owing to the pigmentum being different in colour, is not, we believe, aſcertained. The iris is totally white in the wall-eyed horſe. In the Albino, of whatever race, the iris is ſomewhat white, but almoſt pellucid, ſlightly tinged of a colour between a pale violet and red. The pupil is of a full pink, or rather red. Theſe phenomena are cauſed by the deficiency of the pigment, the tinge ariſing from the numerous blood-veſſels of the iris and choroid coat; and correſpond with the total want of colouring matter in the rete mucoſum. For other peculiarities in the eye of the Albino, or Leucæthiops, we refer the reader to the deſcription of the firſt plate illuſtrating the anatomy of the eye. In all caſes the colours of the iris, the "ſtupendæ colorum varietates" are very much clearer when ſeen through the medium of the aqueous humour, which evidently augments their intenſity; when the cornea is removed, and the aqueous humour diſſipated, they loſe much of their brilliancy.

The iris poſſeſſes but little ſenſibility in its healthy ſtate; its motions are involuntary, and depend not on any direct excitation, but on the quantity of light falling on the retina; rays of light, ſo directed as to fall only on the iris, have no viſible effect in altering its figure. It changes moſt plainly and rapidly when the eye is brought ſuddenly near to the flame of a candle, or removed from a light to a darker place. In the firſt caſe the breadth of the iris is increaſed, and the pupil proportionally contracted; in the ſecond the converſe may be obſerved. This alteration in the diameter of the pupil is connected in ſome degree alſo with the cloſeneſs or diſtance of the object. The iris, in all its motions, appears to poſſeſs a peculiar mode of action, obſerved in no other animal tiſſue. Its dilatation diminiſhes the pupil, and its contraction widens that opening. Here then the preſence of the ſtimulus produces an elongation of its parts, and its abſence their contraction, the inverſe of what happens in muſcular action. That the iris acts ſympathetically only, is further proved by its loſs of motion in paralytic affections of the retina, as in gutta ſerena, the pupil being in theſe caſes widely dilated. This affords another argument to ſhew that the contracted ſtate of the iris is the ſtate of reſt, and that this part moves only in conſequence of the action of light on the retina. Further, its motion ceaſes at the moment of death, and cannot, like that of muſcular fibres, be renewed by the application of ſtimuli. The very different diameters of the pupil in the dead ſubject depend on the ſtate of the iris at the inſtant of diſſolution, and conſtitute a further argument againſt its muſcularity. The motion of the iris has been aſcribed to the ſudden turgeſcence or depletion of its veſſels; the former condition increaſing its breadth by making the ſerpentine veſſels ſtraight. But no ſuch change can be obſerved in the tremulous and delicate iris of the albino, which ſeems made up almoſt wholly of veſſels, and the motion of the iris continues unimpaired when the action of the heart is occaſionally interrupted. Blumenbach believes the cauſe of its motions to depend on its vita propria, or peculiar vital properties, as the iris, "tam quod ad fabricam et vividiſſimum in multis animalibus colorem, &c. quam quod ad motum, nulli plane in univerſo animali corpore analogum, tam multa habet ſingularia, et propria."

In the infant, at birth the iris is covered at the poſterior ſurface by a very large quantity of dark pigment. In the fœtus, before the end of the ſeventh month, the opening in the iris, the pupil, is occupied by an extremely delicate membrane continuous with its margin, called the membrana pupillaris, (lichtlochſhaut.) It is ſupplied by many veſſels derived from thoſe of the iris; yet it differs from that membrane very materially in ſtructure and appearance. The membrana pupillaris is extremely thin and tranſparent, while the correſponding edge of the iris is thick, and covered by a layer of the dark pigment. Soemmerring particularly mentions it as an independent membrane. It gradually diſappears before birth, at which time no veſtige of it remains; its particular uſe is unknown. It has occupied the pens of Albinus, Hunter, Haller, Walter, Wriſberg, and Blumenbach. Wriſberg has given a paper on the ſubject in his "Commentationes Medicæ," Gött. 1800.

The *retina*, (mark-haut,) deriving its name from the reticulated diſpoſition of its component parts, forms the third membranous inveſtment of the eye, being ſituated immediately between the choroid coat and vitreous humour. As it is connected directly with the optic nerve, we ſhall introduce here ſome remarks on the latter. The optic nerve, after decuſſating its fellow, with which it is moſt intimately connected, paſſes into the orbit by the foramen opticum, covered by a firm ſheath derived from the dura mater. It now aſſumes a cylindrical form, and purſues rather a ſerpentine courſe forwards and outwards, receiving in its paſſage a ſmall artery and vein. It ſoon after enters the globe of the eye, on the inner or naſal ſide of its axis. As the nerve approaches the eye, the faſciculi of opaque pulpy fibres gradually diminiſh in ſize, and increaſe in number by an irregular ſub-diviſion, till they terminate in the retina. Near the eye, where the faſciculi are moſt numerous, the ſubſtance of the nerve has a conſiderable degree of tranſparency, from the number of interſtices between them, filled by a tranſparent jelly. At this part alſo we obſerve in the middle of the ſubſtance of the nerve ſmall veſſels running in its axis, the central artery and vein of the retina. On arriving at the bulb, the ſheath of the nerve becomes connected with the ſclerotica in the manner already deſcribed. The nerve contracts, forming an irregular cone, the temporal ſide diminiſhing more than the naſal, ſo that if divided vertically, the inner ſection of the cone would be the thickeſt. The convex end of the cone having traverſed the thickneſs of the ſclerotic coat, meets with a thin concave layer of membrane, (*lamina cribroſa*,) intimately united with the inner edge of the opening in that tunic, and perforated by numerous foramina. Through theſe the medullary fibres of the nerve are tranſmitted, there being a larger hole in the middle (porus opticus) for the central veſſels. The convex end of the nerve, covered by this perforated membrane, projects towards the inſide of the eye, and the medullary part of it forms within the membrane a conical white papilla, with a depreſſion in the middle. This prominent diſk may be diſtinguiſhed from within by its projecting beyond the level of the retina, and by the difference of its colour. From this circle the retina ſpreads under the choroid as far as the commencement of the corpus ciliare. It has no connection with the choroid, being ſimply in contact with it, and receiving no tinge from the pigmentum. The concave ſurface of the retina embraces cloſely the vitreous humour, but has apparently no further union with it than what is derived from the paſſage of the central artery into that body. The anterior margin of the retina correſponds to the great circumference of the corpus ciliare, the choroid beyond this line being in immediate contact with the vitreous humour. The termination of the retina at this line has been doubted by many anatomiſts, who maintain that it is continued over the vitreous humour to the edge of the chryſtalline. They aſſert that a very delicate layer is continued from its apparent termination between the ciliary proceſſes and vitreous humour, to the edge of the chryſtalline. In order to ſee this part the choroid muſt be carefully removed, and the eye immerſed in water, when the prolongation of the retina becomes evident. That a delicate membrane really adheres to the anterior part of the vitreous humour would thus ſeem clear, but whether it is a continuation of the retina admits of doubt. If the examination be made in a recent eye, the latter membrane terminates moſt decidedly at the edge of the ciliary proceſſes. Immerſion of the eye in ſpirits gives to the vitreous body an opaque and pallid ſurface, which may be miſtaken for a continuation of the retina. But the retina eaſily ſeparates from this apparent prolongation, and appears to end by a regular, acute, and well-defined margin, very different from what we ſhould expect if the membrane had been lacerated. We believe its termination to be at the great circumference of the corpus ciliare, and conſequently more than a line from the circumference of the chryſtalline lens.

In all other animals that have a corpus ciliare the retina terminates as we have deſcribed. In birds it forms a projecting roll at this part. In animals which have no ciliary proceſſes the retina ends ſuddenly towards the commencement of the iris, and it is manifeſt that the anterior ſurface of the vitreous body retains no portion of it. It further appears that an inſtrument paſſed into the eye, in the human ſubject, behind the ciliary proceſſes, occaſions acute pain, which is not the caſe if the wound be made anterior to their commencement. And we have no example in the animal body where the medullary part of a nerve is continued into a membrane of no ſenſibility, whoſe only uſe could be that of ſupporting the ſoft parts within it.

The retina in the living ſubject is moſt perfectly tranſparent; it becomes of a pale white ſoon after death. It poſſeſſes ſome thickneſs, but is ſo ſoft as to be torn with ſlight force. It is formed eſſentially by a medullary ſubſtance continued from the optic nerve. When examined attentively as it lies ſpread over the vitreous humour, we obſerve in it many tranſparent lines, diſtributed without any regular order, united by other tranſverſe lines, between which opaque areolæ are viſible. Theſe lines are probably the ramifications of veſſels of the retina. For in addition to the medullary pulp, of which the retina is compoſed, this membrane preſents a vaſcular and filamentous net-work, occupying its inner ſurface, made up by the central veſſels, and a very fine tiſſue ſupporting them. On this net-work the medullary part reſts, ſo that the retina may be almoſt deſcribed as being compoſed of two layers. It is, however, impoſſible to ſeparate them throughout, even by maceration. On the outer, or temporal ſide of the membrane, about two lines diſtant from the entrance of the optic nerve, and in the very axis of the eye, we obſerve in the recent organ a yellow ſpot, of a deeper colour towards its centre, and of about a line in breadth. It is generally concealed by a fold of the membrane, for which reaſon it eſcaped for a long time the reſearches of anatomiſts, Soemmerring having been the firſt who obſerved and deſcribed it. The centre of this yellow ſpot is perforated by a ſmall hole. Theſe facts are beſt ſeen by detaching the poſterior part of the ſclerotic and choroid coats under water; the eye ſhould be as recent as poſſible. “In vero retinæ centro luculentiſſime tum cernitur foraminulum plane rotundum cum limbo luteo, quod duo vaſorum ſanguiferorum rami eleganti corona cingunt.” The folds ſurrounding it are thus prevented, and the membrane continuing tenſe, theſe appearances are ſufficiently evident. They may alſo be advantageouſly ſeen through the tranſparent vitreous humour in a ſimple ſection of a recent eye. In this way, however, it is difficult to prevent the retina from falling into folds. Another method of demonſtrating it is, by removing the cornea, iris, and chryſtalline. The retina then remains undiſturbed, and the foramen, with its yellow zone, is plainly viſible in a ſtrong light. Mr. Home ſays, that it is apparently a little below the poſterior end of the viſual radius. He obſerves alſo, that in ſeparating the vitreous humour from the retina, there is a greater adheſion at this particular part. This ſpot is pale in children, bright yellow in young perſons, and again pale in old age. It has been obſerved that the intenſity of the colour is connected with the ſtate of viſion: that it diminiſhes where that is obſtructed, and that the yellow ſpot entirely diſappears when viſion is loſt. The plait which has been deſcribed as extending from this ſpot to the optic nerve we believe to be only accidental, and cauſed by the adheſion of the vitreous humour, when the latter has been ſomewhat diſplaced in the examination.

The foramen centrale, firſt diſcovered by Soemmerring in the human eye, has been ſince demonſtrated in the eyes of ſeveral quadrumana, where theſe organs are directed forwards, and have their axes parallel to each other.

The central artery gives its principal branches to the retina; a ſmall trunk only enters the ſubſtance of the vitreous body. We frequently find the larger of theſe branches filled with blood, and two of them ſurrounding the central foramen “inſtar coronæ.” The central veſſels exhibit a very elegant appearance, when ſeen through the tranſparent lens and vitreous humour, on the ſurface of the retina. The central artery varies much in its origin, being derived ſometimes from the trunk of the ophthalmic, at others from the internal long ciliary, or the inferior muſcular. There are ſometimes more than one arterial trunk, but the principal always runs on the axis of the optic nerve, and enters with it as before deſcribed. The central vein uſually correſponds to the artery in its origin and courſe.

The retina is very completely formed in the full grown fœtus. Its veſſels are particularly numerous and apparent. The yellow ſpot is not viſible in the fœtus of nine or eight months; nor can it be obſerved at all times even in the eye of the new-born infant.

The humours of the eye.—The humours of the eye are three in number; *viz.* the *vitreous*, the *chryſtalline*, and the *aqueous*, each poſſeſſing a delicate tranſparent membranous inveſtment peculiar to itſelf. The vitreous body (glaſkörper) ſo named from its reſemblance to glaſs, is compoſed by the vitreous humour, properly ſo called, and the membrana hyaloidea, which contains it. It is a ſoft tranſparent maſs, extending from the back of the eye to the chryſtalline lens, occupying rather more than three-fourths of the globe, and poſſeſſing a ſpherical figure, with a depreſſion in the middle of its anterior ſurface, in which a part of the chryſtalline is lodged. Its ſurface is covered in the greateſt part of its extent by the retina, with which it is connected only at its poſterior part, as before related. Beyond the termination of the retina it is covered by the ciliary body, and is marked by radiated grooves, into which the ciliary proceſſes are received. It is perfectly pellucid, offering, at firſt ſight, no diſtinction of membrane, or humour. The membrana hyaloidea contains the vitreous humour, forming its external capſule. Numerous plates of membrane paſs from its inner ſurface, interſecting each other, and thereby forming ſmall cells of different figure and ſize, in which the humour is immediately held. Towards the commencement of the corpus ciliare this membrane divides into two layers, the internal of which, continuing to cover the vitreous humour, paſſes behind the chryſtalline, whilſt the external goes on under the corpus ciliare to the circumference of the chryſtalline, attaching itſelf to the anterior part of the capſule, in which the lens is contained. This layer is deſcribed by Zinn under the name of the “membranula, or zonula coronæ ciliaris;” which latter term denotes the radiated circle on the front of the vitreous humour, marked by the pigment of the ciliary proceſſes. This membrane has probably been miſtaken for a continuation of the retina. Zinn does not believe it to be a continuation of the outer layer of the hyaloidea, which he aſſerts to be throughout a ſimple membrane. Between it and the membrane immediately inveſting the vitreous humour there is formed a triangular, curvilinear cavity, the baſe of the triangle being formed by the capſule of the chryſtalline. This canal is named from its firſt diſcoverer, F. Petit: it was called by him “le canal godronnè,” from its peculiar appearance. It is covered externally by the black radiated ſtriæ of the ciliary proceſſes, and here it correſponds to thoſe proceſſes. Hence we notice in it radiated fibres, equal in number to the ciliary proceſſes, and in contact with their poſterior edge. Theſe fibres are not ſo long as the looſer membrane between, which correſponds to the hollows between the ciliary proceſſes. They bind it down conſequently from ſpace to ſpace, ſo that when air is impelled into it, we ſee this canal godronnè alternately elevated and depreſſed. Being equal in breadth to the corpus ciliare, it muſt be rather broader on the temporal than on the naſal ſide. It has no communication with the cavity of the chryſtalline capſule. Little is known concerning the intimate ſtructure of the membrana hyaloidea. It receives a few ſmall ramifications from the central veſſels of the retina, and ſecretes, no doubt, the vitreous humour. It is capable of undergoing a certain degree of extenſion without rupture. Boiling water, or concentrated acids, act but feebly on it, producing only a ſlight contraction.

The humour may be obtained, from its containing membrane and cells, by preſſure, or by making inciſions into, and ſuſpending the vitreous body: when thus procured, its quantity is proportionate to the volume of the eye. Its weight, as aſcertained by Petit, was 104 grains in an eyeball which weighed 142 grains. It is ſomewhat viſcous, and perfectly limpid. The ſpecific gravity, as determined by Chenevix, is 10053. It it compoſed of water, albumen, gelatine, and muriate of ſoda; and is eaſily miſcible with water, which, even when boiling, produces only a ſlight opacity.

The arteria centralis ſends to the vitreous body a branch called the central artery of the vitreous humour: this paſſes from behind forwards to the back of the chryſtalline capſule, on which it is diſtributed in a beautifully arboreſcent form. A few very fine branches from this veſſel are ſpread over the membrana hyaloidea.

The ſtructure of the vitreous body may be moſt advantageouſly examined in the ſection of a frozen eye. We then obſerve numerous icy flakes, ſeparated by membranous ſepta of the moſt delicate appearance. Theſe flakes are of different lengths and breadths; they reſemble, on the whole, wedges with the baſe backwards, and the ſummit forwards; the convex part next the circumference of the vitreous body, and the thinneſt directed towards the chryſtalline: in other words, they appear as ſegments of a circle, the centre of which would be in the lens. This ſtructure may be exhibited by means of acids, which render the membrane ſomewhat opaque; and ſtill better by immerſing the vitreous body in a ſolution of potaſh, which acts only on the membrane, and gives no degree of turbidneſs to the contained fluid. The cellular ſepta may be ſhewn by allowing the fluid to eſcape through a ſimple inciſion, and afterwards impelling air through the ſame opening.

The chryſtalline humour—ſo called from its tranſparency, is a lenticular body, ſituated on the anterior ſurface of the vitreous humour, which is hollowed to receive it, and encloſed in a peculiar membrane, called its *capſule.* The chryſtalline is placed at the diſtance of about four-fifths from the poſterior end of the axis of the eye: but, as its axis is the ſame with that of the pupil, and the iris is one-ſixth broader on the temporal than on the naſal ſide, the centre of the chryſtalline is rather on the inner ſide of the axis of the eye, though in the ſame horizontal plane with it. Its anterior ſurface is oppoſite to the back of the iris, from which it is ſeparated by a ſpace called the poſterior chamber of the eye, and containing a part of the aqueous humour. The circumference correſponds to the canal of Petit, and to the ciliary proceſſes, which project a little over its anterior ſurface into the aqueous humour. The two ſurfaces of the chryſtalline are not of equal convexities, the poſterior being the moſt prominent. According to the experiments of Petit, the anterior convexity repreſents a ſegment of a ſphere, whoſe diameter would vary from ſix to nine lines; and the poſterior, of a ſphere, the diameter of which would be ſomewhere between four lines and a half and five and a half. Theſe forms of its ſuperficies, however, are by no means conſtant, the difference of convexity being in ſome inſtances ſcarcely diſcernible. The chryſtalline varies much in figure, tranſparency, and conſiſtence, according to the age of the ſubject. It is firmer in old people, and very frequently acquires a yellow tinge. In the healthy adult the chryſtalline is perfectly tranſparent, not of equal conſiſtence throughout, but gradually increaſing in denſity to its centre. The exterior parts are thick and glutinous, and may be rubbed off by the fingers. Thoſe more deeply ſeated are ſolid, and appear, after immerſion in weak acids or alcohol, diſpoſed in the form of numerous concentric laminæ, harder as we approach the centre. Each of theſe laminæ is compoſed of extremely fine parallel fibres lying in a direction from the circumference to the centre. When expoſed to air after a ſhort maceration or immerſion in alcohol, it further breaks into irregular triangular ſegments, converging by their points to the centre of the lens, which again ſubdivide into ſmaller portions. When immerſed in boiling water the ſoft external parts acquire a milky white colour, and a firmer conſiſtence. In this ſtate it may be eaſily removed, leaving a nucleus much more ſolid. of a pearl colour, ſhining faintly, and not undergoing any further alterations by repeated immerſions. Alcohol produces ſimilar effects, but not in ſo ſenſible a manner. Long continued maceration changes the chryſtalline into a pulpy maſs. Expoſure to the air renders it dry, ſolid, and friable on the ſurface, the primitive form, and even tranſparency, being ſtill preſerved: in this ſtate it may be kept for a long period. Sections of the dried lens exhibit its laminated ſtructure. Examined chemically, the chryſtalline is found to conſiſt of albumen and gelatine, with a very ſmall quantity of water, and has not either any thing acid or alkaline in its compoſition.

It receives no red blood-veſſels; we can trace no nerve even to its capſule; nor does it poſſeſs any animal ſenſibility. Anatomiſts have even doubted whether this body poſſeſs any vital properties. Leeuwenhoek has deſcribed the fibres of the chryſtalline, and indeed ſometimes calls it a muſcle. Little can be drawn from ſuch examination, when we conſider the very great power of his microſcope, and the probably dry ſtate of the chryſtallines he examined. Dr. Young has given an apparently accurate deſcription of numerous fibres, with interſecting tendons, in the chryſtalline of an ox. Theſe he believed to be muſcular, and to poſſeſs a power of increaſing the ſphericity of the part. This opinion he afterwards changed, as we ſhall notice hereafter. The late Mr. Hunter conceived that the chryſtalline could change its figure. He obſerved the remarkable fibrous laminæ which ſurround the more ſolid parts in the cuttle-fiſh, and concluded the ſtructure to be analogous in other animals, where coagulation developes the fibrous ſtructure. We are diſpoſed to admit of a change of figure in the lens, but the arguments for its muſcularity are not convincing. Though it may be ſeparated into ſpherical laminæ after death, we cannot infer that the pellucid, colourleſs, viſcid lens in the living eye is compoſed of fibres and lamellæ divided by regular ſegments. The re-agents above mentioned totally alter its nature, rendering it opaque, and partially friable. The appearance of fibres is equally ſtrong in the coagulated part of the blood, when immerſed in the ſame menſtrua. But if we admit the radiated fibres of the ſeveral artificial laminæ, the tranſparent nature and refractive powers of the lens are hardly reconcileable with the idea of muſcular action. The lens, in experiments made inſtantly after death, is not acted on by thoſe ſtimuli which ſo evidently affect muſcles under ſimilar circumſtances. No change of figure, no action of its component parts, can be ſeen on the application of electricity. In ſhort, if we conſider the peculiar appearance of the recent lens, its perfect tranſparency in a healthy ſtate, and its peculiar diſeaſes; the want of cellular tiſſue, of red blood-veſſels, and nerves, the deficiency of ſenſibility and contractility, animal, or organic, indeed, of all properties poſſeſſed by the common muſcular fibre, we muſt conclude that no ſufficient proofs of muſcularity exiſt. A ſuppoſed neceſſity for the preſence of muſcular fibres, in order to account for certain ſuppoſed changes in the figure of the lens ſubſervient to the accommodation of the eye to different diſtances, has given riſe to an opinion, hitherto unwarranted by anatomical inveſtigation.

The chryſtalline is contained in a tranſparent membranous capſule, compoſed of two portions; one of theſe is derived from the hyaloidea, inſerted into the capſule on its anterior ſurface, beyond its greateſt circumference, and already deſcribed under the name of membranula coronæ ciliaris. This is probably continued over the whole anterior ſurface, but cannot be demonſtrated ſo extenſively; towards the circumference it is manifeſt by a tranſverſe ſection of the canal of Petit. The hyaloidea is in cloſe union with the poſterior part of the proper capſule, but may be ſeparated from it. The proper capſule, thus maintained in its ſituation, forms a complete bag, between which and the ſurface of the lens we find a ſmall quantity of tranſparent aqueous fluid, more abundant on the anterior ſide, and eſcaping inſtantly when the capſule is wounded, (*aquula Morgagnii.*) Its quantity is very ſmall in the recent eye. Haller believes it to be produced by tranſudation from the lens; probably it is ſecreted by the capſule, and prevents the adheſion of the oppoſed ſurfaces. The anterior part of the capſule is more elaſtic than the poſterior. The latter, as it can be ſeparated from the hyaloidea, is thinner and ſofter, but ſtill thicker than that membrane. It contracts and becomes opaque by immerſion in boiling water: ſimilar effects, but in a leſs degree, are produced by acids; it is not altered by alkalies; it becomes yellow by remaining in the air. The texture of the capſule is but little known. It is ſupplied by veſſels from the central artery, which penetrates the vitreous humour. After a minute injection in the fœtus, a ſmall trunk can be perceived coming from this artery, giving off numerous radiating branches on the poſterior ſurface of the capſule. Some of theſe have been even traced into the ſubſtance of the lens; but no ſuch veſſels can be ſeen in the adult. Veſſels have been traced alſo croſſing from the choroid proceſſes to the circumference of the capſule. Some of theſe may be continued to the lens itſelf; but, if they exiſt at all, they muſt be extremely minute.

The *aqueous humour* is a limpid tranſparent fluid, occupying the curvilinear ſpace between the chryſtalline, the front of the corpus ciliare, and the cornea. This cavity is divided by the iris into two unequal parts, communicating with each other by the opening of the pupil. The larger portion being between the iris and the cornea, the ſmaller between the iris and the lens; the firſt is called the anterior, and the laſt the poſterior chamber of the eye. Much pains have been taken, by freezing the eye, to aſcertain the relative dimenſions of theſe. The aqueous humour weighs generally between four and five grains; the exact quantity in each chamber, and the dimenſions of theſe cavities, have been moſt carefully aſcertained by Petit; and the reſults of his inveſtigations are contained in the Memoires de l'Academie des Sciences. The very exiſtence of a poſterior chamber has been doubted; but the moſt accurate reſearches ſhew that there is always a ſpace between the front of the lens and the poſterior ſurface of the iris, occupied by aqueous humor.

The aqueous humour reſembles the fluid contained in the cells of the membrana hyaloidea in its compoſition; it has the ſame ſpecific gravity, and the ſame proportions of albumen, gelatine, and water, and muriate of ſoda, according to the obſervations of Mr. Chenevix. It offers the ſame phenomena when expoſed to the action of ſimilar chemical agents. This humour is probably contained in a fine capſule, ſomewhat ſimilar to thoſe belonging to the other humours. We can obſerve at leaſt an extremely fine membrane lining the poſterior ſurface of the cornea, reflected from its circumference to the anterior ſurface of the iris, and advancing over that membrane towards the opening of the pupil; to the aperture of which it cannot however be traced. This membrane may poſſibly be continued through the pupil, and line the poſterior chamber. We ſuppoſe it to ſecrete the aqueous humour. This may be furniſhed perhaps by the arteries of the iris, or ciliary proceſſes. It is very rapidly renewed after wounds in the cornea.

Muſcles of the globe.—The globe of the eye is ſituated towards the front of the orbit, ſupported by a cuſhion of ſoft and yielding fat, and receiving the inſertion of various muſcles, which execute its rapid and varied motions. Theſe ariſe from the bony orbit; five coming from the poſterior part, at the apex of the cone, and one near the front edge. They follow different directions towards oppoſite parts of the eye-ball; and are named from their direction, or apparent action, the four ſtraight, and two oblique muſcles; or the elevator, depreſſor, abductor, adductor, great and ſmall rotators of the eye. The four recti are cloſely connected at their poſterior attachment, ſo as to form part of the ſides of a hollow cone, of which the baſe is the bulb of the eye, and the form nearly the ſame as that of the orbit. In this ſpace are contained, beſides fat, the ciliary arteries, the ciliary nerves, and lenticular ganglion, and the large optic nerve. Theſe four muſcles, ariſing by ſmall tendinous ends, become preſently fleſhy and of increaſed ſize, which diminiſhes as they arrive at the middle of the bulb, the muſcles terminating in flat tendons. In the latter part of their courſe they are cloſely inveſted by a cellular ſheath, which connects them with the anterior part of the orbit, and is continued on each ſide, connecting the tendons in ſome meaſure, and paſſing forwards between the ſclerotica and conjunctiva. The tendons of the recti proceed beyond the middle of the bulb, which is ſlightly hollowed externally for their reception, and are attached, at about equal diſtances from the cornea, on four oppoſite ſides. Theſe tendons are no where in contact with each other, not even at their termination, which is their broadeſt part; and are ſo cloſely united with the ſclerotica, as not to be ſeparated from it without manifeſt laceration. Mr. Home, and Mr. Pierce Smith aſſert, in the Philoſophical Tranſactions, that the tendons not only paſs to the anterior part of the ſclerotica, but are continued in one united ſheet over the cornea. This very ancient opinion, produced as a new and important diſcovery, has long ſince been overturned by the moſt eminent anatomiſts, and ſcarcely requires diſcuſſion here. Neither would the repreſentation, if well founded, aſſiſt us in explaining the phenomena of viſion, or the motions of the eye. The tendons are inſerted very conſiderably beyond the tranſverſe vertical diameter of the globe, gaining thereby an extent of power, which they could not poſſeſs if attached behind that line. The conſtruction is plainly ſubſervient to the motions of the globe; any further uſe is perhaps problematical.

The *rectus ſuperior, attollens* of Albinus, is attached poſteriorly, between the levator palpebræ ſuperioris and the foramen opticum, by ſhort tendinous fibres; it paſſes nearly horizontally, above the optic nerve, and, turning over the bulb, is attached to the anterior part of the ſclerotica, about $\frac{1}{6}$th of an inch from the edge of the cornea. It covers, anteriorly, the globe of the eye and the tendon of the ſuperior oblique; poſteriorly, the optic nerve, the ophthalmic artery, and the naſal branch of the ophthalmic nerve. Above it, lies the levator palpebræ ſuperioris.

The *rectus inferior, depreſſor* of Albinus, reſembles the preceding in form, but is ſmaller in bulk, ſituated on the lower part of the orbit. It is attached behind by a tendon common to it with the abductor and adductor; a tendon fixed to the ſphenoidal bone near the ſella turcica, and paſſing through the foramen lacerum orbitale; it divides into three portions, one for each of theſe muſcles. The rectus inferior paſſes horizontally forwards, and is united to the ſclerotica oppoſite to the inſertion of the rectus ſuperior. It correſponds below to the floor of the orbit; above it are the optic nerve at ſome diſtance, and in the interval the nerve of the third pair.

The *rectus externus, abductor*, Alb. has a greater length of muſcular belly than any of the four, which it otherwiſe much reſembles. It has two attachments poſteriorly; one to the tendon before mentioned, the other, contiguous to that of the rectus ſuperior, is derived from a ligamentous band croſſing obliquely the upper part of the foramen lacerum. Between theſe attachments a fiſſure is left for the paſſage of the nerve of the third pair, of the ſixth pair, and of the naſal branch of the ophthalmic. The muſcle itſelf proceeds obliquely to the outer ſide of the globe, and is united to the anterior part of the ſclerotica, at about the ſame diſtance from the cornea as the two preceding muſcles. On its outer ſide are the ſurface of the orbit, and the lachrymal gland; on the inner the optic nerve, the nerve of the ſixth pair, and the ophthalmic ganglion.

The *rectus internus, adductor*, Alb. lies on the inner ſide of the orbit. It is attached behind to the common tendon, and to the inner ſide of the foramen opticum, as far as the origin of the rectus ſuperior. It paſſes, in a ſtraight courſe, to the inner ſide of the globe, and terminates in a manner analogous to the reſt. It is the ſhorteſt, and the thickeſt of the four recti muſcles; the former circumſtance ariſing from the relative form and poſition of the orbit and the eyeball.

Of the two oblique muſcles, one ariſes from the bottom of the orbit as the recti, the other from its anterior, and internal part. The firſt of theſe, the *obliquus ſuperior*, or *trochlearis*, is attached poſteriorly to the internal and upper part of the orbit, about two lines from the foramen opticum, by ſhort tendinous fibres. The muſcular portion is ſmall and ſomewhat rounded, and paſſes towards the internal angular proceſs, where it terminates in a delicate tendon, which paſſes through a cartilaginous pulley fixed to the upper ſide of the orbit. This pulley is formed by a cartilaginous plate, with its edges turned upwards and attached to the orbit, ſo as to form a complete tube, ſituated obliquely, of about a quarter of an inch in length. The pulley is bound to the orbit by ligamentous fibres at both its ends, and eſpecially in front. Soemmerring has deſcribed a "ligamentum lunatum ex arcuatis fibris tendineis ſplendentibus compoſitum," paſſing between the edge of the orbit and the pulley, and preventing it from being drawn backwards in the actions of the muſcles of the eye. This canal is lined by a ſynovial membrane, which continues to inveſt the tendon of the obliquus ſuperior, after it leaves the trochlea to its inſertion in the globe. The tendon is reflected at an acute angle, and deſcending a little backwards and outwards, paſſes under the rectus ſuperior, and terminates below it on the outer, poſterior, and upper ſurface of the ſclerotica, about half way between the optic nerve and the edge of the cornea. It correſponds, in the firſt part of its courſe, to the orbit within, the optic nerve without, the rectus ſuperior above, and rectus internus below; in the ſecond its tendon lies between the conjunctiva, the rectus ſuperior, and the eye-ball.

The *obliquus inferior* is fixed by a ſmall tendon to the interior edge of the orbit, rather below and on the outer ſide of the opening of the ductus naſalis. It paſſes obliquely outwards and backwards, between the rectus inferior and the orbit, and turning upwards, between the globe and the rectus externus, is attached by a tendinous expanſion to the ſclerotica at the ſuperior part of its outer ſide, behind the inſertion of the obliquus ſuperior.

The immediate actions of the recti muſcles are ſimply thoſe of directing the axis of the eye towards different points. According to their attachments they will elevate or depreſs the pupil, turn it towards the noſe or the temple. By the differently combined actions of theſe muſcles, the eye may be moved in any of the intermediate angles. By the ſucceſſion of ſuch actions it may be moved rapidly round in the orbit. In all theſe caſes the action of one muſcle is moderated by its oppoſite. The motions of rotation inwards and outwards, motions in which the eye does not move from its place, but only on its axis, are executed, the firſt by the ſuperior, the laſt by the inferior oblique. By the united action of the ſix we are enabled to preſerve the eye in the ſame relative poſition with regard to the object, whether it be at motion, or at reſt; and whether the head is fixed or moving in any direction, ſo as to alter its poſition with reſpect to the object; in ſhort we can by their means direct the eye to any point, and keep it fixed there under any change of the ſituation of either. To uſe the expreſſive words of Mr. Hunter, "the object becomes as it were the centre of motion or fixed point, commanding the direction of the actions of the eye, as the north demands the direction of the needle, let the box in which it is placed be moved in what direction it may." From the two eyes being always thrown on the ſame objects, and the will not being able to change the direction of one of them only, for inſtance to depreſs the left while the right is elevated, they are always ſeen to correſpond in their motions, which are executed in the two eyes by the oppoſite muſcles. If the eyes are directed to the right for example, it will be inſtantly ſeen that the rectus internus of the left eye, and the rectus externus of the right will be principally employed. The will extends only to the moving both the eyes at the ſame inſtant; we have no power over either ſeparately.

The ſtraight muſcles move the eye from object to object, and keep its point of viſion fixed upon any particular one, be it moving or at reſt, while the head remains a fixed point, while it moves progreſſively with the eyes in following a moving object, and even in ſome caſes where the head and the object are moving in oppoſite directions. They produce the circular movement when the head is at reſt; and when the eye is to become fixed, the head performs the circular movement. By theſe means the object, the axis of the eye, and the point of ſenſation, are all preſerved in the ſame ſtraight line. But there are ſome movements of the whole head, of which the eye is a part in which the ſtraight muſcles alone are not ſufficient to effect this, and where the oblique muſcles are eſpecially called into action. "Thus, when we look at an object, and at the ſame time move our head to either ſhoulder, it is moving in the arch of a circle, whoſe centre is the neck. When the head is moved towards the right ſhoulder, the ſuperior oblique muſcle of the right ſide acts, and keeps the right eye fixed on the object; and a ſimilar effect is produced on the left eye by the action of its inferior oblique muſcle: when the head moves in a contrary direction, the other oblique muſcles produce the ſame effect. As this motion of the head ſeldom takes place uncombined with its other motions, ſome of the ſtraight and oblique muſcles will be employed at the ſame time, according as the motions are more or leſs compounded."

It has not been clearly determined whether theſe muſcles can alter the figure of the eye, nor in what direction the change would be produced, although conſiderable labour and ingenuity have been beſtowed on the ſubject. Mr. Home advances, that an increaſed curvature of the cornea, an elongation of the axis of viſion, and a motion of the chryſtalline lens; all which changes he ſuppoſes to have taken place in the adjuſtment of the eye to view objects at different diſtances, depend in great meaſure on the contraction of the four ſtraight muſcles. Compreſſion of the eye will force the aqueous humour againſt the centre of the cornea, while the globe is at the ſame time ſteadied, ſo that the radius of the curvature of the cornea will be rendered ſhorter, and its diſtance from the retina increaſed. When the recent eye of an adult was diſtended by air being blown through an opening made in the optic nerve, the axis of viſion was elongated from 17-20ths of an inch to 17½. Mr. Home ſuppoſes that in this caſe preſſure is made in the moſt unfavourable way for producing the greateſt elongation in the axis of viſion, and that a lateral preſſure from without would be more effectual: this preſſure he believes to be made by the recti-muſcles. That the eye-ball does not recede in the orbit, under theſe circumſtances, he concludes to be ſufficiently proved by its not having done ſo in his numerous experiments. It is not demonſtrated, however, that any action of the recti, or at leaſt any powerful action, took place in any of theſe experiments. Dr. Hoſack, who believes in the elongation of the axis by muſcular action, ſuppoſes the four recti to make the compreſſion, and the oblique muſcles to keep the eye in its proper direction and ſituation. To us it is yet problematical, whether any change is produced in the axis of the eye by the action of its muſcles. How far ſuch changes could contribute to the adjuſtment of the eye to diſtances, will be more properly conſidered hereafter.

The great mobility of the eye has rendered this organ well ſuited to expreſs many of our wants, to aſſiſt, in ſome degree, our geſtures, or our voice, and to ſupply their place when their action fails. The part performed by the eye, in expreſſing the different paſſions, the ſpirit which it gives to the other features, are intereſting ſubjects, on which our limits will not allow us to enlarge.

The courſe of the optic nerve in the orbit, and its termination in the retina, are deſcribed in our account of that membrane. The other nerves of the orbit will be deſcribed under the article NERVE. Some particulars concerning them will be found in the explanation of the plates repreſenting the anatomy of the eye. The arteries are derived principally from the ophthalmic, of which a deſcription will be found under the article ARTERY. The veins of the globe of the eye join the vena ophthalmica cerebralis, which opens into the cavernous ſinus. The veins of the choroid and iris, as named by Walter, are an inferior, ſhort, and an anterior long ciliary joining the infra-orbital vein; an internal ciliary, a ſuperior ciliary, a poſterior and ſome long ciliary veins, joining the trunk of the ophthalmic. Theſe veins return the blood carried to the eye by the ciliary arteries. They ariſe by very minute ramifications from the iris and the ciliary proceſſes, run for a ſhort way in trunks, and perforate the ſclerotica in different parts, in a manner analogous to that of the ciliary arteries, but more particularly at its poſterior ſurface. The venæ vorticoſæ of the choroid, having collected into trunks, follow the ſame courſe. The vena centralis retinæ collects its branches from the anterior termination of the retina into three or four trunks, which unite into a ſingle one, entering the optic nerve in company with the central artery. The reader will find a minute and moſt complete deſcription of the veins of the eye, in J. G. Walteri epiſtolâ de venis oculi. Berolini, 1778, 4to.

The eye-brow, eye lids, and lacrymal apparatus.—Conſiderable protection is afforded to the eye by the edge of the orbit, but its anterior ſurface is further guarded by ſeveral adventitious organs. Theſe parts, to which Haller has given the name of “tutamina oculi,” conſiſt of the eye-brow, the eye-lids, and the parts deſtined to ſecrete and remove the tears.

The eye-brow is an arched eminence, covered with hair, placed at the baſe of the forehead, above the upper eye-lid, extending from the root of the noſe to the temple. It differs very much in its length, breadth, and thickneſs, in different individuals, and is generally very ſtrongly marked in old age. The eye-brow, at its commencement on the naſal ſide of the orbit, is at different diſtances from its fellow on the other ſide; ſometimes the two arches meet at the root of the noſe, at others there is an interval of more than half an inch. It deſcribes but a ſlight curve, the convexity of which is turned upwards, and terminates at the temple by a pointed end. The eye-brow is formed by a thick doubling of the ſkin covered by hairs, by cellular tiſſue and fat, by a ſtrong muſcle, and by bone. It has a plentiful ſupply of blood-veſſels and nerves. The ſuperciliary ridge of the frontal bone contributes very eſſentially to the prominence of the eye-brow, cauſing great variety in this reſpect in different perſons.

The orbicularis palpebrarum, and the frontalis muſcles, ſend many of their fibres into the ſubſtance of the brow, which are very cloſely intermixed with the fibres of another muſcle, called from its office the *corrugator ſupercilii.* This muſcle is ſhort, made up of numerous muſcular fibres, occupying the ſuperior and internal part of the baſe of the orbit. It is attached by ſmall tendinous fibres, divided into two or three portions, to the protuberance above the noſe on the frontal bone; it paſſes, making a ſlight curve, over the internal half of the orbitar arch, and terminates by uniting its fibres with thoſe of the orbicularis and frontalis, by which it is wholly concealed. It is ſeparated from the frontal bone by the veſſels and nerves coming from the orbit.

The eye-brows are covered by hairs of different lengths, which vary much in number, in colour, and in length, in different individuals. They are more numerous towards the noſe, and coarſer. Their colour is generally the ſame with that of the hair of the head. They are generally thicker in brown than in fair perſons. The hairs are diſpoſed obliquely, pointing outwards, and ſtanding off from the ſkin; the inferior hairs are turned obliquely upwards, the ſuperior obliquely downwards, ſo as to decuſſate by their points, and form an angular projecting line in the middle of the brow. They are commonly, but erroneouſly, figured as horizontal. When the eye-brows meet, the hairs next the noſe moſt commonly point upwards. Each hair forms a curve according to its place, and is not ſtraight. It commences by a bulb in the ſkin, becomes fine, gradually ſwells in the middle, and terminates in an extremely fine point.

The eye-brow is ſuſceptible of various motions, and forms, by its prominent ſituation and mobility, a very principal feature in the expreſſion of different paſſions. It will be elevated by the action of the occipito-frontalis, and conſiderably lowered by the orbicularis palpebrarum. The corrugator ſupercilii, having its fixed point near the root of the noſe, will by its action contract and wrinkle the ſkin of the brow perpendicularly, drawing the whole towards the noſe, producing what is called a frown. When we regard a diſtant object, or one which reflects but little light, we elevate the eye-brow; we lower and contract it on the contrary, when the object is near, or very bright, or the ſenſibility of the eye from any cauſe, too great. Thus it protects the organ from the impreſſion of too vivid a light, and guards it in ſome meaſure from foreign bodies.

The eye-lids are two moveable bodies, placed in front of the eye-ball, and occupying the whole opening of the bony orbit, which determines their extent; they are diſtinguiſhed into upper and lower. The upper lid, the largeſt and moſt moveable, when lowered, covers the principal part of the eye, deſcending much below its tranſverſe diameter, “infra æquatorem oculi deſcendens;” the under lid riſing but a ſmall way to meet it. On the convex anterior ſurface of each we obſerve a few wrinkles following the curve of the lid, varying in number according to the poſition of the part. When the eye is open there is always one large fold of the ſkin in each eye-lid: this is more particularly marked in the upper, in conſequence of the levator palpebræ drawing it under the edge of the orbit. The wrinkles are effaced when the eye-lids are cloſed in ſleep, ſo that they exhibit an uniformly ſmooth ſurface. The ſkin of the upper lid is continuous above with that of the brow; the ſkin of the lower with the cheek; the only line of diſtinction is the edge of the orbit, and the depreſſion within the margin. The poſterior ſurface of the eye-lids is concave, ſmooth, in contact with the globe, and always moiſt. The edge of each lid is ſtraight for about one-fourth of an inch next the noſe, where it correſponds to the caruncula lacrymalis. In the reſt of its extent it is ſlightly concave, correſponding to the projection of the eye-ball, and of conſiderable thickneſs, which diminiſhes towards the temple. The anterior margin of this edge is angular, and ſupports ranks of fine hairs, called eye-laſhes; the poſterior is bevelled off, ſo as to form with the globe, when the eye is ſhut, a triangular canal, narrow towards the temple, and gradually increaſing in ſize towards the noſe. It is particularly large at the angle, where the ſtraight and concave portions of the eye-lid meet, which is marked by a projecting papilla, perforated by the punctum lacrymale. From this point outwards, we obſerve alſo, between the two margins, a line of ſmall holes, the openings of ſebaceous glands. The two lids are united at each end, forming two angles, or canthi, of which the naſal or internal is a little rounded off, and called the great angle; the temporal or external is acute, and termed the leſſer angle. The difference is produced by the alteration in the outline of the lid above-mentioned, and by the diſpoſition of the tendon of the orbicularis muſcle. The opening between the lids in different perſons varies a little in its tranſverſe diameter, which is meaſured by the two angles. The perpendicular diameter, depending on the action of muſcles, is conſtantly changing, and determined by the degree of their contraction. We believe it is to the greater or leſs tranſverſe, and vertical diameters of the opening of the eye-lids in various individuals, and not to any great variation in the bulk of the globe, that the apparent ſize of the eye is principally owing. The apparent difference in the volume of large, or ſmall eyes, is certainly greater than can be attributed to a difference in the globe, which we know to vary but inconſiderably.

The eye-lids are compoſed of many different tiſſues, diſpoſed in layers, one beneath the other, over a broad cartilage, which gives the figure to the whole. The curtain formed by theſe is not ſufficiently thick to prevent ſtrong lights from affecting the eye. Beginning from the anterior ſurface, we find ſucceſſively a fine ſkin, a muſcle, a fibrous expanſion, and a plate of cartilage, on the poſterior ſide of which are ſebaceous glands covered by a mucous membrane. In the upper lid there is a ſecond muſcle between the anterior ſurface of the cartilage and the fibrous layer. As the cartilage ſupports the reſt, we ſhall commence with it.

In the ſubſtance of the oppoſed margins of the eye lids we find thin pieces of cartilage, named the *tarſi*, extending through nearly the whole length of the lids. Theſe differ in form and ſize. The tarſus of the upper lid is broad in the middle, narrowing gradually at each end, reſembling the ſegment of a circle, the arc of which is towards the margin of the orbit, and the chord oppoſite the lower eye-lid. It is much larger than the lower, which is of nearly uniform breadth throughout, correſponding to the external figure of the inferior lid. The convex anterior ſurface of each correſponds to the muſcle, the poſterior is lined by a membrane between which and the cartilage are glands. The connected edge of each, thin, in the upper lid convex, in the lower nearly ſtraight, gives attachment to ſome ligamentous fibres. The ciliary or oppoſite margin is thick, covered only by the conjunctiva; its particular figure has been already deſcribed as contributing to form the triangular canal between the cloſed lids. The outer extremity of each is fine and pointed, the naſal or internal is rounded, and of greater thickneſs. The tarſi are thin and flexible, fibro-cartilaginous in ſtructure, of a yellow colour. As the ſolid part of the eye-lids, they favour their gliding over the ſurface of the globe of the eye, keeping them equally extended in every movement. When the upper lid is elevated, its tarſus paſſes in ſome degree under the edge of the orbit, keeping the ſurface next the globe uniformly ſmooth, while the ſkin forms a deep fold in front, the tarſus retreating from it partly as it glides far back over the globe. The broad ligaments of the tarſi are fibrous productions, extending from the edge of the orbit to the oppoſite margins of theſe cartilages. They are very evident, and of conſiderable thickneſs next the orbits, where they appear to be continuous with its perioſteum. As they recede thence, they diminiſh very much in thickneſs, a few fibres only remaining, which are attached to the tarſi, the intervals being completed by cellular tiſſue. They are pierced in many places to give paſſage to veſſels and nerves. This fibrous layer is generally moſt diſtinct towards the temporal ſide of the eye-lids, where it is more evidently attached to the tarſi, the fibres decuſſating each other between the leſſer angle of the eye-lids and the oppoſite angle of the orbit, ſo as to form a tolerably firm band, connecting them together, ſimilar in ſome meaſure to the tendon of the orbicularis on the naſal ſide. In the upper lid, the ligamentous bands lie between the orbicularis and levator; in the lower, between the firſt of theſe muſcles and the membrane lining the lid. They ſcarcely deſerve the name of tarſal ligaments, but they form a tendinous arch round the orbit, the contents of which they aſſiſt in protecting. The tarſus of the upper lid, when elevated, paſſes behind its ligament.

The muſcles of the eye-lids are two in number; *viz.* one common to both, the *orbicularis palpebrarum*, another belonging to the upper eye-lid only, the *levator palpebræ ſuperioris*

This laſt muſcle is thin, long, and flat, placed in the upper part of the orbit, from the bottom of which it ariſes, in front of the foramen opticum, immediately before the origin of the rectus ſuperior. It is tendinous at this point, and ſoon becomes fleſhy, paſſes forwards, making a gentle curve over the convexity of the globe, ſpreading as it proceeds. Oppoſite the globe of the eye it forms gradually a thin tendinous expanſion, which turns downwards, and is attached partly to the ſuperior margin of the tarſus, partly to its ligament on the temporal ſide, by means of which it is connected with the outer angle of the orbit, the remainder of the tendinous fibres paſſing down in front of the tarſus to its ciliary edge. In this latter part of its courſe, it is cloſely connected with the orbicularis in front, adhering by cellular tiſſue to the tarſus on its poſterior ſurface. The upper lid, from its muſcle terminating in a broad diverging aponeuroſis, ſpread over the front of the tarſus, is further ſtrengthened than the lower, which has only its ligament to protect the lower part.

If we now examine the two lids, ſuppoſing them cloſed, we find their temporal ſide eſpecially defended by a fibrous expanſion, ſupplying the place of the bony orbit, which, by the obliquity of its baſe, leaves the eye more expoſed on that part; we find their naſal ſide with but little of this fibrous covering, which was leſs neceſſary, as the ball is defended by the projection of the noſe; we obſerve, moreover, the upper lid fortified by an additional fibrous layer, formed by the tendon of its levator muſcle, a conſtruction the more required here, as it executes almoſt alone the motion by which the lids are cloſed, and is more directly in the way of external injuries.

Externally to the parts we have hitherto deſcribed is a thin, broad, oval muſcle, formed of concentric fibres, with a line of diviſion in the middle, correſponding to the opening of the eye-lids, placed in front of the opening of the baſe of the orbit, occupying a great portion of the upper part of the face, and named *orbicularis palpebrarum.* Its fibres on the naſal ſide have a triple origin: one above, from the naſal proceſs of the ſuperior maxillary and the orbital proceſs of the frontal bones; another, below, from the anterior edge of the lacrymal groove and the neighbouring part of the baſe of the orbit; a third, between theſe two, to the two edges and front of a ſmall tendon, which paſſes tranſverſely from the naſal proceſs of the maxillary bone to the internal commiſſure of the eye-lids, where it divides, and becomes connected with each tarſus. The tendon in its paſſage croſſes over an aponeuroſis which protects the lacrymal groove, and adheres intimately to it; from this aponeuroſis alſo a few muſcular fibres are derived. The fibres ariſing from the two firſt of theſe points paſs outwards in oppoſite curves above and below the orbit, and join each other at its temporal angle, after having formed round the lids an oval plane of ſome breadth, and well defined; a few ſcattered fibres are intermixed with thoſe of the corrugator and frontalis above, others are loſt in the cellular tiſſue and fat of the cheek below, or ſometimes join ſome of the muſcles of the face. On the temporal ſide of the orbit the orbicularis is very thin, it is much ſtronger towards the noſe. The fibres which are derived from the tendon of the muſcle are ſpread over each eye-lid, following the ſame direction as the preceding, with which they are continuous, and uniting at the external ſide of the temporal commiſſure. Theſe fibres are generally paler than the others, and we ſometimes can obſerve them meeting in a tendinous line at the leſſer angle. Cloſe to the edge of the lids we find a ſtronger bundle of fibres, following nearly a ſtraight courſe, to which the name of ciliaris has been given. The orbicularis is connected with the integuments in front by cellular tiſſue. It covers the corrugator ſupercilii, the margin of the baſe of the orbit, and ſome muſcles of the face. It is ſeparated from the membrane lining the lids by the ligaments above deſcribed, and in the upper by the tendon of its levator.

The ſebaceous glands of the eye-lids, known under the name of the *Meibomian* glands, are lodged in grooves hollowed on the poſterior ſurface of the tarſal cartilages. They conſiſt of numerous cluſters of follicles, ranged ſide by ſide, repreſenting yellow lines, the direction of which is vertical, or tranſverſe to the length of the cartilage. Theſe lines are more numerous in the upper lid, where we may count between 30 and 40; in the lower they do not exceed the loweſt of theſe numbers. They vary ſomewhat in breadth, and much in length, eſpecially in the upper lid, in a manner correſponding to the breadth of the tarſus; there are often irregular ſhort lines between the longer ones. They are not ſo long in the lower, its cartilage being much narrower. Theſe lines are generally parallel; ſome of them may be ſtraight, others tortuous, ſeparated by intervals unequal in breadth. Two of the lines often unite to form one, ſome with their angle of union turned towards the ciliary edge, others meeting in an arch convex towards the connected edge of the tarſus. The follicles which form them are exceedingly numerous, diſpoſed in bunches; they communicate with each other, and open near the poſterior edge of the tarſus by a row of minute holes, before-mentioned. Theſe follicles ſecrete an unctuous fluid, which hardens after death, and may be preſſed through the holes in a ſolid form, reſembling little worms.

The parts we have deſcribed are covered anteriorly by the ſkin, and on the poſterior ſurface by a membrane continuous with it, called conjunctiva. The ſkin inveſting the eye-lids is much thinner than that of the brow or cheek, and becomes more and more ſenſible as it approaches the ciliary margin of the tarſus. A looſe cellular tiſſue, in which we never find any fat, but frequently an effuſion of ſerous fluid, lies between the ſkin, and the orbicularis behind it.

As the ſkin arrives at the anterior margin of the eye-lid, it is perforated by numerous holes, from which the *cilia*, or *eye-laſhes*, are produced. Theſe hairs form two or more rows, are more numerous, and longer in the upper lid; they are more numerous and longer alſo in the middle of each, than at the extremities, and we find only a very few fine hairs between the punctum lacrymale and the naſal angle. Each hair is curved in its direction; beginning from a bulb, it is at firſt very fine, ſwells in the middle, and terminates in a conical extenuated point. In the upper lid they are firſt directed downwards, turning up towards the point; in the under the direction is inverſe. They differ in colour in different perſons, but are generally, though not always, of the colour of the reſt of the hair.

At the line formed by the eye-laſhes, the ſkin becomes changed in appearance and ſtructure, and we obſerve continued from it a mucous membrane, called, from its office, the *conjunctiva*, which, after inveſting the poſterior ſurface of the tarſi, is reflected over the front of the eye-ball. Tracing it from the edge of the upper lid, we find it firſt perforated by the mouths of the Meibomian glands, dipping into the canal of which the punctum lacrymale is the opening, and ſpread over the lid a ſhort way beyond the convex edge of the tarſus. Abandoning the lid, it turns over the globe, two-thirds of which it covers, below is reflected again to be extended over the lower lid to the ciliary margin. From this diſpoſition the conjunctiva preſents two ſurfaces, one connected with the parts it covers, the other expoſed. The latter is ſmooth, and conſtantly moiſtened by ſecreted fluids. The former is united to the lids and the globe by cellular tiſſue. On the eye-lids it adheres cloſely to the tarſi, more looſely to the fibrous membrane, to the orbicularis below, and to the tendinous expanſion of the levator above. In quitting the lids to inveſt the globe, it forms a looſe circular fold which correſponds behind to the fat in the orbit, and which, extending further in the upper lid, is lodged during its elevation in a ſmall angular ſpace left for it in the fat behind the margin of the orbit. By this means, tranſverſe folds in the conjunctiva, ſuch as we have remarked in the ſkin, are prevented when the upper eye-lid is raiſed. On the globe of the eye the conjunctiva adheres but looſely to the ſclerotica, giving to it a ſmooth and gliſtening aſpect. On the cornea it adheres very cloſely, and is very thin. In this courſe the conjunctiva forms at the internal angle of the eye a ſemi-lunar fold, concave outwards, ſomething like the third eye-lid in birds. This fold, which appears larger when the eye is turned towards the noſe, diſappears when it is turned far towards the temple. The conjunctiva may be conſidered as a mucous membrane, from the general character of its ſtructure: it has not, however, a villous ſurface, neither is the fluid which it ſecretes of much conſiſtence, in ſome particular inflammations of this membrane it becomes thick and yellow. Although deſcribed under the ſingle epithet of conjunctiva, and obviouſly a ſingle and continuous membrane, its organization differs very conſiderably at different parts. Anatomiſts call that portion which lines the lids, *conjunctiva palpebrarum;* and that which covers the globe, *conjunctiva oculi.* The former contains very numerous red veſſels, viſible in its natural ſtate, and occaſioning the membrane to aſſume a general redneſs when injected. The latter has very few apparent blood-veſſels, and its whiteneſs conſtitutes the white of the eye. But this part under inflammation becomes entirely covered with veſſels carrying red blood. That portion of the membrane covering the cornea is again very different from what is connected to the ſclerotica, being completely tranſparent. That the conjunctiva is actually continued over the cornea cannot, however, be doubted. For, although the latter part is inſenſible, its anterior ſurface is endowed with the ſame exquiſite feeling as the reſt of the conjunctiva. In amphibia, which ſhed their epidermis at certain ſeaſons, this membrane comes off from the front of the eye with the reſt of the cuticle; the ſame fact may be obſerved in ſkinning an eel, and in the zemni, or mus typhlus of Pallas it is covered with fine hairs. It is very ſenſible, and irritated by apparently ſlight cauſes. The eye-lids are ſupplied with veſſels and nerves in great abundance from the neighbouring trunks.

Such is the ſtructure of the eye-lids. Their uſe appears to be that of covering the eye during ſleep, of protecting it from accidental violence, of excluding the light when offenſive, and of keeping the ſurface of the eye conſtantly moiſt, by ſpreading a fluid, the ſources of which we have yet to deſcribe, uniformly over its ſurface. Theſe purpoſes are fully provided for by their organization and diſpoſition, and executed by the muſcles which enter into their ſtructure. The cartilages, in ſome meaſure ſupported by ligaments, preſerve an uniformly ſmooth ſurface; the ſebaceous glands ſecrete an unctuous ſubſtance, which prevents the adherence of the lids in ſleep, or when brought into contact by the rapid and frequently repeated action of winking; which, in conjunction with the cilia, prevent inſects, duſt, or any ſmall bodies from injuring the ſurface of the globe; the conjunctiva preſents two moiſtened poliſhed ſurfaces, which eaſily glide over each other, and it favours, by the looſeneſs of its attachment, the motions of the lids. With regard to theſe laſt, when the eye is opened after ſleep, the lower lid does not alter its ſituation, the opening is made by the upper lid aſcending by the action of its levator muſcle under the edge of the orbit, where there is ſpace to receive it filled only by looſe fat and cellular tiſſue. If the opening of the eye-lids ſucceeds a cloſure of them, effected by the action of the orbicularis, this muſcle, by its relaxation, concurs in producing their ſeparation. This will appear evident if we conſider that the cloſure of the eye is produced very differently in the different ſtates of ſleeping or waking. In the firſt caſe the meeting of the lids is paſſive, owing to the relaxation of the levator muſcle, and the falling down of the upper lid; an effect analogous to what is ſeen in a paralyſis of that muſcle, where the eye cannot be opened without external aid. In the laſt the cloſure of the lids is active, produced by a contraction of the curved fibres of the orbicularis, which by this action approach nearer to a ſtraight line. In the laſt caſe alſo, the particular motion of the eye-lids, called winking, is cauſed in a great degree by the relaxation of the levator, and its alternate contraction. We believe this motion to be deſigned to keep the ſurface of the cornea clean and moiſt, fit to tranſmit the rays of light; but it is alſo neceſſary by the diſpoſition of the ſeveral parts; the levator not being able to remain in a ſtate of permanent contraction, ſince it is a voluntary muſcle, is of neceſſity relaxed at intervals, and cauſes the motion of winking, which is further aſſiſted perhaps by a ſlight action of the orbicularis. Further, in cloſing the eye-lids when awake, the orbicularis acts with leſs or greater energy. When we wiſh to defend the eye from a vivid light, it contracts ſtrongly in company with the corrugator ſupercilii, and collects the integuments of the forehead and cheeks in numerous folds to bury as it were the eye more deeply. The orbicularis and levator are then to a certain point antagoniſts, one opening, the other cloſing the eye-lids; in ſome caſes their actions are combined.

Lacrymal apparatus.—The parts which remain yet to be deſcribed, and which have been included under the general name of the lacrymal apparatus of the eye, are the lacrymal gland and caruncle, the lacrymal points and ducts, the lacrymal ſac, and the common canal leading into the noſe. In animals that live in air, the anterior ſurface of the eye would ſoon become dry, and be rendered foul by duſt, or the numerous ſmall bodies floating in the atmoſphere, were it not conſtantly bathed by a limpid fluid. A part of this we believe to be furniſhed by the conjunctiva; but its more abundant ſource is from the *lacrymal gland.* It is uſually known by the name of the *tears.*

The lacrymal gland is ſituated at the ſuperior, anterior, or external part of the orbit. It is ſomewhat flattened, nearly an inch in length, and half an inch in breadth. It is divided partially into two lobes, of which the internal and upper is the ſmalleſt. From its flattened form we ſhall conſider it as having two ſurfaces. The upper convex ſide correſponds to an oppoſite depreſſion in the bony orbit; the concave inferior ſurface to the globe of the eye, and to the ſuperior and external recti muſcles, with which it is connected by cellular tiſſue. Of its two extremities, the internal, or that turned towards the noſe, is thin and narrow; the external and inferior end is broader, and of greater thickneſs. There is a ſmall ligament, firſt deſcribed and figured by Soemmerring, paſſing from the external and poſterior part of the lacrymal foſſa underneath the gland, which it retains in its ſituation. The lacrymal gland is formed by many ſmall lobes united by cellular tiſſue, the veſſels and nerves being lodged in the intervals. Theſe little lobes are themſelves made up of ſmall granules, into the ſubſtance of which the veſſels penetrate. It is ſupplied with arteries from the lacrymal branch of the ophthalmic; with nerves from the lacrymal branch of the nerve of the fifth pair. The excretory ducts of this gland are very apparent in the larger animals; in man they are not ſo readily perceived. Their number is generally ſeven; they paſs out from the anterior edge of the gland, deſcend in the ſubſtance of the upper lid between the ligament and the conjunctiva, on the ſurface of the laſt of which they open on the temporal ſide about ¼th of an inch above the convex edge of the tarſus. The ducts have no communication with each other.

The *caruncula lacrymalis* is a ſmall reddiſh body ſituated between the internal angle of the eye-lids, and oppoſite ſurface of the globe of the eye. It is oblong and conical in form, its ſummit correſponding to the eye-lids. It differs much in colour, from a pale pink to a full red in different individuals. It is compoſed of a number of mucous follicles, united by cellular tiſſue, and covered by the conjunctiva. On minute examination we may find very fine hairs growing from its ſurface. It appears to ſecrete a mucous fluid, and perhaps from its ſituation may aſſiſt the paſſage of the tears into the lacrymal puncta.

On the outſide of the caruncle, at the angle where the curved and ſtraight portions of the eye-lids meet, there is a ſmall papilla in the margin of each lid perforated by a ſmall hole which is always open, called the *punctum lacrymale.* There is a ſmall interval between them and the openings of the moſt internal of the Meibomian glands, nor are they placed exactly in the ſame row with them. The puncta are always more viſible in the living than in the dead ſubject. They are not immediately oppoſite to each other, but when the lids are cloſed the inferior paſſes up a little on the outſide of the ſuperior; they are both directed a little backwards.

The *puncta lacrymalia* form the openings of two ſhort tubes, named the *lacrymal ducts*, and diſtinguiſhed by the epithets *ſuperior* and *inferior*, from their ſituations in the two lids. Theſe canals are formed in the ſubſtance of the lids, and are neareſt to their poſterior ſurface: they are larger than the area of the puncta, and the ſuperior is rather longer than the inferior. Their direction is nearly inverſe; the ſuperior canal aſcends for a ſhort ſpace, turns inwards at an acute angle, and deſcends obliquely; the inferior firſt paſſes downwards, makes alſo an acute angle, and then goes obliquely upwards. The direction of the ſuperior canal muſt vary as the lid is elevated or depreſſed: the change, however, can never be very conſiderable, as the lid deſcribes but a ſmall ſpace at the internal angle in any of its motions. The canals gradually approach each other, following the margin of the lids, and ſeparated by the caruncle; at the internal angle they unite to form a common duct, which is continued for a very little way behind the tendon of the orbicularis, before it opens into the lacrymal ſac, ſomewhat above the tendon. Sometimes theſe canals are ſeparated throughout by a thin partition, and open in the ſac by two diſtinct mouths; generally, however, this intervening membrane is not continued to the opening into the ſac. The lacrymal canals are lined by a fine membrane continued from the conjunctiva.

The *lacrymal ſac* is a membranous bag, lodged in a groove formed by the os unguis, and the naſal proceſs of the ſuperior maxillary bone. It is of an oval form below, and a little flattened tranſverſely. It is covered on its anterior ſurface by a fibrous membrane attached to the circumference of the lacrymal groove, ſtrongly connected with the tendon, and with the muſcular fibres of the orbicularis. On its external ſide are the caruncle and the conjunctiva, and anterior to theſe the orbicularis and the ſkin. The inner ſide is cloſely adherent to the lacrymal groove. The upper end of the ſac is cloſed, rounded, and extends a little way above the tendon of the orbicularis. The lower end terminates by a contracted portion, which opens into the naſal duct. On the external ſuperior part of its interior ſurface we remark the openings of the lacrymal canals. The ſac is formed by a mucous membrane continuous with the conjunctiva, and the membrane lining the noſtrils, the latter of which it much reſembles. It is inveſted, where not lodged in the bone, by the fibrous membrane above-mentioned.

The inferior end of the lacrymal ſac is contracted by a circular fold of the membrane, through which it communicates with a pretty large tube, called the *naſal duct*, or *ductus ad naſum*, which opens below the inferior turbinated bone in the noſtril. It is encloſed in a bony canal, formed by the union of the bones which ſurround the lacrymal ſac, and at the lower end by the inferior turbinated bone. The duct is not quite half an inch in length; it is often contracted about its middle. Its direction is from above obliquely downwards, and a little outwards and forwards, deſcribing a gentle curve with the convexity in front. It opens in the inferior meatus narium by an oblique ſlit in the pituitary membrane, which is often ſo looſe as to form a valve over the aperture. The area of the opening is never ſo large as that of the duct, but it differs much in ſize, ſo that in ſome individuals an inſtrument has been paſſed into it from the anterior opening of the noſtrils. The membrane of the naſal duct is ſimilar to that of the ſac: we can obſerve mucous cryptæ here and there on its ſurface. It adheres to the fibrous membrane lining the bony canal.

We include, under the appellation *tears*, the whole fluid poured out on the ſurface of the conjunctiva; and produced in part by that membrane, but chiefly by the lacrymal gland. Superficial obſervation would lead a perſon to conclude that its ordinary quantity is ſmall, and only ſufficient, by lubricating the parts, to facilitate their motions. For we notice no actual fluid in the eye, and obſerve merely a moiſt ſtate of the conjunctiva. When, however, the paſſages which carry off the tears into the noſe are obſtructed, and the fluids which ordinarily deſcend into the noſtril, where they are evaporated by the conſtant current of air through that cavity, flow over the cheek, we find that the natural quantity of the tears is very conſiderable. As the conjunctiva belongs to the claſs of mucous membranes, its ſecretion has the properties which belong to thoſe of ſimilarly organized parts. This, when freed by evaporation from the more aqueous portion of the tears, forms the incruſtations obſervable about the eye-lids after ſleep; and would conſtantly agglutinate their margins at that period, were they not defended from its action by the unctuous matter of the Meibomian glands. Hence, when the latter parts do not furniſh this greaſy ſubſtance, or when the conjunctiva, in a diſeaſed ſtate, pours out an increaſed quantity of mucous fluid, the ciliary margins become adherent in a very diſagreeable manner during ſleep. The ſecretion of the lacrymal gland is aqueous, but contains much ſaline matter. The chemiſt diſcovers in it common ſalt, phoſphate of lime, phoſphate of ſoda, and ſoda in an apparently uncombined ſtate. Indeed the bitteriſh ſaline taſte of the fluid produced in weeping is a circumſtance of common notoriety. It appears probable, that the conjunctiva is the ordinary ſource of the lacrymal fluid, which conſtantly lubricates the globe and lids: but when any irritation affects the organ, as when a foreign body, a particle of duſt, &c. is lodged within the lids, a large quantity of fluid is ſuddenly poured out from the lacrymal gland, and often waſhes off the offending ſubſtance. The ſaline nature of this fluid actually produces a degree of redneſs in the conjunctiva, which the natural mucilaginous ſecretion of that membrane does not occaſion; and this difference indicates a diverſity in the nature of the fluid. The tears furniſhed in ſuch a caſe are much more copious than the lacrymal paſſages can convey into the noſe; and they conſequently overflow the lids. A ſimilar increaſed ſecretion from the lacrymal gland, taking place under various mental affections, conſtitutes weeping. The lacrymal fluid is ſpread uniformly over the anterior ſurface of the eye-ball, by the alternate lowering and elevation of the ſuperior lid, an action ſo rapid, that although conſtantly repeated at ſmall intervals, it appears not to impede the functions of the organ. Theſe motions cauſe it to flow towards the naſal angle, along the triangular canal formed by the poſterior edges of the lids. The ſebaceous matter of the Meibomian glands probably prevents it from overflowing their margins. It is directed towards the internal angle, when the eye is cloſed, by the form of this canal increaſing in ſize towards the noſe; and by the action of the orbicularis, which has its fixed point at the ſame part; when the eye is open, by the inclination of the lower lid, as the external angle is then higher than the internal. The puncta lacrymalia take up the tears by a peculiar vital action, and not by capillary attraction. From theſe canals the fluid paſſes into the lacrymal ſac, and thence into the noſtrils.

The parts above deſcribed are very fully developed at the time of birth; correſponding in this reſpect with the almoſt perfect ſtate of the globe itſelf at that period. The eye reſembles another organ of ſenſe, the ear, in the forwardneſs of its evolution, and in the early period after birth, in which its functions are called into exerciſe. They are both analogous in this point of view to the organ of touch. The mutual aſſiſtance which they afford each other, in correcting erroneous ideas formed from the ſeparate uſe of either, is much favoured by this early and contemporaneous completion of their ſtructure.

A knowledge of the forms, proportions, denſities, the refractive and diſperſive powers of the humours, as well as the radii of their ſeveral curvatures, is eſſential to underſtanding rightly the phyſiology of the organs. Our limits will not allow us to detail the numerous experiments which have been inſtituted to determine theſe points. The following admeaſurements and calculations are drawn from thoſe given by Petit, Maſkelyne, Comparetti, Young, Wollaſton, and Cavallo; to all of whom the reader, who wiſhes for minute information, is particularly referred.

The *axis* of the human eye, meaſured from the anterior ſurface of the cornea to the foramen opticum, is about .98 of an inch: of this, the cornea occupies about .04; the aqueous humour .11; the chryſtalline .17; and the vitreous .66.

The *diameter* of the eye, meaſured internally, from the oppoſite ſurfaces of the retina, is about .90.

The vertical chord of the cornea is about .47, and the horizontal .49. The radius of its anterior convexity .35; its verſed ſine .11; its diſtance from the anterior ſurface of the chryſtalline .13.

The radius of the ſphericity of the inner ſurface of the ſclerotica .46.

The aperture of the pupil at a mean .14.

The radius of the anterior convexity of the chryſtalline .34; of the poſterior .22.

The refractive and diſperſive powers of the aqueous and vitreous humours are very nearly, if not exactly, the ſame as thoſe of water; thoſe of the chryſtalline are, for its whole ſubſtance, as 14 to 13.

By calculating from the preceding data the progreſs of rays, ſuppoſed to radiate from an object about 10 inches diſtant, it is found that they will be collected into foci, nearly on the ſurface of the retina: from the different refrangibility of the rays, perhaps not in exact focal points, but the circle of diſperſion is ſo minute, as hardly to be worth conſidering in the phyſiology of the organ.

The axis of the eye is in a line drawn in the axis of the cornea. From the excentricity of the pupil, and chryſtalline lens, with regard to the cornea, their axes are not in the ſame line with that of the latter; and the viſual axis is found to be one twentieth of an inch further from the optic nerve than the point oppoſite the centre of the pupil; and about 16 hundredths of an inch on the outſide of the centre of the nerve.

Deſcription of the Plates in which the Anatomy of the Eye is repreſented.

Plate I.

The figures in this plate repreſent the external parts of the eye in different poſitions, and exhibit the principal varieties depending on ſex or nation, as well as the appearances of the cloſed eye-lids during ſleep.

Fig. 1.—The figures in the upper line exhibit the left eye of an adult male in a front and ſide view. We begin with the firſt.

a b c, the eye-brow, or ſupercilium; *a*, its end next the noſe; *c*, that towards the temple.

† *d* *, the upper eye-lid, or palpebra; †, the part which has but little motion; *d*, the fold which diſappears when the eye-lids are cloſed; the depth of it may be ſeen in *Plate* IV. *fig.* 5; *, the edge fringed with the eye-laſhes or cilia.

e * *r m*, the opening of the eye-lids.

e f g h i, the internal, or larger canthus of the eye; *e*, the caruncula lacrymalis; *f*, the ſemi-lunar fold of the conjunctiva; *g h*, a depreſſion round the caruncle ("lacus lacrymalis"); *i*, the ſituation of the ligament of the palpebra croſſing the lacrymal ſac.

k l, an horizontal line, ſhewing how much the internal canthus is inferior to the external.

m n o p q, the lower eye-lid; *m n*, its margin; *m*, the internal edge or labium perforated by the openings of the ſebaceous glands; *n*, the external edge, from which the lower cilia or eye-laſhes ariſe; *q*, a ſuperficial fold, obſerved when the eye is opened.

r, the external or leſſer canthus of the eye.

s t u v w, the iris ſhining through the tranſparent cornea; *s t*, the narrower part next the noſe; *v w*, the wider part towards the temple; *t v*, the inner, or leſſer circle of the iris; *s w*, the outer, or larger circle; *u*, the pupil.

In the ſide view, we obſerve ſome points not diſtinguiſhable when the organ is viewed in front. We ſhall explain the letters only when affixed to different parts from thoſe in the former figure.

d e f g h, the upper eye-lid; *e*, the fold; *f g*, the breadth of its margin; *g h*, the upper eye-laſhes, decreaſing in number, length, thickneſs, and curvature, as they approach the external canthus.

i k, the cornea; *i*, its convexity; *k*, its circumference.

l, the iris, which can be ſeen in the ſide view, by the alteration in the direction of the rays in paſſing through the aqueous humour. The iris would not be ſeen if the eye was viewed in the ſame manner under water; the cornea alone would appear.

Fig. 2.—The figures in the ſecond line repreſent the female eye, ſeen in the ſame circumſtances as the male eye in the line above. The differences between them are ſufficiently evident to merit attention. The male eye exceeds the female in the relative ſize of the eye-ball, in the thickneſs of the parts which are connected with it, as well as in many other leſſer variations of form, all of which are marked with great effect in the beautiful ſpecimens of ancient ſculpture. In the male, the ſkin of the eye-lids is harſh and rough, with a degree of redneſs not obſervable in the female, where it is more delicate and ſmooth, paler, and apparently humid. Viewed generally, the prominent, full-orbed eye of the male has a bolder character than the oblong, depreſſed, and gentle eye of the female. The ſkin of the brow is thicker, and has a greater projection; the eye-brow itſelf is broader, thicker, and formed of hairs of greater length, and coarſeneſs, not lying ſo cloſe to the ſkin as they do in the female. In the male, the upper lid is more elevated, ſo as to appear ſmaller; the fold is therefore larger, and nearer the eye-brow. The opening between the eye-lids is wider and rounder, the angle at the corners is greater, and the margin of each is broader. The eye-laſhes are thicker, and not ſo fine. The differences we have been noticing are not equally evident in all eyes, but are ſufficiently ſtriking where this feature has its exquiſite diſtinctive form correctly marked.

Fig. 3.—Theſe two figures repreſent the eye of the male adult negro. In the firſt:

a b c, the eye-brow, formed of ſhort, ſcattered hairs.

d e f g, the upper eye-lid, full, puffed, and broad; *e*, a ſuperficial; *f*, the deeper fold.

g h k p, the opening of the eye-lids, rather oblong; *h*, the internal angle, which appears narrow from the thickneſs of the lids; *i*, the caruncle, which, for the ſame reaſon, appears deeper; * the lunated fold.

k l m n o p, the lower eye-lid, comparatively broad; *l*, the outer edge of the margin of the lid, ſomewhat rounded; *m*, the orifices of the ſebaceous glands, appearing as white points; *p* the external canthus.

In the ſide view of the ſame eye we obſerve further differences.

†, part of the forehead.

e f g h i, the upper lid; *g*, its thickneſs; *i*, the eye-laſhes, more curved than in the European.

k to *o*, the lower lid; *l*, its outer edge, rounded; *n*, the laſhes, as much curved as the upper.

p, the outer canthus.

*, the root of the noſe. From this it appears how nearly the eyes are on a level with its edge, differing much in this reſpect from the European.

In reviewing the principal differences between the eyes of the Negro and European, we obſerve, that in the former the eye-brow is thin, and projects but little over the eye lid, ſo as to throw but little ſhade on the eye; the hairs are not woolly, but nearly as ſtraight as in the European. The eye-lids are thicker, and denſer in their texture, and tumid, ſo as to give the eye the appearance of being buried more deeply in the ſkin of the face. Hence many rays, which would fall on the globe at ſmall or acute angles, are averted from it; and the light can affect the eye but little when the lids are cloſed. The lower lid is broader and more moveable, covering a greater portion of the eye. The opening of the lids is narrower; their margins are tumid, and the outer edge rounded. The eye-laſhes are more curved, and thicker; and are ſo extremely fine and black, as to exclude many rays of light. The conjunctiva is not ſo white, and the fold at the inner canthus is broader. The cornea appears ſmaller, and not ſo convex; the bulb itſelf larger. The almoſt uniformly dark colour of the iris is ſo intenſe, that, when viewed at a little diſtance, we can ſcarcely diſtinguiſh it from the pupil, the whole appearing as a dark ſpot. This much diminiſhes its brightneſs. The preceding facts lead us to conclude that the eye of the Negro can bear more light, and is better ſuited to an African ſky, than that of the European, who enjoys, perhaps, a larger field of viſion, from the direction of his orbits. The differences are not equally obſervable in all individuals of the two races.

Fig. 4.—The left eye of a young white negreſs (Leucæthiopiſſa, or Albineſs) is here repreſented. The character of the female eye is ſtrongly marked in theſe figures; which however differ remarkably from the preceding ones of the male ſubject, as well as from thoſe of the European female. The eye-brow is ſoft, of a yellowiſh or pale white colour, and ſtraight, with the hairs ſcattered. The lids are puffed, and poſſeſs rather the colour of chalk than of fleſh; and the ſkin is ſcaly inſtead of being ſmooth. The upper lid appears comparatively very narrow. The opening of the eye-lids is narrow, particularly when the light is at all ſtrong. The eye-laſhes are delicate and much curved, eſpecially in the lower lid, where they are exceſſively cloſe; they are of a pale white. The caruncle is not ſo red; the cornea more convex. The iris, formed of thin, delicate, reticulated fibres, appears of a pinkiſh white colour, and ſo tranſparent, that between the fibres we can ſee the roſe colour of the bottom of the eye; in other words it ſhines through the iris. The iris itſelf is in an almoſt conſtant ſtate of tremulous motion.

Fig. 5.—The eye of an adult female, drawn in a ſtate of tranquil ſleep.

a b c, &c. the eye-brow; *o d e f*, the upper eye-lid, ſmooth and ſtretched; *g*, the eye-laſhes, decuſſating each other.

h i, a line drawn horizontally, ſhewing the external canthus to be the loweſt.

k l, the ſituation of the iris, or rather of the cornea, projecting under the lid.

m n o, cutaneous veins, ſhining through the delicate ſkin.

q, the fold of the lower lid.

In the ſide view of the ſame eye, *a*, &c. denote part of the forehead; *b*, the root of the noſe; *c*, the eye-brow; *d* to *g*, the upper lid; *k*, the middle part, which is folded when the eye-lids are opened. The projection of the cornea is evident in this view. The other letters point out the ſame parts as in the former figure.

In the ſtate of quiet ſleep the eye-lids are gently cloſed; the upper one ſmooth and unwrinkled, deſcends lower on the outer than on the inner ſide, and hangs as it were obliquely. The cauſe of this difference is in the ſtructure of the two angles; the upper lid having but little motion at the inner angle, on account of the tendon of the orbicularis muſcle, while it deſcends freely at the external canthus. The bulb of the eye is ſomewhat turned upwards, as we may obſerve in drowſy perſons; ſo that when the eye is ſhut, the cornea, with the greateſt part of the globe, is covered by the upper lid alone. This ſituation of the eye-ball is very manifeſt in children when aſleep; the cornea in them ſhining through the thin eye-lid, appearing as a dark ſpot, and its convexity being viſible when viewed from the ſide. The lower lid generally retains its fold. The difference in the angular form of the two canthi is ſtill obvious. The eye-laſhes decuſſate each other; and, if the eye be naturally prominent, the cutaneous veins are ſeen ſcattered over the upper lid.

Plate II.

The figures in this plate illuſtrate the ſtructure of the eye-lids and of the lacrymal apparatus.

Fig. 1.—Exhibits the orbicularis muſcle of the left eye in the adult.

a b, the opening of the eye-lids cloſed; *c*, the tendon, which joins the eye-lids at the internal canthus, and is fixed into the naſal proceſs of the ſuperior maxillary bone; *d*, muſcular fibres attached to the bones; *e*, *f*, fibres intermixed with thoſe of the corrugator ſupercilii and frontalis; *g*, delicate bundles of fibres covering the upper lid; *k*, fibres covering the lower lid, joining the preceding at the outer angle; *h*, ſtronger fibres attached to the bone, and the tendon; *i*, fibres paſſing towards the noſe; *l*, *m*, thin fibres towards the temple; *m*, *n*, ſtrips of muſcle going over the cheek; *o*, *o*, ſcattered fibres at the very outer edge; *p*, *p*, cloſe fibres immediately ſurrounding the edge of the eye-lids, called by Albinus "muſculus ciliaris."

Fig. 2.—The eye-lids opened widely, and the margins turned out a little.

a, the eye-brow; *b*, the fold of the upper lid; *c*, the openings remaining after having pulled out the eye-laſhes; *d*, the punctum lacrymale; *e*, the upper edge of the internal canthus; *f*, the orifices of the ſebaceous glands; *g*, the union of the two eye-lids, externally; *h*, the caruncle; *i*, the ſemi-lunar fold of the conjunctiva; *k*, the fold of the lower lid; *l*, the openings after having pulled out the eye-laſhes; *m*, the punctum lacrymale; *n*, the lower crus of the inner canthus; *o*, the mouths of the ſebaceous ducts. The marks left by the cilia are far more numerous in the upper than in the under eye-lid, as well as larger. The openings of the ſebaceous glands are placed in a curved line, and rather nearer to the inner edges of the tarſi. The puncta lacrymalia, or openings of lacrymal ducts, are much larger, and placed in a ſmall papilla.

Figs. 3, and 4.—A long and ſhort hair taken from the eye-brow, magnified to four times their natural ſizes; *a*, the bulb, buried in the ſkin, which becomes thinner at *b*; and is continued ſwelling, cylindrical, and curved, *c*; and terminates in a fine point *d*.

Figs. 5, and 6.—Two hairs from the eye-laſhes, magnified. They begin alſo in a ſmall bulb, *a*; diminiſh in ſize conſiderably at *b*; become gradually thicker, *c*; are thickeſt about their middle, *d*; again decreaſe in a conical form, *e*; and end in a very fine point, *f*. Theſe figures point out the differences in the ſhape of the hairs of the eye-brows and the laſhes, or cilia.

Fig. 7.—The eye-lids of the right eye, moderately open, ſeen from behind, with the lacrymal gland turned a little forwards, covered at its anterior point by the conjunctiva.

a, a portion of the orbicularis palpebrarum, on its inner ſurface; *b*, the chink between the lids; *c*, the lacrymal gland, on its lower ſide; *d*, its diviſion into two principal lobes; *e*, its excretory ducts; *f*, the openings of theſe ducts in the conjunctiva; *g*, the conjunctiva, lining the internal ſurface of the eye-lids; the part which appears folded has been turned off from the bulb; *h*, the ſebaceous glands of the upper lid, ſhining through the conjunctiva; *i*, the ſuperior punctum lacrymale; *k*, the glands of the lower eye-lid; *l*, its punctum lacrymale, or mouth of the lacrymal duct; *m*, the caruncula; *n*, the ſemi-lunar fold of the conjunctiva. This is drawn back a little by the other folds of the membrane; its natural ſituation would be at *i*.

Fig. 8.—The internal or poſterior ſurface of the eye-lids, to ſhew the ſtructure of the ſebaceous glands. The figure is magnified to twice its natural ſize, which may be ſeen by comparing it with the preceding one.

a, the orbicularis palpebrarum; *b*, the opening of the eye-lids, through which the cilia of the upper lid are diſcernible; *e*, the levator palpebræ ſuperioris; *f*, the openings of the excretory ducts of the lacrymal gland; *g*, the conjunctiva; *h*, the ſebaceous glands ſhining through it; *i*, the portion of the conjunctiva reflected, and the glands expoſed; *k*, the openings of theſe glands; *l*, the ſebaceous glands of the lower lid wholly expoſed, ſo as to ſhew their diſpoſition in rows made up of ſmall bunches united with each other.

Fig. 9.—This may be conſidered as the reverſed appearance of *fig.* 2. The true relative ſituation of the lacrymal gland, and of the lacrymal ducts, is particularly pointed out.

a b, *c d*, the upper and lower lacrymal canals as contained in the eye-lids; *a*, *a*, the openings or puncta lacrymalia; *b*, *b*, the blind pouches formed by each; *c c*, the continuation of the canals; *d*, *d*, their openings in the lacrymal ſac; *e f g*, the lacrymal ſac; *e*, the blind ſinus at its upper end; *g*, its termination below in the naſal part of the lacrymal canal; *h i*, the termination of the duct in the noſtril.

Fig. 10.—The lacrymal duct on the left ſide, viewed from the ſide next the noſe, to give an idea of its direction, breadth, and of the opening in the noſtril. It will be ſeen to be much wider on this, the internal, than on the anterior ſide.

a b, the palpebral portion; *c d*, the lacrymal ſac; *e f*, the naſal portion; *f*, the natural appearance of its opening in the noſe, not diſturbed by the introduction of any inſtrument.

Fig. 11.—The lacrymal canal laid open, and halved, to ſhew its internal capacity, its thickneſs, and its ſtructure.

a b c d, as in the preceding figure; *d*, a doubling, or fold of the internal membrane, which marks the end of the lacrymal ſac; *e f g*, the naſal portion of the duct; *f*, a fold in the inner membrane, ſometimes obſervable; *h*, mucous follicles, or cryptæ, which may be ſeen ſcattered up and down the membrane, eſpecially after a ſucceſsful injection.

Plate III.

The figures of this plate exhibit the muſcles of the globe, and the nerves belonging to them; together with the more intimate ſtructure of the globe itſelf.

Fig. 1.—The muſcles of the bulb of the left eye, with the levator of the upper lid, in their relative ſituation to each other, and to the bony orbit in which they lie.

1 2 3, the out-line of the left orbit; 1 3, the internal; 1 2, the external ſide; 3 2, the inferior margin; 4, the cartilaginous pulley for the tendon of the obliquus ſuperior; 5, the bulb of the eye; 6 7, the optic nerve; 6, the part which lies on the ſella turcica; 7, the part which enters the orbit.

a—*e*, the levator palpebræ ſuperioris; *a*, its poſterior tendinous extremity, adhering to the dura mater at the upper margin of the foramen opticum; *b*, its connection with the rectus ſuperior; *c d*, its muſcular part; *e*, its anterior tendinous end at the margin of the upper lid.

f g, the rectus ſuperior, almoſt wholly covered by the levator palpebræ.

h i k, the rectus externus; *l*, the anterior attachment of the obliquus inferior; *m*, the rectus inferior; *n o*, rectus internus; *p*—*s*, obliquus ſuperior; *q r*, its fleſhy fibres, ariſing partly from the tendon, *p*; partly from the orbit; and terminating in the tendon, *s s*, which paſſes through the pulley 4, and ſpreads over the bulb.

Fig. 2.—The ſame parts; the levator palpebræ, rectus and obliquus ſuperior, optic nerve, and globe of the eye having been removed.

a b c, the rectus internus; *d e f*, rectus inferior; *g h i* rectus externus: it is ſplit at its poſterior tendinous end, *g*, to allow of the paſſage of nerves; *k l m*, the obliquus inferior; *k*, its attachment to the perioſteum of the ſuperior maxillary bone.

Fig. 3.—The trunks of all the nerves belonging to the eye, in their relations to the cranium, the orbit, the muſcles, and the other parts of this organ. As this figure, excluſively of the nerves and lacrymal gland, is preciſely the ſame with *fig.* 1, the letters of reference to the muſcles are entirely omitted, to prevent obſcurity.

2, the optic nerve; its final diſtribution will be ſeen below; 3, the third nerve of the brain or motor oculi; 4, the fourth nerve, or trochlearis; 5, the fifth nerve; A the contracted portion next the brain, which ſwells conſiderably at B; C, the firſt branch of the fifth entering the orbit; D, the ſecond branch which paſſes through the foramen rotundum G; E, the third branch, which enters the foramen ovale F F.

The firſt branch of the fifth, after giving off a filament, *a*, which joins the fourth, divides into the ramus frontalis *b*—*i*, and the nervus lacrymalis, *k*. The ramus frontalis ſends a ſmall twig, *c*, to the neighbourhood of the trochlea; another, *d*, which joins the nervus infra trochlearis, *t z*. The proper frontal branch, *e*, is ſtretched over the levator palpebræ ſuperioris, without ſending any twig to it, and is diſtributed over the forehead *h h*; *i i*—*k*, the lacrymal nerve, the branches of which ſeparating and re-uniting, may be divided into two principal parts, an internal, *l*, and an external, *m*. The inner branch, communicating with the external, *n o*, goes towards the lacrymal gland, in which it is partly diſtributed, a few filaments running on in conjunction with ſome from the external branch *r*, to the orbicularis, and ſkin of the upper lid, *s s*. The external branch is ſcattered in the ſubſtance of the lacrymal gland, and communicates by different filaments with the inner branch, *w*; with the third branch of the fifth, *v y*; and is finally loſt on the upper lid; *y*, a ſmall twig which enters the orbit from the facial nerve.

6 6 6, the ſixth nerve of the brain. It is covered by the fifth, as far as D, entering the orbit with it. It is diſtributed on the rectus externus.

Fig. 4.—This figure exhibits more particularly the diſtribution of the third nerve, and the ſtructure of the lenticular, or ophthalmic ganglion. It correſponds with *figs.* 1, and 3, the fourth, and moſt of the branches of the fifth are removed. The levator palpebræ and rectus ſuperior are turned a little aſide.

A A, the rectus ſuperior turned off, ſo as to exhibit a part of its lower ſurface; B B, the levator palpebræ in the ſame ſituation.

3 *a*, &c. the third nerve. At its very entrance into the orbit, a ſmall branch, *b*, is ſeen going off, which is joined by a ſmall filament from the firſt branch of the fifth, *u*, and then divides into a branch for the levator palpebræ, *d*, and another, *c*, for the rectus ſuperior; *e*, the greater branch, paſſes under the optic nerve on the outer ſide of the latter. It divides into an inner twig for the rectus internus; a middle one, *f*, for the rectus inferior; and an inferior, *g*, which again ſubdivides a ſhort but rather thick portion, *h*, joining the ophthalmic ganglion, and a longer, and thinner, *i i*, paſſing to the obliquus inferior. From the ophthalmic ganglion two faſciculi of the ciliary nerves proceed. The ſmaller and ſuperior faſciculus ſplits into three filaments, *k*, *k*, *k*, which purſue a ſerpentine courſe near that of the optic nerve, dividing into ſix or more unequal portions, *l*, *l*, *l*; three of theſe may be ſeen entering the ſclerotica. The inferior faſciculus, rather the largeſt, generally divides into ſix filaments, two only of which, *m*, *m*, are here apparent.

5, the fifth nerve; *n*, the firſt branch of this nerve; four of its twigs are cut off; *o* correſponds to *a* in *fig.* 3; *p* to *b*; *q* to *e*; *r* to *k*; *s*, a fifth twig from this nerve, dividing, into a naſal twig, *t*, which is cut off, into another, *u*, communicating with that twig of the third which goes to the rectus ſuperior; and into a ſmall filament which joins the ophthalmic ganglion.

6 *w*, the ſixth nerve, or abductor, paſſing to the rectus externus at *w*.

The remaining figures repreſent minutely the ſtructure of the globe of the eye.

Fig. 5.—The anterior half of the left eye, after the organs had been divided perpendicularly; the other half forms *fig.* 6; *a*, the cut ſurface of the ſclerotica, of nearly uniform thickneſs all round; *b*, the dark-coloured ſubſtance between the ſclerotica and choroidea; *c*, the tunica choroidea, appearing in folds from being cut; it is really ſpread uniformly ſmooth over the retina; *d*, the pigmentum nigrum, between the choroidea and retina; *e e f f*, the retina; *e e*, its cut margin, folded and turned in; *f f*, its anterior termination, ſeen more diſtinctly in *figs.* 7, 9, 10; *f g h*, the ciliary body, ſhining through the remains of the vitreous humour. From the great quantity of pigment covering it, its folds can be ſeen diſtinctly only towards the margin of the chryſtalline lens. It is manifeſtly not covered by the retina; *h*, the ſpace between the ciliary proceſſes and the lens, ſhewn by *z z* in *fig.* 7; *i k l*, the chryſtalline lens, included in its capſule, ſeen through part of the vitreous humour; *i k*, the iris, broadeſt at the outer ſide; *l*, the pupil.

Fig. 6.—The poſterior half of the preceding ſection; *a b c d*, as in the foregoing figure; *e*—*k*, the retina, on its inner ſurface; the margin *e f* much wrinkled; *l*, the round ſpot, ſhewing the entrance of the optic nerve; *g h i*, branches of the central artery, and vein of the retina, filled with blood; *h*, *i*, two branches, which ſurround in a circle the foramen centrale, or centre of the retina; *k*, edged by a yellow ring, concealed in this view by the folds of the retina.

Fig. 7.—The lower half of the eye-ball divided horizontally, or at right-angles to the ſection exhibited in the two preceding figures. Its axis lies between the points *3*, *d*.

a—*d* 6, the ſclerotica; *b*, its thinneſt part, under the tendons of the recti muſcles; *c*, its middle portion, thicker; *d*, its thickeſt part, united with the ſheath of the optic nerve; 6, an hemiſpherical riſing in the ſclerotica, pierced by holes, through which the medulla of the optic nerve paſſes, to be expanded in the retina; *c*—*r*, the iris; *s*, its poſterior ſurface, covered by pigmentum nigrum; *u u w*, the retina; *u*, its anterior margin, or termination; *w*, its internal ſurface, ſeen through the vitreous humour; 1 2—8, the optic nerve divided; 4 5, the ſheath of the nerve, conſiſting of two laminæ; 8, marks of the central veſſels of the retina perforating the optic nerve. The nerve diminiſhes very much in ſize at 6.

Fig. 8.—The poſterior ſurface of the retina of the left eye, drawn from behind; the true centre of the retina falling exactly in the middle of the figure.

a, the retina ſpread over the vitreous humour, ſo placed as to ſuit the poſition of *fig.* 5; *b*, the foramen centrale; *c*, the yellow ring ſurrounding it; *d e f*, the place where the optic nerve perforates the ſclerotica, the ſituation of the central veſſels of the retina, improperly ſo called; *g*, *h*, *i*, three principal branches of theſe veſſels, filled with blood.

Fig. 9.—A view of the retina and vitreous body, with the lens, ſeen from the front; it is the reverſe of the preceding figure, exhibiting the anterior limits of the retina, the ſpace between it and the lens, the anterior ſurface of the latter, and the foramen centrale, ſeen through the chryſtalline and vitreous bodies.

a b, the retina; *b b b*, its termination in front; *c b*, the corona ciliaris, formed by the membrana hyaloidea round the edge of the lens, correſponding to the ciliary proceſſes; *c d e*, the lens; *d*, the foramen centrale; *e*, *e*, veſſels of the retina.

Fig. 10.—The outer ſurface of the retina in the left eye; *a a*, its anterior margin; *b*, its central foramen; *h*, *i*, blood-veſſels ſurrounding the latter; *c d*, the optic nerve, deprived of its inveſtments; *e f g*, the corona ciliaris, not covered by the retina; *e f*, the diſtance of the ciliary body from the lens; *g*, remains of pigmentum nigrum; *k l*, the lens; *k*, the part projecting above the corona ciliaris.

Fig. 11.—The choroid coat of the left eye with the veſſels injected; ſeen on the ſide towards the noſe.

a b, the optic nerve; *c*—*f*, the remaining part of the ſclerotica; *g*—*w*, the tunica choroidea; *g h i m*, the annulus gangliformis; *m*, the internal long ciliary artery; *n*, the internal long ciliary vein; *o*, the internal long ciliary nerve; *p*, *p*, the long and ſhort arteries of the choroid; *q*, *q*, the ciliary nerves; *r*, a trunk of the vena vorticoſa ſuperior: *s*, a trunk of the vena vorticoſa inferior; *t*, another of the ſame; *g h*, the margin which marks its ſeparation from the iris.

Fig. 12.—The anterior ſurface of the choroid, and iris of the left eye, being a front view of the preceding figure.

a b c, tunica choroides; *b c*, the annulus; *d*—*g*, the iris; *d h*, the margin connected with the choroides; *d e*, the outer or larger ring; *e f*, the inner or leſſer ring of the iris; *g*, the pupil; *d f*, the narrow ſide of the iris next the noſe; *g h*, the broader ſide towards the temple; *n*, *n*, ciliary nerves, forming plexuſes on the annulus; *r*, the external long ciliary artery; *s*, the internal long ciliary artery.

Fig. 13.—A view of the chryſtalline lens of a child newly born, ſhewing its rounded form.

Fig. 14.—The lens of a child of ſix years old, increaſed in circumference, not in thickneſs.

Fig. 15.—A ſide view of the lens of an adult. The difference between the anterior and poſterior ſegments is leſs than in either of the preceding.

Plate IV.

Fig. 1.—A ſegment of the choroides and iris of a new-born child, ſeen on its internal ſurface, magnified twenty-five times. The veſſels are filled with injection.

a, the true ſize of this ſegment; *b*—*g*, the part belonging to the iris; *b c*, the margin of the pupil; *f g*, the margin next to the circumference of the cornea; *b*—*e*, part of the leſſer ring of the iris; *h*, *h*, trunks of blood-veſſels ſupplying this net-work; *d*—*g*, part of the greater or outer ring. The difference in the diſtribution of the veſſels on theſe parts is very evident; *i*, *k*, *l*, three larger arteries ariſing from the circle formed by the long ciliary veſſels round the iris; *m*—*s*, a ſegment of the corpus ciliare: *n*, *o*, *p*, three entire plicæ or folds; *m*, *q*, two ſegments of folds; *t v*, the projecting margin of the fold, which dips into a correſponding depreſſion in the vitreous body; *v w*, a deeper part of the margin, where the plicæ join each other; *r s x y*, a ſtriated part of the choroides between the ciliary body or proceſſes, and the anterior margin of the retina, ſeen in *Plate* III. *fig.* 5; *x y z* 1, part of the choroid correſponding to the retina; *x y*, that oppoſite the termination of the retina; 2—8, trunks of the venæ vorticoſæ.

Fig. 2.—The anterior part of the choroides, with the iris, and membrana pupillaris, in a fœtus of ſeven months, magnified quadruply, and the veſſels filled with injection.

A, the true ſize of this ſegment; *a b*, the proper choroid of the bulb; *c*, the annulus gangliformis; *c d*, the iris; *d e*, the membrana pupillaris, its veſſels continuous with thoſe of the iris; *f*, the long internal ciliary artery; *g*, the long external artery. Theſe arteries, by their diviſions, form a ring round the iris; 1—5, five venous vortices in the choroid.

Fig. 3.—The poſterior part of the chryſtalline lens, encloſed in its capſule, from a fœtus of ſeven months, with the veſſels injected, magnified to four times its natural ſize.

A, the true ſize of the lens; *b*, a blood-veſſel from the central artery of the retina, which has paſſed through the middle of the vitreous humour, and is ſcattered over the capſule.

Figs. 4 and 5.—Views of the left eye, after a plane perpendicular ſection paſſing antero-poſteriorly through the orbit, and the parts it contains, dividing them into two equal portions, an internal and external, the former of which is here repreſented. Every part is ſeen in its natural ſituation, nothing having been diſturbed or removed. The explanations are given in the following plate, where the figure is magnified to three times its natural diameter, in order to avoid confuſion, and expreſs the objects more diſtinctly. In *fig.* 4. the eye is ſhut; in *fig.* 5. it is open. Some parts alſo which were exhibited in *fig.* 4. having been removed, others are brought into view in *fig.* 5. In *fig.* 5. we obſerve the fold of the upper lid, and the cartilage paſſing under the fold back into the orbit. The retina and lens being removed, the choroid is brought into view, with its ciliary proceſſes, venæ vorticoſæ, and long internal ciliary artery. It ſhews alſo the ſituation of the central artery of the retina.

Plate V.

A magnified outline of *fig.* 4. of the preceding plate. As this is a moſt important view, the references are given very fully. The words "cut ſurface of" ſhould be underſtood throughout: they are omitted to avoid the tedious repetition of the ſame phraſe.

A—Q, the bony orbit; A—H, the upper plate of the orbit; A B, the ſmooth ſurface towards the eye; C C G H, the convex ſurface, uneven, correſponding to the brain; A D E F, the frontal part of the os frontis; C C G, the orbital part of the os frontis; E E, the medullary cells of the frontal part; F, the left frontal ſinus; F F, the medullary cells of the orbital part; G, the ſuture between the frontal and ſphenoidal bones; G B H, a part of the upper or leſſer ala of the ſphenoidal bone, which forms the upper part of the canal for the optic nerve; Q—M, the inferior plate of the orbit; I I, the ſuperior maxilla; K L, the orbital fiſſure occupied by tendinous fibres, fat, veſſels, and nerves; M, part of the leſſer ala of the ſphenoidal bone, forming the lower part of the foramen opticum; L, the perioſteum; B H M, the canal in the ala minor of the ſphenoidal bone for the optic nerve, or foramen opticum; N, the perioſteum of the frontal bone; O, a continuation of the perioſteum towards the upper lid, forming a kind of ligamentous arch, the ligament of the ſuperior tarſus; P, the perioſteum of the ſuperior maxilla; Q, a continuation of this perioſteum, towards the lower lid, in the form of an arch, the ligament of the inferior tarſus; † †, the axis of the orbit; R—V, the dura mater; R, the external, S, the internal layer; T U V, the place where the dura mater is united partly with the perioſteum of the orbit T, partly with the ſheath of the optic nerve U, partly with the origin of the levator palpebræ 1, and the rectus ſuperior 4; W—Z, the forehead; W, the thickneſs of the ſkin of the forehead; X, the fat between the ſkin and the frontalis; Y, the frontalis; Z, the fat between the frontalis and the perioſteum of the frontal bone.

a—*d*, the brow, or ſupercilium; *a*, corrugator ſupercicilii ; *b*, mouth of the frontal vein ; *c*, mouth of the frontal artery ; *d*, hairs of the eye-brow ; *e—w*, the upper eye-lid ; *e*, ſkin ; *f*, fat between the ſkin and orbicularis, gradually diſappearing towards the eye ; *g*, orbicularis palpebrarum ; *h*, fat beneath the orbicularis, terminating in a thin edge below ; *i*, the tendon of the levator palpebræ ſuperioris ; *k*, cellular tiſſue between it and the conjunctiva ; *l*, the cartilage of the upper lid ; *m*, marks of the ſebaceous follicles ; *r r s t*, conjunctiva of the upper lid ; *r r*, where it inveſts the cartilage and ſebaceous glands ; *r s*, where it is connected with the tendon by cellular tiſſue ; *r k s t*, where it becomes reflected on itſelf ; *s t*, where it is ſpread over the globe of the eye ; *y r* 24 *s*, the ſuperior burſa, or fold of the conjunctiva ; *h e*, the ſpace between the two layers, repreſented by the black line, as the two ſurfaces are in contact ; *o p q*, the margin of the upper lid ; *q*, the part where the ſkin of the face becomes inflected, and continued into conjunctiva ; *u*, the cilia or eye-laſhes of the upper lid ; *n*, the opening of the coronary artery of the upper lid.

a—q, the lower eye-lid ; *a*, ſkin ; *b*, fat beneath it ; *c*, orbicularis ; *d*, fat under the orbicularis ; *g e*, cartilage of the lower lid ; *f g h*, margin of the lower lid ; *h*, a groove between the two edges ; *y*, triangular hollow left between the edges of the eye-lids, and the eye-ball, when ſhut ; *k—n*, conjunctiva of the lower lid, diſpoſed as in the upper ; *y*, *l*, the inferior burſa of the conjunctiva ; *p*, lower eye-laſh ; *q*, a quadrangular ſpace between the cilia and the margins of the eye-lids.

1—11, muſcles of the eye ; 1 2 3, levator palpebræ ſuperioris ; 4 5 6, rectus oculi ſuperior ; 7 8 9, rectus inferior ; 10, the tendon of the obliquus ſuperior ; 11, the fleſhy part of the obliquus inferior.

12—18, the optic nerve, curved, ſomewhat like an italic *ſ* ; 12 13, the ſheath of the optic nerve ; 12, its internal, 13, its external layer ; 14, the thin membrane immediately inveſting it ; 15, the fibres of the nerve cut and expoſed ; 16, part of the nerve as it paſſes the bony canal, appearing compreſſed from above below ; 18, the contracted extremity of the nerve in the ſclerotica ; 19, the principal trunk of the ophthalmic artery ; 20, the principal trunk of the ophthalmic vein ; 21, ſome branches of the nerve of the fifth pair.

22—43, the bulb of the eye ; 22 22, the axis of the bulb ; 23, the greateſt tranſverſe diameter of the bulb ; 24–26, the cornea ; 25 26 26, the ſpace between the cornea and lens, divided into the anterior chamber, 25 ; and the poſterior chamber, 26 26 ; 24 *t*, and 24 *r*, a double groove between the cornea and ſclerotica ; 27—29, the ſclerotica ; 27, its anterior limit, with the double groove, to which the annulus of the choroid is firmly fixed, 32 ; 28, the thinneſt part of the ſclerotica ; 30, the pigmentum nigrum between the ſclerotica and choroidea ; 31—37, tunica choroidea ; 32 33, the annulus gangliformis ; 34, 35, ciliary proceſſes ; 34 39 39, part of the choroid not covered by retina, and which is generally of greater brightneſs than the reſt ; 36 37, the iris ; 36, the margin by which it adheres to the annulus and ciliary proceſſes ; 37 26, the margin of the pupil ; 38, pigmentum nigrum between the choroides and retina ; 39 40 41, the retina. Its anterior termination pointed out by the line 39 46 39 ; 40—46, the chryſtalline lens ; 43 42, the long diameter ; 44 45, the ſhort diameter ; 42—44, its anterior convexity ; 42 45 43, its poſterior convexity ; 46 26, the capſule of the lens ; 34, 42, the diſtance of the lens from the ciliary body.

In this outline the forms and proportions of the ſeveral parts are preſerved with the moſt ſcrupulous exactneſs, ſo that any calculations made from it will be founded correctly.

Phyſiology of the eye.—To eſtimate correctly the powers of the eye requires an acquaintance with the nature of light, and with the laws by which it is regulated ; an exact knowledge of the organ ; and of the forms, proportions, denſities, refractive and diſperſive powers of the tranſparent parts, as well as of the radii of their curvatures. Since many of theſe points are hitherto but imperfectly elucidated, we cannot expect to determine the functions of the eye accurately in all their detail. Generally, indeed, in inveſtigating this delicate organ, the mathematicians have been deficient in correct anatomical knowledge ; while anatomiſts have been unacquainted with the ſcience and with the method of calculating accurately the reſults of their obſervations.

Experiment and calculation prove that the luminous rays proceeding from any object to the eye undergo certain changes in their paſſage through the tranſparent parts of the organ ; that theſe changes ultimately collect the rays, proceeding from the ſeveral points of the object, into oppoſite correſponding focal, or nearly focal points on the retina ; and that the impreſſion thus produced cauſes the perception of the object. A ſimple but intereſting experiment will prove the point. Let an eye, from which the back of the ſclerotica and choroid have been carefully removed, and their place ſupplied by oiled paper, or by the membrane which lines the ſhell of an egg, be placed in a room with a ſingle candle, with the cornea towards the luminous object. The image of the candle will be repreſented on the paper, diminiſhed in ſize and inverted. Without attempting to calculate preciſely the refraction or diſperſion of the rays in the different parts, we ſhall trace them from the anterior ſurface of the cornea to their collection into foci on the retina, giving the change of direction in general terms.

The pencils of rays radiating from any object, when they arrive at the ſurface of the cornea, form cones, the points of which are at the object, and the baſes on the cornea. Thoſe which impinge on the opaque ſclerotica are reflected, and have no concern in the production of viſion ; and thoſe which, falling very obliquely, make a very conſiderable angle with the cornea, are alſo reflected without penetrating into the aqueous humour. The rays, which fall within an angle of about 48 degrees, paſs through this membrane, undergoing a certain refraction, by which they are brought nearer to the line of the axis of the cornea ; and, if produced, would converge into a focal point beyond the bottom of the eye. From the cornea the rays paſs into the aqueous humour. They are divided by the diſperſive powers of this fluid, ſo that, if continued in the ſame medium, they would not only converge beyond the back of the eye, but on account of the aberration cauſed by their different refrangibility, would produce a confuſed and coloured image.

The rays collected by the cornea paſs through the pupil. Thoſe which come in an unfavourable direction are either reflected by the iris, or abſorbed by the pigmentum on its poſterior ſurface. The pupil admits only thoſe rays which are the neareſt to the axis of viſion. They then meet with the chryſtalline, which, by its refractive powers, collects them, and brings them into foci, after paſſing through the leſs refractive medium of the vitreous humour on the concave ſurface of the retina.

They do not impart a correct perception of the body which reflects them, unleſs they fall on the retina preciſely in the order in which they are detached from that body.

To produce this effect, it is neceſſary that all the rays, which proceed from any one point, ſhould be collected in one point of the retina; and that all the points of union thus formed ſhould be diſpoſed in the ſame manner as in the body, of which they form an image.

The cone of rays which proceeds from any luminous point to the cornea forms another cone, the apex of which falls on the retina. Theſe two cones have their axes almoſt in a ſtraight line. That which is perpendicular to the middle of the chryſtalline proceeds directly to the bottom of the eye; that which comes from above falls inferiorly; that on the left proceeds to the right, and ſo on with reſpect to the others: thus an inverted image is formed on the retina.

Among the obvious advantages derived from the actual diſpoſition of the ſeveral parts of the eye, we may remark, "that the ſurface of the cornea only, if it had been more convex, could not have collected the lateral rays of a direct pencil to a perfect focus, without a different curvature near its edges; and then the oblique pencils would have been ſubjected to a greater aberration, nor could have been made to converge on any focus on the retina. A ſecond refraction performs both theſe offices much more completely, and has alſo the advantage of admitting a greater quantity of light.

The iris, by altering the diameter of the pupil, in the manner we have already noticed, will influence immediately the quantity of light admitted into the eye. If one eye is cloſed, and we continue to look at the ſame object, the pupil of the open eye dilates evidently, and contracts again, as the other is opened, to its former diameter. The iris alſo intercepts ſuch rays as would fall on parts incapable of refracting them regularly, or ſuch as are directed ſo obliquely on the cornea as to be too much refracted, admitting only the ſmaller pencil which enters the eye more in the direction of its axis. This reaſoning applies, however, but partially, and only in caſes where the opening of the pupil is circular, and where the confuſion which would ariſe from the aberration of the extreme lateral rays may poſſibly be prevented: it will not hold good where the opening is very much extended, oblong, vertical, and, in ſome circumſtances, almoſt linear, as in the cat. The excentricity of the pupil mentioned in the deſcription of the iris can only ſo far influence the pencils of rays as to make them fall on the anterior vertex of the chryſtalline, with which it correſponds: the axes of the pupil, and the lens, do not correſpond with that of the cornea. From obſerving that the pupil changes, when objects are brought nearer to or removed farther from the eye, phyſiologiſts have fancied that alterations in its diameter are the principal means of adjuſting the organ to different diſtances. But it has appeared from careful experiments that this contraction and dilatation are irregular and limited; that by bringing the object nearer to the eye, within a certain diſtance, the pupil not only ceaſes to contract, but becomes again dilated; and, that beyond a few yards diſtance, it alſo ceaſes to dilate. In viewing the ſun, inſtead of dilating according to the diſtance, it contracts moſt cloſely, obeying the quantity and intenſity of the light, rather than the diſtance of the object. In viewing a leſs luminous object, the pupil dilates, when it is more diſtant, a greater quantity of light being neceſſary to produce a clear impreſſion; as the object is brought nearer, we require a leſs degree of light, and the iris contracts to exclude what is ſuperfluous. Thus far the iris may be uſeful in accommodating the eye to different diſtances; it may regulate the quantity of light, but it cannot alter the direction. In quieſcent viſion, the pupil preſerves its diameter with ſteadineſs, when the proportion of light neceſſary to be admitted is once determined. By its contraction, when a nearer object is viewed, it leſſens the confuſion which would ariſe, in ſuch eyes as cannot accommodate themſelves ſufficiently by powers hereafter to be examined, from the magnitude of the imperfect focal points on the retina.

Some inflection of the rays may have place in paſſing the edge of the pupil; but its great mobility, the wideneſs of the opening, and its very ſmall diſtance from the chryſtalline, prevent any apparent confuſion. Where from any cauſe the opening is very narrow, and the iris has but little motion, a confuſion may certainly take place from this cauſe.

The alterations of the pupil accommodate the eye to various ſtates of diſeaſe, by regulating the quantity of light. When a great number of rays would occaſion pain in an inflamed organ, the contraction of the aperture excludes the light; while a proportionate enlargement of the pupil provides againſt the inconveniences of diminiſhed ſenſibility, by admitting the greateſt quantity of rays.

As the chryſtalline lens diminiſhes in denſity gradually in every direction, approaching the vitreous humour on one ſide, and the aqueous on the other, Mr. Ramſden ſuppoſes that its refractive power muſt be the ſame with that of the two contiguous ſubſtances. Its principal uſe appeared to him to be that of correcting the aberration ariſing from the ſpherical figure of the cornea, where the principal part of the refraction takes place. From the conſtitution of the chryſtalline he inferred, that it will refract the rays of light without reflecting any of them; ſo that, although we have two ſurfaces of the aqueous, two of the chryſtalline, and two of the vitreous humour, we have only one reflected image, and that being from the front of the cornea, there can be no ſurface to reflect it back, and dilute the image on the retina. If the ſurfaces of the chryſtalline had been abrupt, there muſt have been a reflection at each, and an apparent hazineſs would have interfered with the diſtinct view of every luminous object. The ſmaller denſity of the lateral parts will not only correct the aberration of the ſpherical ſurface of the cornea, but will cauſe alſo the focus of each oblique pencil of rays to fall either accurately, or very nearly ſo, on the concave ſurface of the retina, throughout its extent. Had the refractive power been uniform throughout the whole ſubſtance of the lens, it might have collected the lateral rays of a direct pencil nearly as well, but it would have been leſs adapted to the oblique pencils of rays. Alſo, the gradual increaſe of denſity in approaching the centre makes the chryſtalline equivalent to a much more refractive ſubſtance of equal magnitude.

The principal uſe of the vitreous humour appears to be that of giving a ready paſſage to the rays of light, as they are converging into foci on the retina, and of keeping at the ſame time the ſurface of the latter uniformly ſpherical. It would allow a change of figure in the eye, or in the lens, or even a change of place in the latter, ſuppoſing there were powers in the living organ adequate to the purpoſe.

Some have conceived that the retina is not equally ſenſible in all parts, and that a certain portion only, near the axis of the eye, is capable of conveying diſtinct impreſſions of minute objects. Comparetti ſays that diſtinct viſion is effected only in the optic axis, which is moved moſt rapidly over every point of the object; and that what is ſeen apparently out of the axis is cauſed by the direction of the firſt impreſſion in the axis. We believe, however, that the limits of diſtinct viſion are far more extenſive. Dr. Young, ſpeaking of his own eye, ſays, that the viſual axis being fixed in any direction, he can ſee at the ſame time a luminous object placed at conſiderable diſtances from it; the angle, however, differs. Upwards it extends to 50 degrees, inwards to 60, downwards to 70, and outwards to 90 degrees. Theſe internal limits of the field of view nearly correſpond with the external limits formed by the different parts of the face, when the eye is directed forwards and ſomewhat downwards, which is its moſt natural poſition; and both are well calculated for enabling us to perceive the moſt readily ſuch objects as are the moſt likely to concern us. The extent of the retina is every way greater than the limits of the field of view. The whole extent of perfect viſion is little more than ten degrees; or, more ſtrictly ſpeaking, the imperfection begins within a degree or two of the viſual axis, and at the diſtance of five or ſix degrees becomes nearly ſtationary, until, at a ſtill greater diſtance, viſion is wholly extinguiſhed. The imperfection may be owing partly to the unavoidable aberration of oblique rays, but principally to the inſenſibility of the retina; for, if the image of the ſun itſelf be received on a part of the retina remote from the axis, the impreſſion will not be ſufficiently ſtrong to form a permanent ſpectrum, although an object of very moderate brightneſs will produce this effect, when diſtinctly viewed. The motion of the eye has a range of about 55 degrees in every direction, ſo that the field of perfect viſion, in ſucceſſion, is by this motion extended to 110 degrees.

It appears from ſome experiments of Haldat's, made by producing an artificial ſtrabiſmus, that the opinion, which limits the poſition in which an image can be ſeen diſtinctly to a point at the bottom of the eye, is by no means reconcileable with actual obſervation. For, in an artificial ſtrabiſmus, one of the impreſſions falling on a part without the viſual axis, ought not to produce any perception of the object; this we know not to be the caſe. From this fact alone we may conclude that the place of the image is not neceſſarily confined to the axis, but that many points of the ſurface of the retina are capable of conveying an impreſſion of it. As the angle is increaſed, the perfection of the image may be leſſened; but we do not loſe the perception of it until its poſition is ſuch, that none of the rays proceeding from it directly can be brought to converge on the poſterior hemiſphere of the globe. This would appear to conform alſo with our ideas of the uſe of the extent of the retina, for which, if the field of viſion was ſo extremely limited, we could aſſign no reaſon. The points of it, at a diſtance from the axis, may be leſs favourably diſpoſed, but are not perhaps leſs ſuſceptible of being affected. "The whole of the retina is of ſuch a form as to receive the moſt perfect image on every part of its ſurface, that the ſtate of each refracted pencil will admit; and the varying denſity of the chryſtalline renders that ſtate more capable of delineating ſuch a picture than any other imaginable contrivance could have done." To illuſtrate this, Dr. Young has given an excellent diagram, repreſenting the ſucceſſive images of a diſtant object filling the whole extent of view, as they would be formed by the ſucceſſive refractions of the different ſurfaces. In oppoſition to the obſervations given above reſpecting the decreaſing ſenſibility of the retina remarked by Dr. Young, it has been obſerved by others, that, on comparing the impreſſions produced by rays parallel to the optic axis with thoſe by rays much inclined to this axis, they have appeared to differ in intenſity only in a degree correſponding to the diminution in the extent of the opening of the pupil, produced by the obliquity of its plane to the luminous rays, and by the obliquity of the rays themſelves to the refracting ſubſtances through which they paſs. At the moſt, the difference of the clearneſs of the impreſſion is not ſuch as it would be, if it depended on a diminution of the ſenſibility of the retina, proportionate to its diſtance from the optic axis. Notwithſtanding the influence of the cauſes juſt mentioned, the light of a candle paſſing into both eyes, when their axes are artificially inclined, ſo that the images make angles of 15 to 25 degrees with the optic axis, ſuffers no apparent diminution of brightneſs. This fact certainly gives to the field of diſtinct viſion a more conſiderable extent than that uſually aſſigned it. The point of the retina, which correſponds to the optic axis, may poſſibly be the place of moſt perfect viſion; not becauſe it is endowed with a greater ſenſibility than other parts of the retina, but from its being in the exact focus of the refractive powers of the eye, and the only point where the image can be impreſſed with every perfection.

In conſidering the ſenſibility of the retina, the effects of the pigmentum muſt not be overlooked. In the human ſubject the pigment varies in colour; but is always more or leſs dark. In animals, where the pigmentum is more than of one colour in the ſame eye, the lighter portion is always placed at the bottom of the eye, including the entrance of the optic nerve in its ſweep; the colour varies in different animals, but has always a brilliant ſurface. Probably the light has a greater effect on the retina, in eyes which have a white pigmentum, than in ſuch as poſſeſs a dark one. Hence all animals ſee more or leſs diſtinctly in the dark, according as their lucid tapetum approaches nearer to a white or black colour. Man, in whom it is dark, ſees very imperfectly in a light where a cat, or dog, would perceive objects with tolerable clearneſs. We may obſerve, that when either of the latter look at us in the dark, the whole pupil is enlarged and illuminated; but in a full light there is no ſuch appearance. Here there muſt be a reflection of light from the bottom of the eye to produce the effect; and the reflected light is always of the ſame colour with the tapetum. Thoſe individuals of our ſpecies who have a light pigmentum, ſee much better with leſs light than thoſe who have it dark. In the Albino, where the colouring matter is exceedingly thin, or wholly deficient, the common day-light is far too powerful to admit of diſtinct viſion. When he attempts to examine the qualities of an object with preciſion, the eye-brows are knit, and the eye-lids kept almoſt ſhut. In the twilight he can ſee more plainly, as the luminous rays are then not too intenſe for the very ſenſible retina. The ferret is deſtined, from its mode of life, to ſee in dark places; and its pigmentum is naturally white.

The rays which paſs through the tranſparent retina are diſpoſed of according to the reflecting powers of the pigmentum. In man, who requires diſtinct viſion in a moderate light, rather than the power of ſeeing where light is almoſt wholly wanting, the pigmentum is dark, and the rays are abſorbed, and entirely loſt; therefore, in ſuch eyes, it can add nothing to acuteneſs of viſion, and a conſiderable quantity of light is required to produce an adequate impreſſion on the retina. The rays are then loſt in the pigmentum, and the accuracy of the image is no way impeded. In animals, who require a great acuteneſs of ſight, the rays, reflected from a light and brilliant ſurface, again impreſs the retina, and increaſe the power of viſion. The interval of time is too ſhort, and the diſtance between the points they may ſtrike in their double paſſage too minute, to occaſion any indiſtinctneſs of the image.

Diſtinct viſion requires that the object ſhould be fixed, and not allowed to move over the ſurface of the retina. To accompliſh this object, the muſcles of the globe are employed in the manner above deſcribed. We believe the impreſſion made on the retina by the luminous rays to be in ſome degree permanent, and the more ſo as the light is ſtronger. The duration may vary probably from 100dth of a ſecond to nearly a ſecond. Hence the well-known phenomenon of the circle of light in revolving a lighted ſtick. If the object is painfully bright, the ſenſation is more permanent, and vaniſhes at laſt gradually.

It is very difficult to aſcertain the proportions of the eye ſo exactly as to determine with certainty the magnitude of the image on the retina, as the ſituation, curvature, and conſtitution of the lens will make a very material difference in the reſult. It is proportionate to the magnitude and diſtance of the object, and is meaſured by the angle which each end of the object makes with the retina. The more remote therefore the object, the ſmaller the image, as it is included in a ſmaller angle: when the diſtance is ſo great as to put an end to diſtinct viſion, we ſuppoſe the angle on the retina to be too acute to convey any preciſe idea of the ſize of the object. By aſcertaining the leaſt poſſible object that the eye is capable of diſcerning, we may thus form ſome conjecture as to the ſmalleſt poſſible image. The power varies no doubt in different individuals, and has been variouſly eſtimated. The eye of almoſt all perſons can perceive diſtinctly two points ſubtending an angle of a minute; in ſome perſons it can diſtinguiſh the difference of objects ſubtending an angle of 20 ſeconds. A ſingle object, if bright, and at the proper diſtance for diſtinct viſion, (about eight inches,) may be diſcerned, though not ſubtending an angle of two ſeconds and an half. Haller ſays even leſs than this. In the ſection of a gilded ſilver thread, the gold may be diſtinguiſhed from the ſilver, when not exceeding $\frac{1}{110501000}$dth of a line in thickneſs. According to the rule above-mentioned, the image of diſtinction in this caſe muſt form on the retina a point almoſt incalculably ſmall, and yet ſuch is the ſenſibility of the latter, that the difference of the objects is accurately determinable. This far exceeds the common opinions concerning the powers of the eye in diſcerning minute objects.

Experiment has ſhewn that there exiſts in the retina an inſenſible ſpot, about an inch in diameter: if the image falls on this, no perception is produced. Two pieces of white paper are fixed on a wall ſomewhat darkened, about level with the eyes, two feet diſtant from each other, the left eye is then ſhut, and the right eye directed upon the left object; if the obſerver moves ſlowly backwards, the object, although four inches in diameter, will diſappear at the diſtance of nine or ten feet. The experiment may be made more ſimply with the two thumbs, or two candles. The latter are placed, ſay at ten inches from each other; at a diſtance of 16 feet, if the eye is directed to a point four feet to the right or left of the middle of the ſpace between them, they are loſt in a confuſed ſpot of light; but any inclination of the eye brings one or other of them into the field of view. The object is ſuppoſed to vaniſh, or become obſcure, when it falls directly on the ſpot occupied by the entrance of the optic nerve. Different experimenters have varied in their eſtimate of the diameter of the inſenſible ſpot, from the fortieth part of an inch, to a ſeventh part of the diameter of the bulb; the firſt we believe to be too ſmall, the laſt certainly too great. Since the diſcovery of the central foramen in the retina, a queſtion has been ſtarted, whether the want of the retina at this ſpot does not account more ſatisfactorily for the vaniſhing of the object, than any ſuppoſed inſenſibility at the entrance of the optic nerve? The anſwer is, that the ſituation of this foramen in the retina does not correſpond with the part oppoſed to the object, when rendered inviſible; and that the entrance of the optic nerve is found to be preciſely in the part oppoſed. The orifice itſelf is placed juſt at the end of the viſual axis, and muſt, we ſhould conceive, have ſome material office attached to it, and have a conſiderable effect on viſion. The ſaturation of the yellow ring around it appears by obſervation to be connected with the acuteneſs of the organ. Mr. Home ſays, "it is probably too ſmall to produce any defect in viſion:" that it produces no defect we readily admit, but that it is too ſmall to influence viſion, is not, we think, at all probable. Its uſe has not been as yet aſcertained. Blumenbach advances the following conjecture on this point. Man, and ſuch animals as have the two eyes placed with the axis parallel, thereby gain the advantage of ſeeing objects with both eyes at once, and therefore more acutely. But at the ſame time they are expoſed to this inconvenience, that in a ſtrong light both eyes become dazzled at once; and this happens ſo much the ſooner, becauſe the light falls on the correſponding principal focuſes of both eyes at once. This inconvenience ſeems to be obviated by the foramen centrale; ſince that part which forms the principal focus of the eye opens in a dazzling light, ſo as to form a kind of ſmall pupil, through which the concentrated rays paſs, and fall on the pigmentum beneath.

Since the images are pictured inverted on the retina, many diſputes have ariſen as to the cauſe of our perceiving the objects erect. If it be allowed that we judge of the ſituation of each luminous point by the direction of the rays it tranſmits, it follows, that we muſt ſee bodies as we really do ſee them, in their proper poſition. The opinion that we really ſee objects reverſed, and correct the ſenſation by experience and judgment, derived from the other ſenſes, is liable to very numerous objections. The chick juſt hatched knows where to direct its bill; and perſons born blind, who have ſuddenly gained their ſight, ſee objects in their proper poſition. We do not ſee the picture on the retina, but the object itſelf in the direction of each of the rays which conveys to us the ſenſation, or, to ſpeak more correctly, in the direction of the axis of that pyramid, which a pencil of divergent rays forms in proceeding from any point of an object to the eye. Berkeley explains the ſuppoſed difficulty in another way; he does not allow that we can eſtimate the ſituation of parts or objects by the decuſſation and direction of the rays of light, as the mind neither perceives the interſections of the radious pencils, nor purſues the impulſes they give in right lines: without perceiving them it cannot form a judgment, and it cannot perceive them without a conſciouſneſs of ſuch perception. The ſituation of viſible objects muſt be entirely relative, and depend on the place which they occupy with regard to each other. And as all viſible objects are inverted at the ſame inſtant, each will be in the ſame relative ſituation on the retina as it is in actually. Thus the terms of above and below are arbitrary expreſſions, by which it is agreed to call upper, what correſponds to the heavens, and lower, what correſponds to the earth. Now it is evident, that at the bottom of the eye the ſituation of theſe is inverted, the earth is above, and the heavens below. We call that the lower end of an object which is neareſt the ground; and the image of a man's feet, being in contact with the image of the earth on the retina, we naturally infer that they are in contact with the actual earth; the head being more remote from the earth, we ſuppoſe that it is higher. The confuſion has ariſen from mixing the ideas derived from the different ſenſations of ſight and touch. You ſay, (to uſe the words of Dr. Berkeley,) the picture of the man is inverted, and yet the appearance is erect. I aſk you what mean you by the picture of the man, or, which is the ſame thing, the viſible man's being inverted? You tell me, it is inverted becauſe the heels are uppermoſt, and the head undermoſt. Explain me this: you ſay, that by the head being undermoſt, you mean that it is neareſt to the earth; and by the heels being uppermoſt, that they are fartheſt from the earth. I aſk again, what earth you mean? You cannot mean the earth that is painted on the eye, or the viſible earth; for the picture of the head is fartheſt from the picture of the earth, and the picture of the feet neareſt to the picture of the earth; and accordingly the viſible head is fartheſt from the viſible earth, and the viſible feet neareſt to it. It remains therefore that you mean the tangible earth, and ſo determine the ſituation of viſible things with reſpect to tangible things, which is abſurd, and perfectly unintelligible. The two diſtinct provinces of ſight and touch ſhould be conſidered apart, and as if their objects had no intercourſe, no manner of relation to one another, in point of diſtance or poſition.

Two diſtinct images are painted, one upon each eye, and yet we only perceive a ſingle object. Many very different explanations have been given of this phenomenon; the moſt ſatisfactory is, that in the two eyes there are correſponding parts of the retinæ which are probably ſuſceptible of the ſame impreſſion in equal degree, and convey it to the ſenſorium in that equal degree: hence, as long as ſimilar points of the images fall upon the correſponding points of the retinæ, the perception of the ſame object is ſingle. It is double for the ſame reaſon whenever the diſpoſition of the viſual axes is deranged. Every object which produces two diſtinct images on the retinæ is neceſſarily placed at the point of interſection of the optical, or viſual axes, and is painted conſequently on correſponding points of the retinæ. By an artificial preſſure on one of the eyes we may ſo diſplace its viſual axis, or point of moſt perfect viſion, that the two images ſhall not fall on thoſe parts of the retinæ of the two eyes uſually impreſſed ſimultaneouſly; a double image is the conſequence. The optical axes are ſo nearly parallel to each other, that they naturally meet at a great diſtance: but, in order to preſerve the ſimplicity of the perception, when we look at an object brought nearer to us, we make them converge towards it by means of the external muſcles of the eye, which is further adjuſted to the decreaſing diſtance by ſome other of its powers, ſo as to convey a ſingle and diſtinct image of the object. This opinion is confirmed by ſome obſervations of Mr. Home's on double viſion as the conſequence of a want of correſpondence, produced by ſome change in the refracting media of one of the eyes, or elſe by a want of ſimilar actions in the muſcles of both eyes reſpectively. The former takes place after the chryſtalline lens has been extracted, and the convex lens made uſe of to produce the requiſite focal adjuſtment is not properly placed. Yet, when objects are in rapid motion, or when brought very much nearer to the eye than the point of diſtinct viſion, may not the impreſſions be made on points not exactly ſymmetrical, or in the viſual axis, without producing double viſion? It appears from experiments that it is not abſolutely neceſſary that objects ſhould fall on the viſual axis in order to produce ſingle viſion, but that there are many points at different diſtances from the axis on which, if the images fall, they will appear but as one. In the tranverſe plane the optical axes muſt be much inclined (about 15 degrees), in order to produce a double image; in the vertical, a very ſlight inclination is ſufficient to cauſe it. It is inferred from theſe experiments, that the limits of the field of ſingle viſion, or of the area of the points of correſpondence, will form an ellipſe, of which the long axis correſponds to the tranſverſe axis of the globe, and the ſhort to the vertical axis: the firſt of theſe is about three lines and a half in length, the laſt ſcarcely one. It has been a matter of doubt, how far the judgment is concerned in the perception of the ſingle image. Objects appear ſingle, it is ſaid, although there is a double image, becauſe the touch which corrects the impreſſion produced by viſion teaches us that the ſame object we ſee double is actually ſingle. Experience and cuſtom have ſo well eſtabliſhed our judgment, formed from theſe two ſenſations, that we cannot derange it by the will. An argument againſt this is, that in caſes where perſons born blind have obtained their ſight, the object is at once ſeen ſingle.

As double viſion is produced by a moderate derangement of the optic axes, ſquinting is produced by a much greater derangement. It does not follow that the ſquinting perſon ſees every object double, for the apparent improper direction of the eye may be owing to the unuſual ſituation of the parts of the eye, ſo that the image may yet fall on correſponding parts of the retinæ. The more probable explanation is, that the object is not ſeen by both eyes; but that one eye, more or leſs perfect, is directed to the object; while the other, which in ſuch caſes is imperfect, is drawn aſide by habit, in order that its operation may not diſturb the impreſſion received by the other eye. The greater ſtrength, ſhortneſs, and ſtraightneſs of the rectus internus muſcle, may be the reaſon that the deviation is made towards the noſe. Squinting takes place in three different circumſtances; when one eye has only an indiſtinct viſion; where both eyes are capable of ſeeing objects, but the one is leſs perfect than the other; and where the muſcles of one eye have, from practice, as in the caſe of frequently looking through teleſcopes, acquired a power of moving it independently of the other.

The ſuperiority of viſion with one eye over that with two has been the ſubject of many diſcuſſions. It is commonly ſuppoſed that the firſt produces the moſt diſtinct perception; the opinion, however, is not correct. If we place a ſheet of white paper directly before the eyes, and bring any opaque body, a book for inſtance, before the right eye, ſo that half the paper is concealed from it, while the whole is viſible to the left; on regarding the ſurface alternately with one, or both eyes, we may obſerve diſtinctly that the part viſible to both eyes is brighter and clearer than that which is viſible only to the left: the firſt is of its uſual whiteneſs, the laſt is obſcured by a ſlight ſhade. The ſuperiority of teleſcopes with two eye glaſſes, over thoſe with one, is univerſally acknowledged. In viſion, with two eyes, therefore, we believe the impreſſion to be ſtronger, the ſenſation more vivid, and the perception clearer; not doubly ſo as the impreſſion is, becauſe we can with difficulty diſtinguiſh coincident ſimilar impreſſions. If we look at any object through fluids of two different colours placed one before each eye, the object will appear of the colour reſulting from the mechanical mixture of the two employed. If the colours were yellow and red, the perception would be as from orange, &c.; proving that a double impreſſion produces in this caſe a compound or mixed ſenſation, from which a ſimple perception ariſes. There are many other phenomena attendant on the ſeparate viſion of different objects producing different combinations of them, which our limits will not allow us to diſcuſs. The reader will find this ſubject very amply conſidered by Dr. Haldat in the Journal de Phyſique, t. 63, and illuſtrated by numerous apparently accurate experiments. The concluſion to be drawn from them is, that in many circumſtances viſion with both eyes will produce a ſimple perception, an apparent combination of objects varying in colour and form when they are viewed ſeparately by each eye. And that objects are not increaſed in their apparent dimenſions when ſeen with both eyes, although their brightneſs is rendered more intenſe under the ſame circumſtances.

The image of the object is ſuppoſed to be painted on the retina, free from any priſmatic colours produced by the different refrangibility of the rays, which might render it confuſed. The tranſparent parts of the eye are ſo diſpoſed as to correct the aberration of the viſual rays, and to prevent their final diſperſion. Theſe effects are principally effected by the curvatures and conſtitution of the chryſtalline already inſiſted on, which produce the ſame effect that in an achromatic object glaſs we obtain in a leſs perfect manner, by proportioning the radii of curvature of different lenſes. In the eye it has been generally ſuppoſed that the correction is perfect, the regular diminution of the denſity of the chryſtalline, redreſſing the errors cauſed by the cornea and aqueous humour. The perfection of the achromatic powers of the eye has been called in queſtion by many able men, eſpecially in conſequence of experiments related by Maſkelyne, Comparetti, and Dr. Young. Dr. Maſkelyne, by calculating the refractions of the mean, moſt, and leaſt refrangible rays at the ſeveral humours of the eye, inferred a diffuſion of the rays, proceeding from a point in an object, at their falling on the retina. The circle of diſſipation, however, would be too ſmall to occaſion any confuſion; and he ſhews that the picture of objects on the retina is relatively, if not abſolutely, perfect, and fitted for every uſeful purpoſe.

The experiments and obſervations of Comparetti are ingenious; he ſuppoſes that the chryſtalline lens cannot, under all circumſtances, correct the diſperſion of the rays, although he conceives it to be ſuſceptible of certain alterations of poſition directed ſolely to that purpoſe. His experiments are too numerous, and complicated to be introduced here in any ſhape. He proves, perhaps, a ſlight imperfection, under certain circumſtances. Dr. Young does not think that the ſtructure of the chryſtalline, or any other proviſion, has the effect of rendering the eye perfectly achromatic. He adduces the colour bordering the image of an object ſeen indiſtinctly; the colours perceived on viewing an object through ſmall openings, ſuch as thoſe of his optometer; and the following experiment mentioned by Dr. Wollaſton. He looks through a priſm at a ſmall lucid point, which of courſe becomes a linear ſpectrum. But the eye cannot ſo adapt itſelf as to make the whole ſpectrum appear a line; for if the focus be adapted to collect the red rays to a point, the blue will be too much refracted, and expand into a ſurface; and the reverſe will appear if the eye be adapted to the blue rays; ſo that in either caſe the line will be ſeen as a triangular ſpace. He concludes alſo by another experiment, that the red rays, from a point of twelve inches diſtance, are as much refracted as white or yellow light, at eleven. The inference is, that the eye is not capable of uniting at the ſame point all the elementary colours of light. Theſe obſervations have been examined with much ingenuity by Haldat, who draws from them arguments highly in favour of the achromatic powers of the eye. The ſlight appearances of the decompoſition of light at the edges of minute bodies are not owing to any inequality in the refractive powers of the eye on the different rays; but to the attraction which theſe bodies have for the luminous rays, which ſtrike on their ſurfaces, after being reflected from the plane on which theſe ſmall bodies are placed. When placed on a black wall, or table, no reflection takes place, and no colours are viſible at their edges. It is evident, that if differently coloured rays are unequally refracted by the eye, ſpots of different colours ſhould produce penumbræ of unequal extents, proportionate to the refrangibility of the rays they may reflect. But circular pieces of card, equal in ſize, and about a line and a half in diameter, painted red, yellow, blue, green, viewed on black, or white walls, at equal diſtances, and at the ſame time, offer penumbræ of equal extents. The colour obſerved on viewing objects through the optometer is cauſed by the luminous rays, by which we perceive them, being neceſſarily acted on by the narrow opening through which they paſs; and no further decompoſition of the light takes place than can be readily accounted for by principles well eſtabliſhed in optics. If this were not the caſe, why ſhould the eye be ſuppoſed to decompoſe rays which come through narrow apertures, and not thoſe which arrive without any external obſtacle to their natural radiation. In bodies ſeen indiſtinctly, the rays which glance on their margins are decompoſed; and this diſperſion, not viſible at a diſtance from the mixture with the undecompounded rays which are in the greateſt number, is plainly ſeen when the object is brought cloſe, becauſe they arrive at the retina almoſt without any intermixture. The colours, therefore, ſeen at the edges of ſuch bodies, do not ariſe from any ſuppoſed imperfection in the refractive powers of the eye, when the object is brought cloſe to it. In order to draw a concluſion that the humours of the eye are not achromatic, luminous rays ſhould be brought to bear on them, ſuch as they are when radiating from a luminous body, and without undergoing any decompoſition in their paſſage from cauſes external to the eye; it ſhould then be proved that they undergo a decompoſition in paſſing through the humours, and that this diſperſion cannot be corrected. In the caſe of the priſm, the ſeparated rays may appear to be refracted unequally, becauſe the ſpectrum is not linear in its whole extent. But on account of this very extent, they arrive at the tranſparent cornea with different inclinations, in unequal proportions, and impinge on a refracting medium, the curvature and denſity of which are unequal: we cannot therefore expect an equal refraction. The eye is capable of preſerving the natural mixture of the elementary rays which arrive at its ſurface; its not having the power of recompoſing thoſe rays, which artificial external cauſes have diſſipated, is not ſufficient to induce us to conclude that its achromatic powers are not perfect. The perfection of the achromacy of the eye is further proved, by there being no diminution whatever in the diſtinctneſs of the image, when, by an artificial dilatation of the pupil, by means of belladonna, the anterior ſurface of the chryſtalline is almoſt wholly expoſed. Again, when the greateſt poſſible inclination has been given to the rays, no colour is perceptible.

The luminous rays, which arrive at the eye from an object at ſome little diſtance, will unite into a focus at a certain diſtance behind the chryſtalline lens. Rays, which paſs from an object cloſer to the eye, as they diverge more conſiderably, will unite into a focal point at a greater diſtance behind the chryſtalline, and indiſtinct viſion would be the neceſſary conſequence, if the eye had not the power either of elongating its axis, or ſhortening its focal diſtance; ſo that in theſe very oppoſite conditions the rays ſhould converge equally into a point on the retina. This power of adjuſtment to diſtance is one of the moſt important to the perfection of the organ, and has excited the attention of every writer on the mechaniſm of viſion; all allowing that ſome change muſt be produced, but few agreeing as to its nature or mode. The ſubject has been particularly agitated in this country, and has called forth many excellent obſervations on the mechaniſm of viſion, which, if they have not finally proved the means by which the accommodation is brought about, have, at leaſt, proved the fallacy of moſt of the theories adopted to account for it. To us, Dr. Young's opinion, of the change of the focal diſtance by ſome alteration in figure of the chryſtalline, appears the moſt ſatisfactory, and ſupported by the moſt deciſive proofs: the manner in which this alteration is effected, is a point not perhaps as yet demonſtrated, however concluſive the arguments may be in favour of ſuch alteration actually occurring. There is a certain point at different diſtances in different perſons, from which luminous rays, paſſing to the eye, will be brought to a focal point on the retina, without any apparent exertion of any part of the organ. This is called the point of perfect indolent viſion. In perſons who are near-ſighted, or in whom this point is pretty cloſe to the eye, owing to the too great refractive powers of the organ, the rays from objects at a moderate diſtance are brought to a focus at a point anterior to the ſurface of the retina. In ſuch caſes the divergence of the rays is increaſed, by means of a concave lens, and a confuſion of the image is prevented. In thoſe who are long ſighted, where this point is at a greater diſtance, the rays from near objects cannot be brought to focal points ſoon enough to impreſs a diſtinct image, and the defect depends on cauſes the converſe of thoſe which produce the myopic or near-ſighted eye. It is remedied by a convex lens. We poſſeſs, however, in the perfect eye, the power of ſeeing diſtinctly objects much nearer to the eye than this ſuppoſed point of diſtinct viſion; and this exiſts in very different degrees in different individuals. It is equally true, on the other ſide, that we cannot, by any volition, accommodate the eye to view objects at a diſtance greater than that of indolent viſion, a circumſtance eaſily experienced by any one. In the year 1793 Dr. Young made ſome obſervations on the ſtructure of the eye, and its proviſions for adjuſtment, among which are accounts of the theories of adjuſtment, propoſed by various earlier writers. Of theſe we ſhall ſay nothing, as a reference to the anatomical deſcription of the eye, and other remarks already detailed, would at once refute the greater part of them. It was the opinion of Dr. Young that rays of light, paſſing from objects at a ſmall diſtance, could only be brought to foci on the retina by a nearer approach of the chryſtalline to a ſpherical form: this change, he believed, was effected by the muſcularity of the lens. In the following year, ſome obſervations of John Hunter on this ſubject were publiſhed by Mr. Home, from which it appears, that he had for many years entertained a notion, that the chryſtalline humour was enabled, by its own internal actions, to adjuſt itſelf, ſo as to adapt the eye to different diſtances. Mr. Hunter had inſtituted ſome experiments, but died before he had made ſufficient progreſs to draw any concluſion. In the ſame year, Dr. Hoſack, in a paper on viſion, controverts Dr. Young's deductions with regard to the muſcularity of the lens, and attributes the effects produced in adjuſtment to the actions of the muſcles. He aſſumes, as the neceſſary conſequence of contraction in theſe muſcles, that the axis of the eye will be elongated, and the elaſtic cornea rendered more convex; both which circumſtances would tend to preſerve diſtinctneſs of viſion with regard to near objects. In order to prove that the eye is capable of having its focal adjuſtment conſiderably varied by external preſſure, he applied the common ſpeculum to his own eye, and by increaſing the preſſure of it conſiderably, was enabled to ſee objects diſtinctly, though placed much nearer than the natural focal diſtance. The means here made uſe of to aſcertain the fact do not appear to us very accurate. In the Croonian lecture for 1795, Mr. Home relates a ſeries of experiments and obſervations made by himſelf and Mr. Ramſden, from which he concludes, that the eye has a power of adjuſting itſelf to different diſtances, when deprived of the chryſtalline lens; and that, therefore, the ſuppoſed fibrous, and laminated ſtructure of that lens, is not intended to alter its form, but to prevent reflections in the paſſage of the rays through the ſurfaces of media of different denſities, and to correct ſpherical aberrations; that the cornea is elaſtic, capable of being elongated $\frac{1}{11}$th of its diameter; that the tendons of the four ſtraight muſcles terminate in forming a lamina of the cornea; and, that in changing the focus of the eye from ſeeing with parallel rays to a near diſtance, there is a viſible alteration produced in the figure of the cornea, rendering it more convex; and when the eye is again adapted to parallel rays, the alteration by which the cornea is brought back to its former ſtate is equally viſible. The exertion required to adjuſt the eye to near diſtances, and the eaſe with which it is adapted to remote objects, proves that the firſt was a poſitive action, and the ſecond a relief. The defect of elaſticity in the cornea, inferred to ariſe from age, is applied to explain the changes of viſion which take place in advanced life. By ſome further experiments Mr. Ramſden and Mr. Home were induced to abandon the opinion that the adjuſtment is produced ſolely by the alteration of the convexity of the cornea, which might probably be ſufficient when the lens was removed, but not when the eye is entire. Mr. Home aſſumes that the action of the ſtraight muſcles will elongate alſo the axis of the eye, and produce an effect upon the chryſtalline lens, and ciliary proceſſes, puſhing them forward in proportion as the cornea is ſtretched. Granting theſe two laſt changes, Mr. Ramſden computed that the increaſe of the curvature of the cornea may be capable of producing one-third of the effect, and that the change of place of the lens, and elongation of the axis of viſion, ſufficiently account for the other two-thirds of the quantity of adjuſtment neceſſary to make up the whole. We muſt here obſerve, that it is not yet demonſtrated that the actions of the ſtraight muſcles can produce the effect aſcribed to them. They have been ſuppoſed by others to flatten the eye, and ſhorten its axis, upon arguments equally plauſible. We believe they have but little effect, except that of directing the axis of the eye to the object, and doubt if they can exert any preſſure on the globe. Neither is it aſcertained what effect ſuch preſſure would have in elongating the axis, puſhing forwards the lens, or increaſing the curvature of the cornea. The opinion that the chryſtalline lens is moved forward by the action of the ciliary proceſſes, is equally gratuitous. In the year 1800 was publiſhed an excellent paper by Dr. Young, on the mechaniſm of the eye, in which he examines, with great acuteneſs and accuracy, the different opinions on this ſubject. It is impoſſible to give an abſtract of his obſervations in the compaſs of this article; we muſt refer the reader to the paper itſelf, for the detail of all the proofs by which he endeavours to eſtabliſh his opinion of an alteration in the figure of the chryſtalline, and give here only the general concluſions drawn from his inveſtigations. "The arguments in favour of an increaſe of the convexity of the chryſtalline lens are of two kinds; ſome of them are negative, derived from the impoſſibility of imagining any other mode of performing the accommodation, without exceeding the limits of the actual dimenſions of the eye, and from the examination of the eye in its different ſtates by ſeveral teſts, capable of detecting any other changes if they had exiſted: for example, by the application of water to the cornea, which completely removes the effects of its convexity, without impairing the power of altering the focus, and by holding the eye, when turned inwards, in ſuch a manner as to render any material alteration of its length utterly impoſſible. Other arguments are deduced from poſitive evidence of the change of form of the chryſtalline, furniſhed by the particular effects of refraction and aberration, which are obſervable in the different ſtates of the eye; effects which furniſh a direct proof that the figure of the lens muſt vary; its ſurfaces, which are nearly ſpherical, in the quieſcent form of the lens, aſſuming a different determinable curvature, when it is called into exertion. The objections which have been made to this concluſion are founded only on the appearance of a ſlight alteration of focal length in an eye from which the chryſtalline had been extracted; but the fact is neither ſufficiently aſcertained, nor was the apparent change at all conſiderable: and even if it were proved that an eye without the lens is capable of a certain ſmall alteration, it would by no means follow that it could undergo a change, five times, or ten times as great."

The means whereby we are enabled, by ſight, to determine the diſtance, magnitude, and ſituation of objects have not been ſufficiently explained to allow us to ſpeak with confidence. It is acknowledged that the eſtimate we make of the diſtance of objects conſiderably remote, is rather an act of judgment grounded on experience than of ſenſe. When we perceive a great number of intermediate objects, which we have experienced to take up a conſiderable ſpace, we conclude that the object we ſee beyond them is at a great diſtance. When an object appears faint and ſmall, which at a near diſtance we have experienced to make a ſtrong and large appearance, we conclude it alſo to be far off. It is ſuppoſed by ſome that when an object is ſo near that the interval between the eyes bears any ſenſible proportion to it, the two optic axes meeting at the object, make a ſenſible angle, by means of which, according as it is greater or ſmaller, the object is perceived to be nearer or further off. This does not depend on judgment formed from experience, but reſults from a ſuppoſed neceſſary connection between the idea of an obtuſe angle and a near diſtance, and an acute angle and a farther diſtance. There is another way mentioned by others, by which we are ſaid to perceive diſtances when we look only with one eye. And that is, the greater or leſs divergency of the rays which fall on the eye, that point being judged neareſt which is ſeen by the moſt diverging rays, the apparent diſtance increaſing as the divergency of the rays decreaſes, until the diſtance is ſo great that the rays which fall on the eye are to ſenſe parallel. This mode of judging is not derived from experience, but from the difference of angular impreſſions made by diverging and nearly parallel rays; it being a certain neceſſary truth, that the nearer the direct rays falling on the eye approach to paralleliſm, the farther off is their point of interſection, or the viſible point from which they flow. Such are the common opinions concerning our perceiving diſtances by ſight. Thoſe which make no allowance for the interference of judgment formed by experience, appear to us inadmiſſible. With all the advantages derived from experience, our judgment of diſtances is ſtill imperfect, owing to the deceptions ariſing from the apparent magnitude compared with the real, from the uncertainty attending the intenſity of the colours, the appearance of the minute parts of the object, and its relative ſituation with regard to others. Theſe are the principal means of directing our judgment, and if they be imperfect, or any of them deficient, an error in judgment will be the probable conſequence. If we judged of diſtance by magnitude only, we ſhould be led into numerous errors; it is by conſidering the other qualities of the object, and its ſituation with regard to others, that we are led to form a correct judgment as to its real diſtance. We know that a man equal to us in ſize, appears ſmaller a hundred yards off, and ſmaller ſtill at five hundred. Here, being certain of the real ſize, we can make uſe of it with tolerable accuracy in determining the diſtance. We are deceived, when unacquainted with the real magnitude, we draw concluſions from the apparent only. We know by experience that objects become paler, and more indiſtinct, in proportion as they are remote. We know by a number of objects being interpoſed between ourſelves and the object to which we particularly direct our attention, that the latter is at a certain diſtance. Hence diſtances at ſea appear much ſhorter than on land. It is only by combining the different ſenſations, and the judgments ariſing from them, that we can form an opinion anywiſe correct. It is equally neceſſary to have a recollection of the diſtance of an object, when forming a judgment of its ſize. It is poſſible that we may judge of magnitude by the viſual angle, or by the ſize of the image on the retina. But we muſt take into the account the connection between the magnitude or extenſion of the viſible object, and the ſize as aſcertained by the touch; the confuſion or diſtinctneſs of the image; the faintneſs or intenſity of the rays, and their direction; the figure, number, and ſituation of objects; and other circumſtances that have been obſerved to attend greater or ſmaller tangible magnitudes. Experience is equally required to aid our judgment of magnitude as of diſtance. By ſight we can diſtinguiſh the quantity, the colour, and the direction of the luminous rays which ſtrike our eye: it is yet a matter of doubt how far the ſight alone can convey ideas of magnitude or diſtance. When judging from viſible appearances only, we are liable to many deceptions, which are extremely intereſting, as they illuſtrate the theories of our different ſenſations; and there are many other circumſtances, connected with the theory of viſion, which will be better conſidered under the different heads of phyſical optics.

The phenomenon of accidental colours, or ocular ſpectra, obſerved long ſince by Buffon, who gave an account of it in the Memoirs of the Academy of Paris, has ſince been conſidered at length by Dr. R. Darwin, and by many other writers. When a perſon, after looking long and attentively at a ſmall bright object, removes his eyes, or cloſes them, an image is ſtill viſible to him, reſembling in form that which he was attending to, but of a colour oppoſite to the firſt, that is, of ſuch a colour as would be produced by withdrawing the firſt from white light. Thus if a perſon look ſtedfaſtly, and for a conſiderable time, at a ſmall red ſquare painted upon white paper, he will at laſt obſerve a kind of green-coloured border ſurround the red ſquare. If he now turn his eyes to ſome other part of the paper, he will ſee an imaginary ſquare of a delicate green, bordering upon blue, and correſponding exactly in point of ſize with the red ſquare. This imaginary ſquare continues viſible for ſome time, and indeed does not diſappear till the eye has viewed ſucceſſively a number of new objects. To this imaginary image the name of accidental colour was given by Buffon, and ocular ſpectrum by Dr. Darwin. If the object be yellow, the ſpectrum is blue; if green, red; if blue, yellow; if white, black; and if black, the accidental colour is white. We may therefore ſay, generally, that the reverſe ſpectra are ſimilar to a colour formed by a combination of all the primitive colours, except that with which the eye has been fatigued in making the experiment. The theory deduced from this remark is ingenious, and has much probability. The aſſigned reaſon of the oppoſite appearance is, that the portion of the retina that is affected has loſt a part of its ſenſibility to the light of that colour with which it has been impreſſed, and is more ſtrongly affected by the other conſtituent parts of the white light; ſo that if we then regard a colour which admits in its compoſition that which has fatigued the eye, the latter will ceaſe to be viſible. Dr. Darwin divides ocular ſpectra into four kinds: 1ſt, ſuch as are owing to a leſs ſenſibility of a defined part of the retina, or ſpectra, from defect of ſenſibility; 2dly, ſuch as are owing to a greater ſenſibility of a defined part of the retina, or ſpectra, from exceſs of ſenſibility; 3dly, ſuch as reſemble their object in colour as well as in form, or direct ocular ſpectra; and 4thly, ſuch as are of a colour contrary to that of their object, or reverſe ocular ſpectra. He believes the retina to be in an active ſtate during the exiſtence of theſe. In the firſt caſe, the retina is not ſo eaſily excited into action by leſs irritation, after having been lately ſubjected to a greater. In the ſecond, the retina is more eaſily excited into action by greater irritation, after having been lately ſubjected to leſs. In the third, a quantity of ſtimulus, ſomewhat greater than natural, excites the retina into ſpaſmodic action, which ceaſes in a few ſeconds, or which ceaſes and recurs alternately. In the laſt, the retina having been excited into action much greater than natural, falls into oppoſite ſpaſmodic action, or into various ſucceſſive ſpaſmodic actions, or into a fixed ſpaſmodic action, which continues for ſome days, or a temporary paralyſis is produced, the effects mentioned being ſucceſſively proportionate to the increaſed ſtimulus. He adds many miſcellaneous remarks on the ſubject in queſtion, which tend further to illuſtrate the phenomena by the contraſt of the ſenſations. Dr. Young thinks that the phenomena of the direct ſpectra may be better underſtood from the analogy of coloured ſhadows. There are many inſtances related of an imperfection in the ſight reſpecting colours, ſome individuals being only able to tell black from white; others miſtaking orange for green; others to whom full greens and full reds appeared alike, while yellows and dark blues were nicely diſtinguiſhed. This has been aſcribed to an inſenſibility of the retina to particular colours. There are many other imperfections of ſight which are not introduced here, as not immediately connected with the theory of viſion.

The reader is referred for further information to a moſt excellent catalogue of authors in the ſecond volume of Dr. Young's Natural Philoſophy. The liſt of references is too long to be introduced here, and is too complete to permit us to curtail it. The authors we have been principally indebted to are Zinn, Haller, Hunter, Soemmerring, Cuvier, Home, and, more particularly Young; to ſome papers by Petit in the Memoirs of the French Academy, and to ſome papers in the Gottingen Commentaries, by Wriſberg and Blumenbach. Zinn's deſcription of the eye, with the ſupplement of Wriſberg; Soemmerring's moſt exquiſite plates and his explanations, with Haller's rich collection of facts and references to authors in the fifth volume of his Elementa Phyſiologiæ, are particularly worth conſulting. Portal, in his Tableau Chronologique d'Anatomie, &c. tom. vi. has given a long and very full deſcriptive catalogue of authors who have written on the ſubject of the eye, which contains much information.

The comparative ſtructure and anatomy of the eye are very curious; the ſituation, number, conformation, &c. of this organ in different animals, being finely and wonderfully adapted to their different circumſtances, occaſions, and manners of living.

In man, and ſome other creatures, an ingenious author obſerves, the eye is placed chiefly to look forward; but withal is ſo ordered as to take in nearly the hemiſphere before it. In birds, (See Birds) and ſome other creatures, the eyes are ſo ſeated as to take in near a whole ſphere, that they may the better ſeek their food and eſcape danger. In others they are ſeated ſo as to ſee behind them, or on each ſide, whereby to ſee the enemy purſuing them; thus, in hares and conies, the eyes are very protuberant, and placed ſo much towards the ſide of the head, that their two eyes take in nearly a whole ſphere; whereas in dogs that purſue them, the eyes are ſet more forward in the head, to look that way more than backward.

Generally, the head is contrived to turn this and that way chiefly for the occaſions of the eyes; and generally the eyes themſelves are moveable upwards, downwards, backwards, and ſidewiſe, for the more commodious reception of the viſual rays. Where nature deviates from theſe methods, ſhe always makes uſe of very artful expedients to anſwer the ſame end.

Thus, in ſome creatures, the eyes are ſet out at a diſtance from the head, to be moved here and there, the one this way, and the other that; as in ſnails, particularly, whoſe eyes are contained in their four protuberances, like atramentous ſpots fitted to the ends of their horns, or rather to the ends of thoſe black filaments or optic nerves ſheathed in the horn. Power, Exper. Phil. Obſ. 31.

And in other creatures, whoſe eyes or head are without motion, and in divers inſects, that defect is ſometimes made up by their having more eyes than two; as in ſpiders, which having no neck, and conſequently the head being immoveable, the defect is ſupplied by the ſituation and multiplicity of their eyes; ſome having four, ſome ſix, and others eight, all placed in the fore-front of their head, which is round like a locket of diamonds. The reaſon Dr. Power gives, is, that being to live by catching ſo nimble and ſhy a prey as flies, they ought to ſee every way, and ſo take them *per ſaltum*, without any motion of the head to diſcover them.

Again, men, and moſt quadrupeds, are found to have ſeveral muſcles belonging to their eyes, by help whereof they can turn them any way, and ſo obvert the organ of ſenſe to the object. But nature not having given that mobility to the eyes of flies, ſhe in recompence furniſhes them with a multitude of little protuberant parts, finely ranged upon the convex of their large bulging eyes; ſo that by means of theſe numerous little ſtuds numberleſs rays of light are deflected from objects placed on either hand, above or beneath the level of the eye, and conveniently thrown upon that organ, to render the objects they come from viſible to the animal; and by the help of a good microſcope, and a clear ſight, ſome hundreds of theſe little round protuberances may be diſcovered, curiouſly ranged on the convexity of a ſingle eye of an ordinary fleſh-fly.

So ſcorpions are found to have above a hundred eyes; and Swammerdam has obſerved no leſs than two thouſand in the little inſect called *ephemeron*.

In other creatures the like deficiency is ſupplied by having their eyes nearly two protuberant hemiſpheres, each conſiſting of a prodigious number of other little ſegments of a ſphere.

The eyes of a cameleon, Dr. Goddard obſerves, reſemble a lens, or convex-glaſs, ſet in a verſatile globular ſocket, which he turns backward and forward without ſtirring the head, and ordinarily the one a contrary way to the other.

Laſtly, the mole, which the ancients, Ariſtotle, Pliny, Alb. Magnus, &c. ſuppoſed to have no eyes at all, is now found to furniſh a notable inſtance of the diverſity of the apparatus of viſion; for that animal living altogether under ground, ſight would generally be uſeleſs to it, and ſo tender a part as the eye troubleſome. It has therefore eyes, but thoſe ſo exceedingly ſmall, and withal ſituated ſo far in the head, and covered ſo ſtrongly over with hair, that they cannot ordinarily be of ſervice or diſſervice to it. Yet to guide and ſecure it a little when it chances to be above-ground, Borrichius, Blaſius, Schneidner, Dr. Derham, and others, obſerve that it can protend, or put them forth beyond the ſkin, and again draw them back at pleaſure, ſomewhat after the manner of ſnails.

In the eyes of nocturnal animals is a part not yet mentioned, *viz.* a ſort of tapetum at the bottom of the eye which gives a kind of radiation on the pupil, enabling them to ſee and catch their prey in the dark. Thus, Dr. Willis, "Hujus uſus eſt oculi pupillam quaſi jubare inſito illuminare—quare in fele plurimum illuſtris eſt; at homini avibus & piſcibus deeſt." De Anima Brutor.

He adds, that in ſome perſons the iris has a faculty alſo of darting out light; and inſtances in a man of a hot head who, after a plentiful drinking of generous wine, could ſee to read in the darkeſt night. Ibid.

The like Pliny tells us of Tib. Cæſar, that upon his firſt waking in the night he could ſee every thing for a little while as if in broad day-light. (Nat. Hiſt. lib. xi. cap. 37.) and Dr. Briggs gives a parallel inſtance of a gentleman in Bedfordſhire. Ophthal. cap. v. § 12.

Frogs, beſides the parts of the eye which they have in common with men, and moſt quadrupeds, have a peculiar membrane or cartilage, which is not commonly perceived, wherewith they can at pleaſure cover the eye without too much hindering the ſight; becauſe the membrane is both tranſparent and ſtrong, ſo that it may paſs for a kind of moveable cornea, or occaſional ſafeguard to the eye. A like membrane is alſo found in many birds, as alſo in the crocodile.

Naturaliſts relate wonders of the ſharpneſs and accuracy of the eyes of ſome animals, as the eagle, &c. beyond thoſe of men.

Yet do thoſe of men ſeem improveable to a ſurpriſing degree. Mr. Boyle inſtances in a major of a regiment of king Charles I. who being afterwards forced abroad, ventured at Madrid to do his king a piece of ſervice of an extraordinary nature and conſequence; which being there judged very irregular, he was committed to an uncommon priſon or rather dungeon, having no window belonging to it, only a hole in the wall, at which the keeper put in proviſions, and preſently cloſed it again on the outſide, but not perhaps very exactly. For ſome weeks this gentleman continued utterly in the dark, very diſconſolate; but afterwards began to think he ſaw ſome little glimmering of light; and this from time to time increaſed ſo, that he could not only diſcover the parts of his bed, and other ſuch large objects, but at length, amidſt this deep obſcurity, could perceive the mice that frequented his chamber to eat the crumbs of bread which fell upon the ground, and diſcern their motions very well.

The author juſt mentioned, in his Obſervations on Vitiated Sight, gives us ſome uncommon phenomena that regard the eyes. He furniſhes ſeveral inſtances of nyctalopies, or people whoſe eyes in the day-time were quite dark, or at leaſt ſo dim that they could hardly diſcern their way; who yet, ſoon after ſun-ſet, and during twilight, ſaw very clearly.

Eye, *Artificial*, is the reſemblance of a natural eye, formed either for the purpoſe of ſupplying the appearance of an eye in a perſon who wants one of thoſe natural organs; or for the purpoſe of illuſtrating the conſtruction, together with certain defects, of the natural eye, deſcribed in the next article.—The latter part of an artificial eye is a little machine which exhibits the principal parts, and the principal offices of a natural eye.

From the deſcription of the camera obſcura, and from the anatomical deſcription of the eye, it plainly appears that the latter is a moſt excellent camera obſcura, having all the neceſſary properties of it, to a moſt admirable nicety. It is a globular dark room, with one aperture for the admiſſion of light, with a lens and other media fit to form a picture of external objects on the hind part of its cavity, which is lined with a membrane called the retina. It has likewiſe all the neceſſary adjuſtments within certain limits; ſuch as the power of adapting itſelf to the view of near as well as of diſtant objects, the power of admitting more or leſs light, according to circumſtances, and ſo on. (See Vision and Sight.) If the eye of an animal, eſpecially of a large ſize, as that of an ox, be taken out ſoon after the death of the animal, and the ſkin, fat, &c. be carefully ſcraped off from the back of it, until a thin ſemi-tranſparent pellicle remains, which is the retina, the eye ſo prepared may then be uſed as a little camera obſcura; *viz.* if it be turned towards any objects, the figures of thoſe objects will be ſeen depicted on the thin membrane juſt mentioned, ſo that the obſerver being placed behind the prepared eye, may ſee that picture very diſtinctly.

In old perſons the humours grow thicker, and the parts leſs pliable, hence their eyes loſe in great meaſure the power of adjuſting themſelves. But, independent of old age, the eyes of certain perſons can be adjuſted for viewing diſtant objects eaſier than for near objects, and *vice verſâ.* When the eye is defective, and in conſequence of its ſize or of other peculiar conformation, parallel rays form their foci before they arrive at the retina; then the perſon, who is poſſeſſed of ſuch eyes, will be able to ſee near objects only; and ſuch perſons are ſaid to be *near-ſighted*, or *myopes.* When the eye is flatter than ordinary, then the foci of rays proceeding from pretty near objects, are formed beyond the retina; and ſuch perſons as are poſſeſſed of eyes thus formed, are ſaid to be *long-ſighted*, or *preſbytæ;* for they can only adjuſt their eyes for viewing objects ſituated beyond a certain diſtance; the latter is generally the caſe with perſons advanced in age.

Theſe imperfections may in great meaſure be corrected by the uſe of proper glaſſes or ſpectacles; for ſince in near-ſighted perſons the rays of light converge to a focus before their arrival at the retina, a concave lens, placed before the eye, will remedy that imperfection, becauſe a concave lens diminiſhes the convergency of the rays of light, and, of courſe, will prolong the pencil ſo as to enable it to converge exactly on the retina. And for thoſe who can ſee diſtant objects only with diſtinction, that is, in whoſe eyes the rays of light do not converge ſoon enough, convex lenſes, which increaſe the convergency of the rays, will remedy the imperfection.

Now the artificial eye we are treating of, ſerves to illuſtrate the above-mentioned defects, together with the corrections by means of lenſes. In its moſt improved ſtate of conſtruction, it alſo ſerves to exhibit imitations of the principal parts of the human eye.

The artificial eye is formed principally of glaſs, and its parts are kept together by a braſs cell; but the ſhape and formation of ſuch a machine is, in ſome meaſure, varied by almoſt every workman. The part which repreſents the globe of the eye, and its humours, is fixed in a ſocket, where it may be moved in any direction. The fore-part of the ſocket forms a ſcreen to prevent the concurrence of ſuperfluous light; but it has a hole in its middle, which is painted round ſo as to repreſent nearly a human eye. If this artificial eye be turned towards objects that are at a moderate diſtance, their picture will appear very diſtinct, but inverted, upon the back part of the machine, where the rough ſurface of the glaſs performs the office of the retina. The parts of this artificial eye may be examined in the following manner: unſcrew the ſocket which confines the ball of the eye and its parts; then the outermoſt coat repreſents the ſclerotica, the more protuberant part of which is the cornea. Next to this there is a plano-convex glaſs lens to repreſent the firſt chamber of the aqueous humour, under which there is a perforated flat piece of tortoiſe-ſhell to repreſent the iris with the pupil, and under this there is another plano-convex lens which repreſents the ſecond chamber of the aqueous humour. On removing the ſecond coat, which repreſents the choroides, a ſmall double and unequally convex lens will be found which repreſents the chryſtalline humour, and under this is a large piece of glaſs which occupies the remaining ſpace of the machine, and repreſents the vitreous humour. The back part of the laſt mentioned piece of glaſs is made rough, ſo that the pictures of objects may be formed upon it, as upon the retina of a real eye.

In order to repreſent the nature of viſion in long-ſighted perſons, the uſual plano-convex lens, which repreſents the firſt chamber of the aqueous humour in front of the artificial eye, muſt be removed, and another ſimilar lens, but leſs convex, muſt be placed inſtead of it. With this alteration, if the artificial eye be turned towards the ſame objects, which before the alteration were repreſented diſtinctly on the back of the machine, they will now form an indiſtinct image upon the ſame place, becauſe now the rays converge to a place more diſtant than the back of the artificial eye. But if in this ſtate a proper convex ſpectacle lens be placed before it, the image on the back of the artificial eye will be rendered perfect, which ſhews the uſe of that kind of ſpectacles to long-ſighted perſons. In order to repreſent the imperfection of ſhort-ſighted eyes, the plano-convex lens, repreſenting the firſt chamber of the aqueous humour, muſt be more convex than the original one. In this caſe then the focus of rays will fall ſhort of the retina, in conſequence of which an imperfect image of objects will be formed on the back of the artificial eye; but by placing a proper concave ſpectacle lens before it, the above-mentioned image may be rendered perfect. And this ſhews the uſe of concave lenſes to ſhort-ſighted perſons.

A ſimpler conſtruction of an artificial eye conſiſts of a globular braſs box, having a ſmall rough glaſs on its back, and a convex lens in front. This convex lens is ſet in a braſs ſocket, which may be ſcrewed farther into, or farther out of the braſs box; by which means the picture of objects on the rough glaſs may be rendered imperfect either by ſcrewing the ſocket with the lens farther out, which imitates the ſhort-ſighted eye, or farther in, which ſhews the imperfection of long-ſighted people; and the image may be rendered perfectly diſtinct by placing a concave ſpectacle lens in the firſt caſe, or a convex one in the latter caſe, before the artificial eye.

Eye, *Artificial*, in *Surgery*. When ſuppuration takes place in the eye, the matter at length makes its way through the cornea, and eſcapes together with the aqueous, and ſome of the vitreous, humour; the tranſparent cornea is in part deſtroyed, while the reſt continues in a ſtate of opacity; the pupil becomes cloſed, the iris is adherent to the cornea, and the whole eye-ball ſhrivels up in a greater or leſs degree. A total loſs of viſion, and great deformity of the countenance, are the evils neceſſarily ariſing from all this miſchief. The firſt of theſe conſequences is quite incurable; the ſecond may be obviated by the uſe of an artificial eye.

Artificial eyes are concave little plates, adapted to the anterior half of the eye. Upon the middle of their front, convex, white ſurface, the tranſparent cornea, the pupil, and the iris, are imitated in the beſt poſſible manner. When they are applied, what remains of the natural eye-ball lies in their poſterior excavated ſurface. They may be made either of glaſs or enamel. Though ſuch as are made of glaſs anſwer tolerably well, yet they are apt to break. The enamel ones are not ſubject to this objection, and, as we ſhall hereafter explain more fully, their back edges may be made with the file better than glaſs ones, for lying conveniently in the orbit. In the choice of artificial eyes, for every kind of caſe, the ſurgeon ſhould take care, that the contrivance reſembles the natural healthy eye as much as poſſible, in regard to the colour of the iris, the greater or leſſer convexity of the cornea, the greater or leſſer projection of the whole eye-ball from the orbit, and the more or leſs conſiderable breadth of the globe of the eye between the external and internal canthus.

Artificial eyes are conſtructed of various ſhapes and depths. Some are made of a long oval form, and theſe are found the moſt eligible for perſons, whoſe eye-lids have a long fiſſure between them. Other artificial eyes are of a rounder ſhape, and are proper in caſes, in which the interſpace between the two eye-lids is ſhort. Deep concave plates are to be choſen for patients, whoſe eyes make a conſiderable projection forward; but flat ones are to be preferred when the eyes are naturally ſmall and deeply ſituated in the ſockets. Deep plates are alſo to be employed, when only a ſmall part of the eye-ball is left; but flat ones, when a conſiderable portion remains. A principal object always conſiſts in endeavouring to render the reſemblance between the artificial and natural eye, as complete as poſſible, ſo that the artifice may not be diſcovered.

When what remains of an eye, which has been deſtroyed by ſuppuration or diſeaſe, is of middling ſize, the artificial eye can be applied with the greateſt convenience. There is now ſufficient room, conſequently, no painful preſſure is excited, and the inſtrument does not lie too deeply in the orbit. Beſides, the remaining part of the natural eye, which always retains ſome degree of motion, and lies in the hollow of the artificial one, communicates to the latter a certain motion; ſo that, in this caſe, the deception becomes more difficult to detect than in any other examples.

When what remains of the natural eye is too ſmall, or large, it does not enter into the hollow of the artificial one, and, conſequently, the latter lies quite immoveable under the eye-lids, and the patient has the appearance of ſquinting in a much greater degree, than in the foregoing caſe. When the remaining portion of the natural eye has loſt ſo little of its original ſize, that there is not room enough for an artificial one, an opening may be made into the eye-ball, a part of the vitreous humour let out, and thus ſufficient room made for the artificial eye. This operation is free from pain and danger; but, it occaſionally happens, that the vitreous humour collects again in its original quantity, ſo as to deſtroy the ſpace for the artificial eye, and render a repetition of the puncture proper.

When, from any cauſe, the whole of the eye-ball has been quite deſtroyed, as, for inſtance, when it has been extirpated on account of ſome cancerous affection, the uſe of an artificial eye is hardly admiſſible. For although the orbit, in this caſe, uſually becomes more or leſs filled up with fleſh, which would ſerve as a ſupport to an artificial eye, yet the eye-lids generally loſe their natural power of motion, and ſhrink up to the edges of the orbit, ſo as not to be capable of covering the artificial eye. Perhaps, however, this kind of contraction of the eye-lids might be prevented, by filling the inſide of theſe parts with lint, immediately after extirpating the eye, and keeping them approximated with ſtrips of adheſive plaſter,

The application and removal of an artificial eye are ſo eaſy, that the patient commonly ſoon acquires the art of putting it on and taking it off himſelf. The edge of the upper eye-lid is to be taken hold of with the thumb and index finger of one hand, and drawn a little outward from the eye-ball, while the artificial eye, which is to be previouſly moiſtened, muſt be puſhed under the eye-lid with the other hand. This can be accompliſhed with moſt eaſe when the little corner of the artificial eye is firſt puſhed under the eye-lid. It then lies tranſverſely, and puſhes the upper eye-lid ſo high, that the lower edge of the artificial eye is ſituated higher than the upper margin of the lower eye-lid. The lower eye-lid is now to be drawn a little outward with the finger, while the artificial eye is allowed to glide downward behind the part.

When the artificial eye is to be taken off, it is only neceſſary to draw the edge of the lower eye-lid a little outward with one of the fingers, and to introduce the blunt end of a needle under the lower margin of the artificial eye, which is now to be ſomewhat raiſed and preſſed outward. When this is done, it immediately ſlips out of the orbit.

The front ſurface of what remains of the natural eye is often uneven, forming a prominence in one place, and a depreſſion in another; conſequently the glaſs eye fits cloſer on ſome parts than on others, and creates ſuch painful ſenſations as oblige the patient to remove it. This inconvenience may be obviated by taking off ſome of the border of the artificial eye at the parts which fit too cloſe, and make too much preſſure, by means of a file. When the whole circumference of the eye ſmarts after the application of the glaſs one, the plate employed is probably too deep, and the whole circumference of its edge makes too ſtrong preſſure. In this circumſtance a flat plate muſt be applied. When, notwithſtanding this plan, the eye continues painful, there is reaſon for apprehending that the organ is in an irritable ſtate. In this inſtance, the beſt way is to take off the inſtrument again, and bathe the eye well with cold water, or ſome aſtringent collyrium. After a time, the eye-ball generally becomes capable of bearing the preſſure of the artificial eye, without any uneaſineſs. However, ſome patients are ſo irritable, that they can never wear an artificial eye without ſuffering pain, and ſuch perſons ought to be adviſed to give up the intention altogether.

It is obvious, that, in every example in which the eye has been deſtroyed by ſuppuration, no idea ſhould ever be entertained of uſing an artificial eye, before all inflammation and tenderneſs of the organ have been quite removed. Alſo, the uſe of the artificial eye muſt always be diſcontinued, whenever an inflammation is brought on by any accidental cauſes.

Perſons ſhould be recommended always to keep by them more than one artificial eye of the ſame kind, in caſe one ſhould ever happen to be loſt. It is alſo adviſeable to take off the artificial eye once every day, and cleanſe it, and particularly the orbit, from all kinds of dirt, mucus, &c. Want of attention of this kind is frequently the cauſe of ſuch inflammations, as compel the patient to diſcontinue the uſe of an artificial eye for a conſiderable time. See Richter's Anfangsgrunde der Wundarzneykunſt; Band 3.

Eye, *Cancer*, and *Extirpation of.* It becomes indiſpenſably neceſſary to remove the eye-ball in ſeveral kinds of caſes, as, for inſtance, when the organ protrudes from the orbit, and cannot be reduced. The operation is alſo requiſite for ſome ulcerated ſtaphylomas, and for every kind of caſe in which the coats and humours of the eye are ſo diſeaſed, as not to admit of being reſtored to a natural ſtate, and in which the affection, if left to itſelf, would be likely to be communicated to the orbit.

Cancer of the eye, however, is the chief diſorder, which creates a neceſſity for the performance of the operation

The eye may become affected with cancer in three different manners. Sometimes the globe of the eye acquires an irregular knotty ſhape, and enlarges to the ſize of an apple. The ſight is gradually deſtroyed, the blood-veſſels in the white of the eye are varicoſe, and the whole of the internal and external ſtructure of the organ is ſo altered, that the part looks like a piece of fleſh, and no veſtiges of the original organization are any longer perceptible. Sometimes, a ſmall remaining portion of the tranſparant cornea is externally obſervable; and, in certain caſes, a little aperture may ſtill be ſeen within, through which the remainder of the vitreous humour and choroid coat is diſcoverable. Sometimes a fœtid fluid is diſcharged from the diſeaſed organ, an ulcerated opening into the part having occurred. Occaſionally, no ulceration whatever can be noticed, and the eye-ball reſembles a firm piece of fleſh. The patient commonly experiences at firſt burning pains in the eye, which, however, are not in an inſupportable degree; but, at laſt, they become of a violent darting nature, and ſhoot all over one-half of the head. The cauſes of this diſtemper are involved in conſiderable obſcurity. A German ſurgeon, named Vogel, mentions, that the diſeaſe is ſometimes brought on by the ſmall-pox. The foregoing form of cancer of the eye is the principal, and moſt frequent one.

Sometimes excreſcences make their appearance upon the front ſurface of the eye, and moſt frequently upon the tranſparent cornea. Such tumours often admit of being eradicated with the knife, ligature, or cauſtic. In certain inſtances, however, they always grow again after the employment of theſe means, and become larger, more malignant, and even cancerous. At length, they change into a fungous growth, which is extremely painful, covers all the anterior part of the eye, and renders the operation of removing this organ abſolutely neceſſary. Such is the ſecond form in which cancer of the eye preſents itſelf.

On ſeveral occaſions ulcers are produced upon the forepart of the eye, and although a great many of them may be cured by the uſe of external and internal remedies, they are often exceedingly obſtinate, deſtroy viſion, and acquire ſo malignant a ſtate, that they may very well be called cancerous. This is the third ſpecies of cancer, which makes the extirpation of the eye requiſite.

With regard to the treatment of every cancerous kind of diſeaſe, affecting the eye, we have a choice of three different methods. We either plainly diſcover ſome particular determinate cauſe, and employ meaſures calculated for its removal; or the malignant character of the ſymptoms leads us to have recourſe to the remedies uſually preſcribed for carcinomatous diſeaſes; or elſe, when both theſe plans fail, we proceed to put in practice the extirpation of the eye. What is commonly called a cancer of the eye does not ſeem to be nearly ſo malignant as the ſame ſort of diſeaſe in the breaſt; for the operation almoſt always accompliſhes a radical cure, as long as the diſtemper is confined to the globe of the eye, and the eye-lids, cellular ſubſtance, and bones of the orbit continue unaffected. The knowledge of this circumſtance ſhould lead us to undertake the operation in good time, and we can the more readily make up our mind to perform it, ſince the power of ſeeing is, in all theſe caſes, irrecoverably loſt. When the patient ſuffers violent head-achs, and pains in other parts of the body, when his glands in different ſituations are in an indurated ſtate, when the eye-ball has burſt, and it diſcharges a fœtid matter, and when the eye-lids are red, ſwollen, and painful, the event of the operation muſt be conſidered, as at leaſt very doubtful.

In the performance of the operation there are two important circumſtances, to which attention ought to be paid. The firſt is to remove every particle of the diſeaſe, and leave none of the affected parts behind. The ſecond is to avoid doing any injury to the perioſteum and bones of the orbit. The perioſteum, in this ſituation, lies ſo near the dura mater, that the conſequences of any miſchief done to the firſt membrane, may eaſily extend to the laſt; and the bones of the orbit are in moſt places ſo thin, that they cannot be pierced, or broken, without a riſk of injuring the brain, which is ſituated immediately behind them. It is on this account that ſome ſurgical writers have recommended, for the performance of this operation, inſtruments which have no points. A man, endued with a very moderate ſhare of dexterity, however, may certainly uſe a pointed knife for the purpoſe both with ſafety and advantage.

In order to be able to ſeparate the eye-lids far enough from each other, it is ſometimes recommended, in the firſt inſtance, to make an inciſion through them at their external commiſſure. An aſſiſtant is to raiſe the upper eye-lid as much as poſſible towards the fore-head. Some authors alſo adviſe us to introduce through the eye-ball a ligature, with which the part may be drawn to one ſide, or the other, during the operation. We cannot conceive, however, that there can be any real occaſion for this painful proceeding, nor for the employment of any kind of hook, with a ſimilar intention, ſince any operator poſſeſſing common adroitneſs may eaſily ſucceed in drawing the globe of the eye forward with his fingers, as ſoon as it is detached, from its connections within the orbit.

In this operation, ſurgeons have ſometimes made uſe of a ſcalpel curved ſideways, and a pair of ſciſſars of a ſimilar ſhape, with which inſtruments it has been ſuppoſed that the parts behind the globe of the eye can be more conveniently cut, than with any ſtraight ones. But many of the beſt operators prefer a ſtraight inſtrument, and find no inconveniences attending its uſe.

The ſurgeon ſhould firſt divide the conjunctiva connecting the eye-lids with the eye-ball, and this ought to be done both above and below. Then the nerves and muſcles of the eye are to be cut on all ſides of the organ; a part of the operation ſometimes effected with crooked ſciſſars, though, as we have already obſerved, it may be as well done with a common ſtraight ſcalpel. When a ligature is introduced through the front of the eye ball, or when a hook is uſed, the ſurgeon, by ſuch means, is always to draw the globe of the eye in that direction which will give moſt room on the ſide where the parts are to be cut. But we conſider the employment of a ligature, or hook, for the purpoſe of pulling the globe of the eye in this manner, quite unneceſſary, and therefore improper.

Richter takes notice, that as the enlarged eye for the moſt part lies cloſe to the cheek, and it is frequently very difficult to make an inciſion into the orbit, between the eye-ball and lower eye-lid, the operation may often be more eaſily accompliſhed by firſt ſeparating the upper eye-lid from the diſeaſed organ; then cutting from above downwards more deeply into the orbit, ſo as to divide the muſcles above and at the ſides of the eye; and, laſtly, detaching the eye-ball from its connection with the lower eye-lid. This mode of operating is, according to Richter, the more eaſy, becauſe the globe of the eye can always be more readily inclined downwards, ſo as to make room above, than it can be puſhed in the direction upward for the purpoſe of making room below. Until the optic nerve has been divided, the operator muſt avoid drawing the eye-ball too forcibly forward.

As ſoon as the eye has been completely detached, all the inſide of the orbit ſhould be very carefully examined with the finger, and whatever indurated parts are diſcovered ought to be diligently removed.

In certain inſtances, it is proper and prudent to cut away one, or both eye-lids, when affected with cancerous diſeaſe. Surgical writers alſo ſeem univerſally to agree about the propriety of always removing the lacrymal gland, as it is particularly apt to be the ſource of ſuch fungous excreſcences as are to be apprehended after the operation.

Let the parts, however, be taken away with the utmoſt ſkill and caution, ſtill the event of the operation is invariably to be regarded as extremely doubtful, when the adjacent parts participate in the diſeaſe with the eye-ball.

The bleeding is ſeldom of any importance, generally ſtopping as ſoon as the orbit is filled with ſoft lint. The inflammatory ſymptoms and fever are alſo ſeldom ſo violent as to require any antiphlogiſtic means, except a low diet, and keeping the bowels well open.

During the ſuppuration, the orbit becomes filled with healthy granulations, and the proceſs of cicatrization muſt be regulated by the ſame principles, which are obſerved in the treatment of common wounds.

When the cure is complete, an artificial eye can ſeldom be worn, on account of the manner in which both the eye-lids ſhrink, and contract, to the upper and lower margin of the orbit. It is true, an attempt may be made to prevent ſuch contraction of the eye-lids, by uſing a bandage and ſtrips of ſticking plaſter to keep theſe parts together, after the orbit is filled with lint. However, notwithſtanding our beſt endeavours, it muſt be confeſſed, that an artificial eye can ſeldom be made uſe of after the operation.

Sometimes the granulations, which form in the orbit, are flabby and indolent, in which circumſtance ſome mild aſtringent ſhould be applied, as for inſtance, lapis calaminaris, pulvis myrrhæ, alumen uſtum, &c. In ſome examples, the granulations acquire a fungous and malignant nature, in which event they ſhould either be cut away with a ſcalpel, or deſtroyed with cauſtic. Sometimes the fungus is continually reproduced, and at length occaſions death. In ſome caſes, as late as half a year, or even later, after the cure has appeared perfect, a fungous excreſcence has ariſen, and proved fatal. Occaſionally head-achs, vomiting, convulſions, &c. followed by death, come on a few days, or weeks, after the operation. It is ſaid, that in caſes of this kind the cancerous diſtemper has been diſcovered to have ſpread to the brain, along the optic nerve, and to have excited induration and ulceration in that viſcus.

When a fungous malignant excreſcence occurs on the cornea, there is no occaſion to extirpate the whole eye. It is quite ſufficient to cut off the anterior portion of the organ; for the baſe of the fungus ſeldom extends beyond the edge of the cornea. The operation may be effected by making a puncture into the eye with a lancet, a little way behind the margin of the cornea, and then enlarging the wound all round by means of a pair of ſciſſars.

Though the baſis of the excreſcence does not often extend into the white of the eye, yet, it is obſervable, that the coats of this organ, for a greater or leſs extent around the root of the fungus, are preternaturally thick and ſwollen. Hence, as ſoon as the operation is finiſhed, we ſhould attentively examine, whether the coats of the eye, in the place where the inciſion has been made, are in a natural ſtate, and ſhould any part not ſeem to be ſo, it ought to be cut away.

Eye, *Contuſions of the.* See Ophthalmia.

Eye, *Diſeaſes of the,* are an ophthalmia, or inflammation of the eyes; the gutta ſerena, or amauroſis; a ſuffuſion, or cataract; an ectropium; a glaucoma; an amblyopia, or obſcurity of ſight, including the myopia, the preſbytopia, the nyctalopia, and the amauroſis; the ſtrabiſmus, or ſquinting; an unguis pannus, or pterygium of the membrane of the eye; the albugo, leucoma, or ſpot in the eye; a ſugillation of the eye; an epiphora, or rheum in the eyes; a trichiaſis; and the fiſtula lachrymalis. See each deſcribed under its peculiar denomination. See Warner's Deſcription of the human Eye, &c. with its principal Diſeaſes, &c. 2d edit. 1775.

Eye, *Falling out of the.* See Prolapsus *oculi.*

Eyes, *Running of the,* in *Infants.* See Infant.

Eyes, *Scarification of the.* See Scarification.

Eye, *Wounds of the.* See Wounds.

Eye *of Birds.* See *Anatomy of* Birds.

Eye *of Fiſhes.* See Fish.

Eyes *of Flies.* Every naturaliſt has obſerved, that the eyes of flies are of a reticulated texture; and each reticulated eye of this kind is truly an aſſemblage of multitudes, often of many thouſands, of ſmall but perfect eyes. The reticulated eyes of flies are large, not only in proportion to the ſize of the creature, but abſolutely, and in themſelves; but the ſeveral ſmall eyes of which they are compoſed are remarkably minute in compariſon of thoſe of the butterfly claſs.

Many of the butterfly claſs have in each of their reticulated eyes many thouſand ſmall eyes; but the fly claſs greatly exceed them in number of theſe, as many of the eyes of theſe are three times as large as thoſe of the butterflies; and beſides, that each ſmaller eye is vaſtly more minute than the ſmall eyes of the butterflies.

Mr. Hook computed 14,000 hemiſpheres in the two eyes of a drone; Mr. Lewenhoeck reckoned 6236 in a ſilkworm's two eyes in its fly-ſtate; 3181 in each eye of a beetle; and 8000 in the two eyes of a common fly. The pearl-eyes of the dragon-fly appear with a common reading-glaſs like ſhagreen; and Mr. Lewenhoeck reckons in each eye of this inſect 12,544 lenſes, placed in an hexangular poſition, each lens having ſix others round it. He alſo obſerved in the centre of each lens a minute tranſparent ſpot, brighter than the reſt, ſuppoſed to be the pupil, ſurrounded with three circles, and in appearance ſeven times leſs than the diameter of the whole lens. Mr. Puget counted 17,325 in the eye of a butterfly, which Malpighi concludes to be diſtinct and ſeparate eyes. The abbé Catalan, and others, have ſince ſhewn, that all the eminences diſcoverable in the cornea of inſects have the neceſſary parts, and perform the offices of an eye. Lewenhoeck diſcovered the bundles of optic nerves which ſerve theſe ſmall lenſes; and Reaumur ſuppoſes that theſe ſupply the place of all that is wanting behind the lenſes, for the organization of an eye complete for viſion. Baker's Micr. 1743, p. 228. Reaumur, Hiſt. Inſ. vol. i. p. 261, &c. See Entomology.

Eyes *of Horſes,* in the *Manege,* &c. Theſe ſhould be bright, lively, full of fire, pretty large, and full; but not too big, gogling, or ſtaring out of the head: they ſhould alſo be reſolute, bold, and briſk. A horſe to appear well, ſhould look on his object fixedly, with a kind of diſdain, and not turn his eyes another way.

In the eye of a horſe are diſcovered his inclination, health, and indiſpoſition. When the eyes are ſunk, or the eyebrows are too much raiſed up, and as it were ſwelled, it is a ſign of viciouſneſs and ill nature. When the pits above the eyes are extremely hollow, it is for the moſt part a certain ſign of old age: this, however, does not hold of horſes got by an old ſtallion; for theſe have them very deep at the age of four or five years, as alſo their eye-lids and eyebrows wrinkled and hollow.

Two things are chiefly to be conſidered in the eye of a horſe, *viz.* the chryſtalline part, and the bottom or ground. The chryſtalline, or moſt tranſparent part, ſhould, for clearneſs, reſemble a piece of rock-cryſtal, otherwiſe the eye cannot be good. When this part is reddiſh it is a ſign that the eye is inflamed, or elſe, as ſome pretend, influenced by the moon. When it is of the colour of a withered or dead leaf upon the lower part, and troubled on the upper, it infallibly ſhews that the horſe is lunatic, which diſtemper continues no longer than while the humour actually poſſeſſes the eye.

As to the ground or bottom of the eye, which is properly its pupil or apple, it ſhould be large and full, and ought to be carefully inſpected, that there be no *dragon,* as it is called, on it. This is a white ſpot or ſpeck, which at firſt appears no bigger than a grain of millet, but grows to ſuch a bigneſs as to cover the whole apple of the eye: it is incurable, never failing to make a horſe blind in the eye where it is found. If the whole bottom of the eye be white, or of a tranſparent greeniſh white, it is a bad indication, though perhaps the horſe is not as yet quite blind: however, it ought to be obſerved, that if you view a horſe's eyes when oppoſite to a white wall, the reflection of it will make their apples appear whitiſh, ſometimes inclining to green, though they be really good. When this is perceived, you may try whether his eyes have the ſame appearance in another place.

In caſe you perceive above the bottom of the eye, as it were, two grains of chimney-ſoot fixed thereto, it is a ſign the chryſtalline is tranſparent; and if, beſides this, the ſaid bottom be without a ſpot or whiteneſs, then you may infer that the eye is ſound.

You ought alſo to examine whether an eye which is troubled and very brown be leſs than the other; for if it be, it is irrecoverably loſt.

All eyes which are ſmall, narrow, and have long pupils, run a greater riſk of loſing the ſight than any others. See Blindness.

The diſeaſes of the eyes in horſes proceed either from a defluxion, or from ſome external hurt. In the former caſe the eyes are watery, hot, red, and ſwollen, the diſtemper advancing by degrees; in the latter the malady comes ſpeedily to a height, and the ſkin on the outſide of the eye is peeled off.

If the diſtemper take its riſe from a rheum or defluxion, it is to be conſidered whether it proceeds from the eye itſelf, or from another aggrieved part: in the latter caſe, the redreſſing of the part will ſet the eye free; in the former, it is proper to cool the horſe's blood with an ounce of ſal prunellæ, mingled every day with his bran; and when it leſſens his appetite, to change it for liver of antimony till he recovers his ſtomach.

For ſore eyes, where a ſkin is growing over them, the following receipt is recommended: to the white of an egg add a little fine powdered ſalt; then ſet this on the fire till it be reduced to a powder. This, mixed with a little honey, is to be put into the horſe's eye with a feather. If it is found inſufficient to eat off the ſkin, the powder alone muſt be blown into the eye with a quill.

In caſe of a blow on the eye, take honey, and having added a ſmall quantity of powder of ginger, put it into the horſe's eye; or elſe take hog's lard, with the oil of roſes and elder, of each an equal quantity; then, having melted them together, anoint the eye therewith.

Some horſes have naturally tender weeping eyes, which void a ſharp eating humour; theſe are eaſily cured, by waſhing or bathing them every morning or evening with brandy. See Horse.

We ſay alſo, "a horſe unſhod of one eye," which is a rallying expreſſion, importing that he is blind of an eye.

Eye *of the Branch of a Bridle*, is the uppermoſt part of the branch which is flat, with a hole in it, for joining the branch to the head-ſtall, and for keeping the curb faſt.

Eye *of a Bean*, is a black ſpeck or mark in the cavity of the corner teeth, which is formed there about the age of five and a half, and continues till ſeven or eight; and it is from hence that we uſually ſay, ſuch a horſe marks ſtill, and ſuch a one has no mark.

Eye-*Flaps*, thoſe pieces of leather which cover the eyes of coach horſes.

Eye, *Altitude of the*. See Altitude.

Eye, in *Architecture*, is uſed for any round window made in a pediment, an attic, the reins of a vault, or the like.

Eye, *Bullock's*, *Oeil de bœuf*, denotes a little ſky-light in the covering or roof, intended to illumine a granary, or the like.

The ſame term is applied to the little lutherns in a dome; as in that of St. Peter's at Rome, which has forty-eight in three rows. See Luthern.

Eye *of a Dome*, denotes an aperture at the top of the dome; as that of the Pantheon at Rome, or of St. Paul's at London. It is uſually covered with a lantern. See Dome.

Eye *of the Volute*, is the centre of the volute, or that point wherein the helix or ſpiral whereof it is formed commences; or it is the little circle in the middle of the volute, wherein are found the thirteen centres for deſcribing the circumvolutions thereof.

Eye, in *Gardening*, a term which in the management of fruit-trees ſignifies the ſmall bud or ſhoot which is to be inſerted into another tree. See Bud and Budding.

It alſo ſignifies the ſmall pointed knot to which the leaves adhere, and from which the ſhoots ſpring forth. The eye of a pear denotes the extremity oppoſite to its ſtalk.

Eye, in *Geography*, a town of Norway; 36 miles S. of Bergen.

Eye, a market and borough town of Suffolk, England; is ſituated in the hundred of Hartiſmere, at the diſtance of 20 miles from Ipſwich, and 90 from London. It is ſeated in a valley, and is almoſt ſurrounded by a brook, which gives name to the place. As a borough it was firſt incorporated by king John, from whoſe charter, and ſome that have been ſubſequently granted, it derived ſeveral privileges, but many of theſe have latterly been diſcontinued. The borough did not return members to parliament till the thirteenth year of the reign of queen Elizabeth, ſince which period it has ſent two. The right of election is veſted in the free burgeſſes, corporation, and thoſe inhabitants who pay "ſcot and lot:" a number amounting to about 200. The earl of Cornwallis is patron, or proprietor of the borough, and thereby has the power of controlling the elections. In the reign of king William I. a priory for Benedictine monks was founded here, and in the time of king Edward III. an hoſpital for lepers. The ſtreets are moſtly narrow. The church is a large, handſome building. In the year 1801 the town conſiſted of 300 houſes, and contained 1734 inhabitants. There is a weekly market on Saturdays, and an annual fair. It has a ſmall manufacture of bone-lace; and ſome of the inhabitants are occupied in ſpinning. Kirby's Suffolk Traveller.

Eye, a river of Scotland, which riſes in the north-weſt part of Berwickſhire, and falls into the North ſea, at Eyemouth.

Eye is alſo uſed among *Jewellers* for the luſtre and brilliance of pearls and precious ſtones, more uſually called the *water*.

Eye, among *Naturaliſts*, is ſometimes alſo uſed for a hole or aperture: whence it is that the firſt of the larger inteſtines is called *cæcum*, or the blind gut, as having no eye or perforation. For a like reaſon the chemiſts call a cloſe veſſel, uſed in diſtillation, a blind head.

Eye, in *Perſpective*. See Perspective.

Eye, in *Printing*, is ſometimes uſed for the thickneſs of the types and characters uſed in printing; or, more ſtrictly, it is the graving in relievo on the top of the latter; otherwiſe called its *face*.

It is the eye or face that makes the impreſſion; the reſt, which they call the body, ſerving only to ſuſtain it.

The eye of the *e* is the little aperture at the head of that character, which diſtinguiſhes it from the *c*. See E.

Eye, in a *Ship*. The hole wherein the ring of the anchor is put into the ſhank is called the "eye of the anchor;" and the compaſs or ring which is left of the ſtrop to which any block is ſeized, is called the "eye of the ſtrop."

Eye *of a Stay*, is that part of a ſtay which is formed into a ſort of collar to go round the maſt-head.

Eye-*Bolt*, is a long bar of iron with an eye in one end of it, formed to be driven into the decks or ſides of a ſhip for divers purpoſes, as to hook tackles, or faſten ropes to, as occaſion requires.

Eye-*let-Hole*. See Sail.

Eyes *of a Ship*, a name frequently given to thoſe parts which lie near the hauſe holes, particularly in the lower apartments within the veſſel.

Eye-*Bright*, in *Botany*. See Euphrasia.

Eye-*Brows*. See Eye, in *Anatomy*.

Eye-*Brows*, *wounded*. See Wounds.

Eye-*Brow*, in *Architecture*. See Fillet.

Eye-*Glaſs*, in our *Double Microſcopes*, is uſually a lens convex on both ſides; but Euſtachia Divini long ſince invented a microſcope of this kind, the power of which he places very greatly above that of the common ſort; and this principally depending on the eye-glaſs, which was double, conſiſting of two plano-convex glaſſes, ſo placed as to touch one another in the middle of their convex ſurface. This inſtrument is ſpoken of with great credit by Fabri in his Optics, and is ſaid to have this peculiar excellence, that it ſhews all the objects flat, and not crooked, and takes in a large area, though it magnifies extremely much. Phil. Tranſ. No. 40.

Eye-*Glaſs*, in *Teleſcopes*, is the lens next the eye; and if the teleſcope conſiſt of more than two lenſes, all but that next the object are called eye-glaſſes.

Eye-*lids*, *Encyſted tumours of*, in *Surgery*. Encyſted tumours frequently form on the eye-lids: indeed, this is ſo much the caſe, that ſome ſurgical writers aſſert that ſuch ſwellings are more often found ſituated on thoſe parts than any where elſe in the body.

We ſhall not ſtop to refute the opinion which has occaſionally ſtarted up, that the frequency of encyſted tumours on the eye lids ariſes from the great number of ſebaceous glands exiſting in theſe parts, which glands have been ſuppoſed to ſwell and enlarge from ſome cauſe or another. Scarpa points out, that the glands of Meibomius are only ſituated at the edges of the eye-lids, and that encyſted tumours are not more common on this part of the eye-lids than on others.

Scarpa remarks, that an encyſted tumour of the eye-lids, in its early ſtate, does not exceed a millet-ſeed or a ſmall pea in ſize, and that it is long before a ſwelling of this kind becomes as large as a bean or filbert. The tumour is in general unattended with pain; but ſome uneaſineſs is experienced as ſoon as the diſeaſe has acquired ſuch magnitude that the free motion of the eye-lid, a partial depreſſion of it, and a degree of preſſure on the eye-ball, are produced.

Scarpa expreſſes a conviction, founded on the obſervation of numerous caſes, that theſe tumours are, from their firſt origin, moſt commonly nearer to the internal membrane of the eye-lids than to the integuments, their baſes being ſo ſuperficially ſituated on the inner ſurface of the eye-lids, that, when ſuch ſurface is turned outwards, the ſwellings ſeem quite denuded, and look tranſparent through the delicate lining of the palpebræ.

Various applications have been tried, with a view of diſperſing encyſted tumours of the eye-lids; as, for inſtance, collyria, containing the aqua ammonia in a very diluted ſtate, reſolvent gums, mercurial frictions, &c. Scarpa obſerves, however, that he has found ſo little ſucceſs attend the uſe of theſe remedies, that, he is convinced, the only effectual mode of cure, particularly when the tumour is of long ſtanding, conſiſts in having recourſe to extirpation.

A ſurgeon, who adopts Scarpa's opinion, naturally decides, that the beſt way of removing encyſted tumours of the eye-lids is, generally ſpeaking, to extract them through an inciſion made on the inſide of the eye-lid. The reaſons urged by Scarpa, in favour of this practice, are, that the wound need only be a very ſuperficial one, the cyſt may be eaſily ſeparated from the ſurrounding parts, the place readily heals, and no ſcar is left to denote either that there has been any diſeaſe or operation.

Scarpa allows, however, that there is one caſe in which this plan of operating ſhould not be choſen. When the encyſted tumour is ſo ſituated upon either eye-lid that the part cannot be ſufficiently turned inſide-out, to bring into view the baſe of the ſwelling, and to enable the ſurgeon to cut away the whole of it, the cut ſhould be made from without.

When the encyſted tumour is on the upper eye-lid, the patient being ſeated with his head firmly ſupported, an aſſiſtant is to turn out the upper eye-lid, and preſs in ſuch a manner as will make the tumour project as much as poſſible. The ſurgeon is next to divide, with a lancet, or convex-edged ſcalpel, the delicate membrane ſpread over the tumour. He is to obſerve to make the inciſion in the direction of the edge of the eye-lid, and of ſufficient ſize to allow the tumour to project and be taken out with eaſe. The ſwelling may now be taken hold of with a pair of forceps, or a tentaculum, and detached from all its connections with the knife, or, as ſome may prefer, with a pair of ſciſſars. The eye-lid is then to be put into its natural poſition again, and kept wet with linen dipped in the ſaturnine lotion.

The operation on the lower eye-lid is not materially different from the one already deſcribed.

When an encyſted tumour is to be removed from the eyelid of a child, Scarpa adviſes the child to be laid on a table, with the head raiſed on a pillow, and the hands and feet firmly held by aſſiſtants.

In quadrupeds the lower palpebra is moveable, and is the ſmaller; in birds, on the contrary, the lower is moveable, and the greater.

Animals that have hard eyes, as lobſters, and the generality of fiſhes, have no palpebræ, ſuch eyes being ſufficiently ſecured without.

In the generality of brutes there is a kind of a third eyelid, which is drawn like a curtain, to wipe off the humidity which might incommode the eyes; it is called the nictitating membrane.

The monkey is almoſt the only one that wants it, as being furniſhed, like a man, with hands to wipe the eye on occaſion.

Eye-*lids*, *Wounded*. See Wounds.

Eye, *Bull's*, in *Aſtronomy*, a ſtar of the firſt magnitude, in the conſtellation Taurus, by the Arabs called Aldebaran.

Eye, *Cat's*, *Oculus cati*, in *Natural Hiſtory*, a precious ſtone, called alſo *ſun's eye*, *oculus ſolis*, and taken by Dr. Woodward for the aſterias of the ancients. See Cat's-*eye*.

Eye, *Crab's*, *Oculus cancrorum*. See Crabs-*eyes*.

Eye, *Goat's*, *Oculus caprinus*, is when there is a white ſpeck on the pupil of the eye, as is ſeen in the eyes of goats. Phyſicians call it *ægias*.

Eye, *Golden*, in *Ornithology*. See Duck.

Eye, *Hare's*, *Oculus leporinus*, in *Surgery*, a diſeaſe ariſing from a contraction of the upper eye-lid, which prevents its being able to cover its part of the eye, ſo that the patient is obliged to ſleep with the eye half open, after the manner of hares.

Phyſicians call it *lagophthalmia*, a Greek word ſignifying the ſame thing, being compounded of λαγως, *hare*, and οφθαλμος, *eye*.

EYEABLE, in *Rural Economy*, is a provincial term uſed to denote the fine appearance of collections of ſheep and neat cattle.

EYEMOUTH, in *Geography*, a ſmall fiſhing town in the ſhire of Berwick, having a good harbour for ſmall craft at the mouth of the river Eye. In the reign of Elizabeth the French took poſſeſſion of it for the queen mother, and fortified it, as being a convenient port for landing ſupplies. But queen Elizabeth ſupporting the cauſe of the reformers, the French were ſoon obliged to quit the country. A conſiderable herring fiſhery occupies the inhabitants. In 1791 ſix buſſes only were employed, but there is abundance of room for numbers more, as the coaſt abounds with various kinds of fiſh. In 1756 the harbour was improved by the erection of a new pier on the weſtern ſide, and in 1770 another on the eaſtern ſide was added; ſince which the trade has increaſed, and much corn and meal are annually exported. It has two annual fairs in June and October, and is ſituated nine miles north by weſt of Berwick, and 349 miles from London. Sir John Sinclair's Stat. Acc. of Scotland.

EYERDORF, a town of Germany, in the principality of Wurzburg; five miles S.S.W. of Kiſſingen.

EYERHEIM, a town of Germany, in the principality of Wurzburg; ſeven miles E.S.E. of Schweinfurt.

EYERLANDT, an iſland at the entrance into the Zuyder ſea from the German ocean, N. of the Texel, about 2½ miles in length, and half a mile wide; joined to the iſland of Texel by a bank of ſand, and overflowed only at high water.

EYESS, in *Falconry*. See Eyrie and Falcon.

EYETON, or Ayton, in *Geography*, a town of Scotland, in Berwickſhire, ſeated on the river Eye; ſeven miles N. of Berwick-upon-Tweed.

EYFERDING. See Efferding.

EYGUEL, a river of France, which runs into the Sarre; five miles N.E of Sarre Alb.

EYGUIE'RES, a town of France, in the department of the Bouches, or Mouths of the Rhone, and chief place of a canton, in the diſtrict of Taraſcon; 16 miles E.S.E. of Taraſcon; the place contains 2925, and the canton 7320 inhabitants, in ſeven communes and a territorial extent of 245 kiliometres.

EYGURANDE, a town of France, in the department of Correze, and chief place of a canton, in the diſtrict of Uſſel; the place contains 991, and the canton 4667 inhabitants, on a territory of 180 kiliometres, in 10 communes.

EYKENHOUTS Doublet, in *Conchology*, the name of *Venus macaſſarica*, in Leer's Catal.

EYLA, in *Geography*, a river of Saxony, which runs into the Wichra, two miles N. of Borna, in the margraviate of Meiſſen.—Alſo, a town of Sicily, in the valley of Mazara; 25 miles E.S.E. of Palermo.

EYLAND, a river of Brandenburg, which runs into the Oder; two miles S. of Frankfort.

EYLANDEN, one of the ſmaller Japaneſe iſlands. N. lat. 34° 45′. E. long. 139° 10′.

EYLAU, Drutsch, a town of Pruſſia, in the province of Oberland; 42 miles E.N.E. of Culm. N. lat. 53° 30′. E. long. 19° 24′.

Eylau, *Preuſitſch*, a town of Pruſſia, in the province of Natangen; 20 miles S. of Konigſberg; famous for a bloody battle fought near it in February 1807, between the French and the Ruſſians. N. lat. 54° 20′. E. long. 20° 42′.

EYLES's Island, a ſmall iſland in the Mergui Archipelago, near the ſouth coaſt of Sullivan's iſland. N. lat. 10° 46′.

EYLL, a river of France, which runs into the Roer, near Juliers.

EYME, a town of Germany, in the principality of Calenberg; 16 miles E. of Hameln.

EYMET, a town of France, in the department of the Dordogne, and chief place of a canton, in the diſtrict of Bergerac; 12 miles S. of Bergerac. The place contains 1332, and the canton 5502 inhabitants, in 14 communes, on a territory of 122½ kiliometres.

EYMOUTIERS, a town of France, in the department of Upper Vienne, and chief place of a canton, in the diſtrict of Limoges; 18 miles N. of Limoges. The place contains 1521, and the canton 13,159 inhabitants, in 16 communes, on a territory of 370 kiliometres. This town carries on a conſiderable trade in ſkins, leather, and rags.—Alſo, a town of France, in the department of the Dordogne; 15 miles N. of Perigueux.

EYNDHOVEN, a town of Brabant, ſituated on the Dommel; 25 miles W. of Venlo.

EYNON, a river of Wales, which runs into the Dovic, about three miles below Machynlleth.

EYNSHAM, a village of England, in the county of Oxford, ſix miles N.W. of Oxford, famous for a monaſtery founded here by Athelmer, or Aylmer, earl of Cornwall and Devon, before the year 1005; and alſo for a council held here by king Ethelred, at which the archbiſhops and biſhops of the realm attended, and many acts, eccleſiaſtical and civil, were paſſed. The number of inhabitants in 1801 was 1166.

EYPEL, a town of Bohemia, in the circle of Koniginгratz; three miles S.S.E. of Trautenau.

EYPOLTAN, a town of Auſtria, on the north ſide of the Danube; five miles N. of Vienna.

EYRAGUES, a town of France, in the department of the Mouths of the Rhone; eight miles E.N.E. of Taraſcon.

EYRE, a town of North Carolina; 48 miles W. of Halifax.

Eyré, or *Iré*, a mountain of Africa, between Fezzan and Caſhna.

Eyre, or *Eire*, in *Law*, ſignifies the court of juſtices itinerant.

The word ſeems formed of the old French, *irre*, *iter*, *way*, *track*.

Hence juſtices in eyre are thoſe whom Bracton calls *juſticiarii itinerantes*. See Justices in *Eyre*.

Eyre *of the Foreſt*, is otherwiſe called *juſtice-ſeat*, which by the ancient cuſtoms was to be held every three years by the juſtices of the foreſt, journeying up and down for that purpoſe. See Justices.

EYRECOURT, in *Geography*, a poſt town of the county of Galway, Ireland; 72 Iriſh miles weſt from Dublin, and about 34 eaſt from Galway.

EYRIE, or Ayrie, among *Falconers*, the neſt where hawks ſit and hatch, and feed their young.

Hence a young hawk, newly taken from the neſt, is called an eyeſs.

EYRON, in *Geography*. See Eiron.

EYSACH, a river of the Tyroleſe, which runs into the Adige, near Bolzano.

EYSDALE, or Esdale, a ſmall iſland near the weſt coaſt of Scotland, celebrated for its quarries of excellent ſlate; ſeven miles S.E. from Mull. N. lat. 56° 18′. W. long. 5° 38′.

EYSENBERG, a town of Pruſſia, in Natangen; 20 miles S.S.W. of Brandenburg.

EYSL, a town of Germany, in the principality of Anſpach; four miles N. of Thalmeſſing.

EYSTATHES, in *Botany*, ευςαθης, *firm and ſtable*, in alluſion to the hard and durable nature of the wood. Loureir. Cochinch. 234. Claſs and order, *Octandria Monogynia*. Nat. Ord. *Sapindi*, Juſſ.?

Gen. Ch. *Cal.* Perianth inferior, of five ovate, concave leaves. *Cor.* Petals five, ovate, ſpreading, the ſize of the calyx. *Stam.* Filaments eight, awl-ſhaped, erect, inſerted into the receptacle; anthers erect, ovate, of two cells. *Piſt.* Germen ſuperior, roundiſh, hairy; ſtyle thread-ſhaped, nearly as long as the ſtamens; ſtigma obtuſe, notched. *Peric.* Berry globoſe, fleſhy, of one cell. *Seeds* four, ovate, compreſſed.

Eſſ. Ch. Calyx of five leaves, inferior. Petals five, ovate. Berry of one cell, with four ſeeds.

E. *ſylveſtris*. Lour. 235. Native of the lofty mountains of Cochinchina. A large tree, whoſe wood is reddiſh, even, firm, of an ample ſize, fit for the purpoſes of building. *Branches* ſpreading. *Leaves* alternate, ovate-oblong, pointed, entire, ſmooth, veiny. *Flowers* white, in nearly ſimple oblong cluſters, about the ends of the branches. *Berry* ſmooth, with a hard ſkin, pulpy internally, of a middling ſize, not eatable.

Such is Loureiro's account. We know no deſcribed tree to which his deſcription is applicable. The number of ſeeds which he attributes to this genus, four inſtead of three, renders its natural order doubtful.

EYSTENEY, called alſo *Eaſton-Neſs*, in *Geography*, is a remarkable

remarkable head-land in Suffolk, formerly accounted the moſt eaſtern point of the iſland, whence it received its Saxon, or rather Britiſh, denomination. But ſince the latitudes and longitudes of places have been more accurately aſcertained by modern diſcoveries, the ſtatement has been found erroneous; part of the Norfolk coaſt having a more eaſterly bearing. This point was the ΕΞΟΧΗ, or *Extenſio Promontorium* of the Roman geographer Ptolemy. "And to put it out of doubt," ſays Camden in his Britannia, "that it is the ſame we call Eaſton, it is to be obſerved, that Eyſteney ſignifies the ſame in Britiſh, as Εξοχη in Greek, or *Extenſio* in Latin. Though the name in our language may be with as much probability derived from its eaſtern ſituation." (Vol. ii. Gough's Edit. p. 76.) The probability, however, is in favour of the Britiſh derivation. *Yſten* or *Eyſten*, in Celtic, means to extend, and *hy*, prominent; hence Eyſtenhy, or Eyſteney, will ſignify the extended protection, or bold promontory. Horſley places it at Gunfleet, in the county of Eſſex.

EYTJOU-HOTUN, a town of Corea; 380 miles E. of Peking.

EYWANOUITZ, a town of Moravia, in the circle of Olmutz; 16 miles S. W. of Olmutz.

EZA, a town of France, in the department of the Maritime Alps; 4 miles E. of Nice.

EZAGEN, a town of Africa, in Fez; 60 miles S. of Tetuan.

EZAWEN, a town of Africa, in the country of Sahara; 70 miles N. W. of Tombuctoo.

EZDOUD, a town of Syria, on the ſite of the ancient Azotus, or Aſhdod, famous at preſent for its ſcorpions. This town, which was once ſo powerful under the Philiſtines, affords no proofs of its ancient importance. Three leagues from Ezdoud is the village of El-Majdal, where they ſpin the fineſt cottons in Paleſtine, which, however, are very coarſe.

EZEKIEL, in *Scripture Biography*, one of the inſpired prophets, whoſe predictions are recorded in the Old Teſtament. He was the ſon of Buzi of the houſe of Aaron, and one of the captives carried by Nebuchadnezzar to Babylon with Jeconiah or Jehoiachin. The era at which he commences his prophecies was the fifth year of Jehoiachin's captivity, or the fifth of Zedekiah, or the 593d year B. C. Jeremiah was his contemporary, and propheſied at the ſame time in Judæa. Ezekiel, after his captivity, inhabited ſome place on the river Chebar, which flows into the Euphrates about 200 miles northward of Babylon; and this was the ſcene of his predictions, though he was occaſionally conveyed in viſion to Jeruſalem; and his prophecies were continued for about 22 years. The events of his life, after his advancement to the prophetic office, are interwoven with the detail which he himſelf has given of his predictions; and the manner of its termination is no where aſcertained. Epiphanius, indeed, if he be the author of the life of this prophet that is aſcribed to him, informs us, that he was put to death by the prince or commander of the Jews in the place of his exile, becauſe he was addicted to idolatry, and could not bear the reproaches of the prophet. But on this account, which is intermixed with many fables, we can place no reliance. The ſubjects of Ezekiel's prophecies, contained in the canonical book of the Old Teſtament, bearing his name, are the dreadful calamities, ſoon after inflicted upon Judæa and Jeruſalem, on account of the idolatry, impiety, and profligacy of their inhabitants; the divine judgments that would be executed on the falſe prophets and propheteſſes, who deluded and hardened the Jews in their rebellion againſt God; the puniſhments which ſhould befal the Ammonites, Edomites, and Philiſtines, for their hatred of the Jews, and for inſulting over them in their diſtreſs; the deſtruction of Tyre, which he places in the 26th year of the captivity of Jehoiachin, and alſo the conqueſt of Egypt in the ſucceeding year, by Nebuchadnezzar; the future reſtoration of Iſrael and Judah from their ſeveral diſperſions, upon their repentance and reformation; and their ultimately happy ſtate after the advent and under the government of the Meſſiah. The predictions of Ezekiel are diſtributed by Joſephus, and various other writers, into two books, or parts; the firſt of which extends to the cloſe of the 39th chapter; and the ſecond, in which a new, more elevated, and joyful ſcene is exhibited, begins with the 40th chapter, and is comprehended in the laſt nine chapters. Grotius ſpeaks in high terms of this prophet, obſerving, "that he had great erudition and genius; ſo that ſetting aſide his gift of prophecy, which is incomparable, he may deſerve to be compared with Homer, on account of his beautiful conceptions, his illuſtrious compariſons, and his extenſive knowledge of various matters, particularly of architecture." Biſhop Lowth, in his 21ſt lecture on the ſacred poetry of the Hebrews, gives us an admirable deſcription of the peculiar and diſcriminating characteriſtics of this prophet. "Ezekiel," ſays he, "is much inferior to Jeremiah in elegance; but is equal even to Iſaiah in ſublimity, though their ſtyle of compoſition is very different. For he is bold, vehement, tragical, wholly intent on exaggeration; in his ſentiments elevated, warm, bitter, indignant; in his images fertile, magnificent, harſh, and ſometimes almoſt deformed; in his diction grand, mighty, auſtere, rough, and ſometimes uncultivated, abounding in repetitions, not for the ſake of ornament or gracefulneſs, but through indignation and violence. Whatever ſubject he undertakes to treat of, he purſues it diligently, he remains entirely fixed on it, and rarely deviates from his purpoſe; ſo that his reader is ſcarcely ever unable to diſcern the ſenſe and connection of his matter. Perhaps he is excelled in other reſpects by moſt of the prophets; but none in the whole compaſs of writers has ever equalled him in the manner of writing, for which he ſeems to have been ſingularly qualified by nature, in force, impetuoſity, weight, and grandeur. His diction is ſufficiently perſpicuous; almoſt all his obſcurity lies in his matter: his viſions are particularly obſcure; and yet, as in Hoſea, Amos, and Zechariah, they are interpreted by a narration, which is plain and altogether hiſtorical. The greater part of Ezekiel, and what lies in the middle of his book, is poetical, whether we regard the matter or the diction: but he is for the moſt part ſo rude and void of compoſition in his ſentences, that I am often doubtful what to determine in this reſpect." In another place the ſame learned prelate remarks, that Ezekiel ſhould perhaps be oftener claſſed among the orators than the poets; and he thinks that, with reſpect to ſtyle, we may juſtly aſſign to Ezekiel the ſame rank among the Hebrews that Æſchylus holds among the Greeks. The moſt learned and elaborate commentary upon this prophet was written by two Spaniſh Jeſuits, Pradus and Villalpandus, in three volumes folio, of which Dr. William Lowth has availed himſelf in his valuable continuation of Biſhop Patrick's commentary on the Old Teſtament. The lateſt and beſt verſion of Ezekiel is that of the late learned biſhop Newcome, in 1788, in 4to. with a preface and notes, which Biblical ſcholars will peruſe with advantage. Pridcaux's Conn. vol. i.; Lowth's Comm. Pref.: and Preface to Newcome's Com.

EZEKIEL's *reed*, or *rod*, a ſcripture meaſure, computed by late writers to amount to 1 Engliſh foot 11 inches $\frac{1}{3}$ of an inch.

EZRA, or Ezdras, in *Biography*, a Jewiſh prieſt, author of the book that bears his name, and compiler of the Canon of the O. T., was a deſcendant of Seraiah, the high prieſt, who was put to death by Nebuchadnezzar at the capture of Jeruſalem, in the year 587 B. C. and flouriſhed about the year 458 B. C. He was probably born in the land of captivity, and acquired the reſpect and confidence of his countrymen by his diſtinguiſhed learning, acquaintance with the ſcriptures, and zeal for the religion of his fathers. In the beginning of the 7th year of Artaxerxes Longimanus, or 458 B. C., Ezra received his commiſſion to return to Jeruſalem, with as many of his nation as choſe to accompany him, for the purpoſe of reſtoring and ſettling the ſtate, and reforming the church of the Jews, and of regulating and governing both according to their own laws. The extraordinary powers with which Ezra was inveſted ſeem to have been conferred upon him by the influence of Eſther, who was at this time in high favour at the Perſian court. At the commencement of his journey he appointed a faſt, with a view of recommending himſelf and his aſſociates to the divine protection, and arrived at Jeruſalem on the 1ſt day of the 8th month, having ſpent 4 whole months in the journey from Babylon thither. Having delivered up to the temple the rich offerings which had been made to it by the king, the nobles, and the Jews who remained in Babylon, and having communicated his commiſſion to the king's lieutenants and governors throughout Syria and Paleſtine, he made no delay in the execution of it; and difficult and arduous as it was, he perſevered during an interval of 13 years, till Nehemiah arrived with a new commiſſion from the Perſian court, to co-operate with him. From the advancement of Eſther to the high dignity of queen in the court of Perſia, and the protection and patronage thus afforded him, Ezra derived an encouragement to go on with the work of reforming and ſettling the Jewiſh church and ſtate in Jeruſalem, which he had undertaken.

We ſhall here obſerve that the date of the commiſſion granted to Ezra in the 7th year of Artaxerxes furniſhes the commencement of the 70 weeks of the famous prophecy, delivered in the 9th chapter of Daniel, concerning the advent of the Meſſiah, that theſe 70 weeks are weeks of years, and that the whole number amounts to 490 years, at the end of which the period marked in the prophecy expired; after which the Jews were no longer to be the peculiar people of God, nor Jeruſalem his holy city, becauſe then the economy which he had eſtabliſhed among them was to ceaſe, and the worſhip which he had appointed at Jeruſalem was to be wholly aboliſhed. All this was accompliſhed at the death of Chriſt. Accordingly, the end of theſe weeks being fixed at the death of Chriſt, we may eaſily calculate their commencement. The death of Chriſt, as moſt learned men agree, took place in the year of the Julian period 4746, and in the Jewiſh month Niſan, when the Jewiſh paſſover was always celebrated; and, therefore, if we reckon 490 years backward, this will lead us up to the month Niſan, in the year of the Julian period 4256, which were the year and the month in which Ezra had his commiſſion from Artaxerxes, for his return to Jeruſalem, in order to reſtore the church and ſtate of the Jews. According to this interpretation of the prophecy, the words "to reſtore and rebuild Jeruſalem" cannot be underſtood in a literal ſenſe. If this be the caſe, they muſt be underſtood of that rebuilding of Jeruſalem, which was accompliſhed by virtue of the decree of Cyrus, in the firſt year of his reign, 536 years B. C.; but from this era to the death of Chriſt were 568 years; and, therefore, if the ſaid 490 years be computed from thence, they will expire many years before the cutting off or the coming of the Meſſiah, both of which events ought to fall within the compaſs of them according to the words of the prophecy. But to return from this digreſſion.

One of the firſt objects of Ezra's attention, after he had appointed judges and magiſtrates, was to induce the Jews to diſſolve the marriages, which had been contracted by many of them in direct contradiction to the law of Moſes, with wives from the families of their idolatrous neighbours. During the continuance of his government he ſedulouſly employed himſelf in reſtoring the diſcipline and rites of the Jewiſh church, and the worſhip of the temple, according to the form in which it had exiſted before the captivity. But we muſt not omit to mention a very important meaſure which engaged the attention of Ezra, and to which he devoted his ſkill and induſtry; and this was the correction and reviſion of the books of the ſacred writings. What he did in this reſpect towards forming a complete canon of the ſcriptures, has been already ſtated at large under the article Bible. Although Ezra's commiſſion was ſuperſeded by that of Nehemiah, in the 20th year of Artaxerxes Longimanus, he continued, in concurrence with the new governor, to perfect the reformation which he had begun. When he had completed his reviſion of the ſcriptures, and had them written out in the Chaldæan character, he made preparation for publicly reading the law of Moſes to the people at Jeruſalem. The day appointed for this purpoſe was the firſt day of the feaſt of trumpets, when the commencement of the new year was joyfully celebrated. Having aſcended a ſcaffold, which had been erected in the moſt convenient part of the city, and being attended by 13 of the principal elders of the people, he began to read the law out of the Hebrew text, and ſome of the Levites, previouſly inſtructed and appointed for this purpoſe, rendered it into Chaldee, which was then the vulgar language of the people; and he proceeded thus, day after day, during this feſtival, and alſo that of tabernacles, till the whole law was finiſhed. Nehemiah and Ezra, at the cloſe of this ſolemn buſineſs, by which the minds of the people had been much impreſſed, proclaimed a faſt, in order to give them an opportunity, and alſo incitement, for a public and ſolemn confeſſion of their ſins, and for entering into engagements of future obedience to the laws which had been explained to them.

The ſubſequent events of Ezra's life are not recorded. Joſephus ſays that he died at Jeruſalem; but other Jews affirm that he returned to Perſia, and died there, in the 120th year of his age. Many fables have been related concerning him in the writings of the Talmudiſts, and they have been borrowed by the Mahometans; but they are not deſerving of recital. Several of them may be found in Herbelot's "Bibliotheque Orientale," under the articles *Ozain*, and *Ben Seraiah*.

The book of Ezra was written by him, partly in Hebrew, and partly in Chaldee, *viz.* from the 8th verſe of the 4th chapter to the 27th verſe of the 7th chapter; and contains the hiſtory of the Jews from the time of Artaxerxes's, or, as others ſay, Cyrus's, edict for their return, to the twentieth year of Artaxerxes Longimanus. It ſpecifies the number of Jews who returned, and Cyrus's proclamation for re-building the temple, the obſtruction it met with, and the finiſhing thereof in the reign of Darius. It is canonical, and allowed as ſuch both by the church and the ſynagogue.

The books of Ezra, called in the Engliſh verſion, "the

Firſt and Second Books of Eſdras," though held by ſome, particularly the Greeks, for canonical, are thrown by the Engliſh church into the number of apocryphal books, being only extant in Greek. Theſe have been deſervedly rejected from the canon as ſpurious productions, conſiſting of combined extracts from the genuine book of Ezra, rabbinical fables, and the dreams of ſome Chriſtian viſionary. The Jews aſcribe to Ezra the book of Nehemiah, but this opinion is contradicted by Nehemiah's own declaration at the beginning of it, and by his always ſpeaking of himſelf in the firſt perſon. Some have alſo conjectured that Ezra was the author of the book of *Eſther*, which ſee; and many have, with greater probability, attributed to him the compilation of the two books of Chronicles; and others have ſaid that he was the writer of the two books of Kings. Prideaux's Com. vol. ii. Du Pin.

F.

F, The ſixth letter of the alphabet, and the fourth conſonant.

The letter F may be either conſidered abſolutely, and in itſelf, or with regard to the particular languages where it is found. In the firſt view, F is generally placed by grammarians among the ſemi-vowels, and diſtinguiſhed in the enumeration of the alphabet by a name beginning with a vowel; though it has ſo far the nature of a mute that it is eaſily pronounced before a liquid in the ſame ſyllable. Joh. Conrad. Amman (in his Diſſertatio de Loquela) divides the conſonants into ſingle and double, and the ſingle into hiſſing and exploſive. Among thoſe called hiſſing, there are ſome pronounced by the application of the upper teeth to the lower lip; and theſe are the F and *ph*. The reaſon why ſome account the F a ſemi-vowel, and Amman places it among the hiſſers, is, that one may pronounce a little ſound without any other motion of the organs than what is neceſſary to the pronunciation of the F.

In Engliſh its ſound is invariable, being formed by compreſſion of the lips, or a junction of the upper teeth with the under lip, and a forcible breath.

This letter is derived to us from the Romans, by whom it was borrowed from the Æolians, who, having no rough breathing, invented this character, or rather borrowed it from the oriental tongues; among the Æolians it is called *digamma*, or *double gamma*, as reſembling two Γ's, (gammas,) one over the other. The Latins uſed this great F inſtead of *v*. Hence the Æolians, and the Latins after them, write Fοινος for οινος, *vinum*, and Fεσϖερα for ἑσϖερα, *veſpera*, and αιFων for οιων, *ævum*. (See Letter E.) The aſpirate, ſays the ingenious writer, cited under that article, inſtead of vaniſhing on the principle there ſtated, was changed into a labial letter, *w*, *v*, *b*, *f* or φ. The digamma, however, did not always originate in a guttural, but ſometimes in conſonants allied to our *w* or *y*. The digamma, ſays the ſame author, did not belong, as Dr. Bentley and others ſuppoſed, to the Æolic dialect only, but to all the dialects of Greece in their more ancient mode of pronunciation; and he obſerves, in oppoſition to the opinion of the learned, who ſay that the digamma at *firſt* prevailed, and was afterwards ſucceeded by the aſpirate, that the gutturals at firſt prevailed, which were ſoftened into mere aſpirates, and that theſe were again changed for a more eaſy and agreeable letter, which being ſimply a labial, was diverſified by different people into *y*, *w*, *v*, φ, *b* or *f*. In contradiction to this very plauſible theory, it may be alleged, that the digamma is to be found only in Homer, the moſt ancient writer of Greece, while the aſpirate occurs in all the more recent authors. To this objection it is replied, that the uſe of the aſpirate obtained in the written language, and was, therefore, leſs ſuſceptible of corruption: on the other hand, that of the digamma prevailed in pronunciation, which was more liable to change, and to deviate from the original terms. Homer, we may naturally ſuppoſe, adopted the firſt in compoſing and writing his poems, and the laſt in reciting them to the people. The written form, we may preſume, was at firſt uſed but little, but prevailed by degrees, while the peculiarities of pronunciation in their turn began to decline. The language, as written by Homer, at length became faſhionable in the converſation of poliſhed people; and the aſpirate being thus triumphant in the daily converſe of learned men, would of courſe in their writings triumph over oral and temporary corruptions. The preſervation of the aſpirate in the written poems of Homer, while the digamma was uſed in reciting them, is a proof that Homer did actually uſe a written language, and that his works were preſerved by a written language; otherwiſe the aſpirate would have been loſt, and the digamma alone would have prevailed in all the Greek authors who followed. If an editor of Homer in modern days would inſert the digamma, he would corrupt the original orthography of Homer, and ſubſtitute, in the room of the original characters, the corruption of pronunciation.

Mr. Jones further obſerves, that the change of a guttural into an aſpirate, or into a long vowel, or into a labial letter, called the digamma, is not peculiar to any one language, but is founded in the ſtructure of the organs of ſpeech; and inſtances of it prevail in all tongues, both ancient and modern. We may further add, that the digamma ſeems in its origin to have been no other than the Greek Φ, which being made at three ſtrokes, degenerated at length into the figure F. For the letter Φ being compounded of an omicron with a perpendicular drawn through it, if that perpendicular be made firſt, and the O at two ſtrokes afterwards, *viz.* firſt the upper, then the under part, it may happen, eſpecially in writing faſt, that the two parts ſhall not join; and even inſtead of two arches of circles, haſte and conveniency may naturally enough make two ſtraight lines.

What confirms this tranſmutation of the Φ into F, is, that on the medals of Philip, and the kings of Syria, in the words ΕΠΙΦΑΝΟΥΣ and ΦΙΛΑΔΕΛΦΟΥ, the *phi* is frequently ſeen in the form juſt mentioned; *i.e.* it has no circle or omicron; but acroſs the middle of the perpendicular is a kind of right line, formed only of two dots, the one on the right ſide, and the other on the left, repreſenting a croſs †. Such appears to be the origin of the letter F, which of conſequence is no other than a corruption of the Greek Φ; and accordingly, on the medals of the Faliſci, the F is ordinarily put in lieu of the Greek Φ: but it muſt be added, that though the Greek and Latin letter were thus the ſame thing, yet the ſound was much ſofter among the Latins than among the Greeks, as was long ago obſerved by Terentianus.

The Romans for ſome time uſed an inverted F Ⅎ, in lieu of a V conſonant, which had no peculiar figure in their alphabet: thus, in inſcriptions we meet with TERMINAℲIT, DIℲI, &c. According to Lipſius, in his Comment on the Annals of Tacitus, lib. xi. Covarruvias and Dauſquius, this inverted digamma Ⅎ was firſt introduced by the emperor Claudius. See Tacit. An. lib. xi. cap. 4. and Suet. in Vit. Claud. cap. 41.

It may be added, that the pronunciation of the F is almoſt the ſame with that of the V, as will be evident by attending to the manner of pronouncing the following words: *F*avour, *V*anity, *F*elicity, *V*ice, *F*oment, *V*ogue, &c. The French particularly, in borrowing words from other languages, uſually turn the final *v* into an *f*, as cheti*f* of catti*v*o, neu*f* of no*v*us, ne*f* of na*v*is, &c.

In the latter Roman writers we find the Latin F and Greek Φ *ph* frequently confounded; as in *F*alanx for *Ph*alanx, *F*iloſophia for *Ph*iloſophia, &c. which abuſe is ſtill retained by many French writers, who write *F*iloſophie, *F*ilippe, Epi*f*ane, &c. and even ſometimes by the Engliſh as in *f*antaſy, *f*iltre, &c.

F, in the *Calendar*, is the ſixth dominical letter.

F, in the *Civil Law.* Two ff s joined together ſignify the Pandects: ſee the reaſon of this under Pandect.

F, in our *Ancient Cuſtoms*, was a ſtigma or brand.

He that ſhall maliciouſly ſtrike any perſon with a weapon in church or church-yard, or draw any weapon there with an intent to ſtrike, ſhall have one of his ears cut off; and if he have no ears he ſhall be marked on the cheek with a hot iron having the letter F, whereby he may be known for a fray-maker, or fighter.

F, or Fa, in *Muſic*, denotes the baſs-clef, being placed on the fourth line upwards.

Indeed the character or ſign by which the *f* and *c* clefs are marked, bear no reſemblance to thoſe letters. Mr. Malcolm thinks it were as well if we uſed the letters themſelves; but cuſtom has carried it otherwiſe. The ordinary character of the F or baſs-clef is 𝄢, which Kepler takes a great deal of pains to deduce by corruption from the letter F itſelf.

F, in the *Italian Muſic*, is often uſed inſtead of forte.

FF, implies *fortiſſimo*, very ſtrong, or loud.

F, in *Medical Preſcriptions*, ſtands for *fiat*, *let it be done*, as *F. S. A.* denotes as much as *fiat ſecundum artem.*

F, among ſuch as give us the numeral value of letters, ſignifies 40, according to the verſe

> "Sexta quaterdenos gerit quæ diſtat ab alpha."

And when a daſh was added over it $\overline{\text{F}}$, ſignified 40,000.

F, on the *French Coins*, is the mark of the town of Angers.

Fa, in *Solmiſation*, is always the fourth ſound of each hexachord, as *do*, *re*, *mi*, *fa*.

F, Fa, Ut, in the ſcale of Guido, is the note which occupies the fourth line in the baſs, on which the clef is placed: *fa* implies the fourth in the natural hexachord of C, and the *ut* the firſt note of the molle hexachord.

Fa Feint, in *Old Muſic*, implied F ※; and any note not in the regular hexachords, whether flat or ſharp, was ſaid to be a feigned or fictitious note.

Fa Fictum, Latin, or *Fa Finto*, Ital. in *Old Muſical Language*, implied F ※. See Fa Feint.

FAABORG, in *Geography*, a ſea-port town of Denmark, on the ſouth coaſt of the iſland of Funen, ſituated in a flat but fertile country. Its harbour is not good; it principally trades in proviſions. N. lat. 55° 6′. E. long. 10° 16′.

FAAS, a town of Hindooſtan, in Dowlatabad; 5 miles S. of Amednagur.

FABA, in *Botany*, from φαγω, *to eat*, the common or broad bean. Juſſ. 360. Tourn. t. 212. Juſſieu ſeparates this as a genus from *Vicia* chiefly on account of the vertical, not lateral, inſertion of the ſeeds, whoſe ſcar or *hilum* is terminal. There are ſeveral ſpecies, and their ſtout erect habit, ſo different from that of *Vicia*, countenances the meaſure. Even Gærtner however, ſo critical in differences in fruit, has not adverted to this, and the general opinion is in favour of Linnæus who combines the two. See Vicia.

Faba *Bengalenſis*, in the *Materia Medica*, a roundiſh compreſſed ſubſtance, about an inch in diameter, brought from Bengal, and thought to be a vitiated fruit of the myrobalans kind. It is a very good aſtringent, and has been ſucceſsfully preſcribed in fluxes and hæmorrhages.

Faba *St. Ignatii.* See Strychnos.

Faba *Purgatrix*, the fruit of a ſpecies of ricinus. See Palma *Chriſti* and Castor-*oil*

FABACIUM, a word uſed by the ancients to expreſs a ſort of food then in uſe, which was a kind of cake made of bean-meal.

FABAGO, in *Botany*, ſee Zygophyllum. The name alludes to the thickneſs and ſhape of the leaves, reſembling the ſeed-lobes of a bean.

FABALIS Lapis, in *Natural Hiſtory*, a ſtone mentioned by many ancient authors of repute as found in the river Nile, of the ſhape of the common bean, and of a black colour. They ſay it had the virtue of curing dæmoniacs, and that dogs durſt not bark if it was laid before them. Theſe, and many other like virtues, are attributed to this ſtone; to the great diſgrace of the ſober authors who relate them. The ſtone ſeems to have been of thoſe extraneous foſſils which Dr. Hill has ſtyled ichthyperia, from their having been formerly parts of the bony palates of fiſhes which feed on the ſhell-fiſh kinds; and other authors ſiliquaſtri, from their reſembling the pod of the lupine or bean.

FABARIA, in *Botany*, a name given by ſome authors to the telephium or orpine, and by which it is in ſome places called in the ſhops.

Fabariæ *Calendæ*, among the Romans, the calends of June, ſo called becauſe the beans being then firſt ripe, ſome of them were offered to the goddeſs Carna, the wife of Janus.

FABARIS, in *Ancient Geography*, *Farfa*, a river of Italy, called by Ovid *Farfarus*, which had its ſource at a ſmall diſtance to the eaſt of Carpeſia, at a place now called "Capo Farfa," and purſuing a weſterly courſe, diſcharged itſelf into the Tiber.

FABATARIUM, among the ancients, ſignifies, according to ſome, a large veſſel in which beans were kept; others will have it to have been a kind of diſh or plate into which bean-pulſe was put and offered to the houſhold gods.

FABER, Henry, in *Biography*, publiſhed an elementary tract on muſic, (ad Muſicam Practicam Introductio, mulhus,) 1571, in which the ſcale in the harmonic or Guidonian hand is better arranged than in any other book of the kind that we have ſeen, by placing a clef at the top of the three middle fingers, as beacons or land-marks, and making each finger the repreſentative of a tetrachord. See plate, Hiſtory of Muſic, vol. ii. p. 95.

Faber, Gregory, publiſhed at Baſil, in 1552, "Muſices Practicæ Erotematum," in two books, octavo, containing 230 pages; which, when they were written, could have been but of ſmall uſe to a ſtudent without the colloquial commentary of a maſter: its only value, indeed, now is, that it contains compoſitions of Juſquin, Brumel, Okenheim, and other muſicians of that time.

Faber, Jacobus Stapulensis, or James Lefevre, born at Etaples in the Boulonnois, and who flouriſhed about the beginning of the 16th century, was an able mathematician, and one of the few writers on muſic which France could boaſt of at that early period. He was educated at Paris, and with a view to further improvement, he travelled through various parts of the world, that he might have an opportunity of converſing with the learned. On his return to France, he declared open war againſt the Scholaſtic philoſophy, and attempted to introduce genuine Ariſtotelianiſm, as well as to diſſeminate a taſte for mathematical learning. Beſides ſeveral theological works, he wrote commentaries upon the dialectics, phyſics, politics, and economies of Ariſtotle. Of theſe commentaries one of his contemporaries ſays, "Faber has rendered the Peripatetic doctrine ſo clear, that we have no longer any occaſion for Ammonius, Simplicius, or Philoponus." Another ſays, "Faber was the firſt among the French, as Cicero among the Romans, who united philoſophy and eloquence." The boldneſs with which he oppoſed the corruption of philoſophy brought upon him a ſupicion of hereſy, and the perſecution of the doctors of the Sorbonne; but he found a ſecure aſylum in the court of Margaret, queen of Navarre, where he is ſaid to have lived to the age of 100 years; and where he died while veering between Proteſtant and Catholic. His chief works were theological, but his name is preſerved by Proteſtants as a muſical writer, and author of an elementary treatiſe on the art, (Muſica Libris Quatuor Demonſtrata,) under the title of "Jacobi Fabri Stapulenſis Elementa Muſicalia, ad Clariſſimum Virum Nicolaum de Haqueville, &c." Paris 1496 and 1552. Zarlino mentions him by the title of "Il Stapulenſe." He is ſaid by Bayle to have died at Nirac (where the king of Navarre held his court in 1537) at near 100. Bayle, who ſays nothing of his muſical work, has been very diffuſe on his polemics, calls him a bit of a man, "c'etoit un petit bout d'homme," with a perturbed ſpirit, who attacked his friend Eraſmus in an unhandſome manner; in which controverſy he loſt reputation, and proved himſelf to be neither Catholic nor Proteſtant.

His muſical demonſtrations, in a ſmall 4to. of only 44 leaves, begins by a liſt of the Greek founders and writers on the ſcience, and the wonted wonders of its effects; followed by an eloge on his maſters, Labinius and Turbilius.

He gives a liſt of all the ancient writers on muſic, Greek and Roman, from Ariſtoxenus to Boethius, but appears to have read none of them, except Boethius, whoſe treatiſe he ſeems merely to have abridged. Salinas ſays that he underſtood other parts of mathematics better than muſic. His tract is ſolely confined to harmonics, and was admired in his own time, becauſe he had no rivals; but ſo frequently has the ſubject of harmonics been treated ſince by mathematicians of a ſuperior order, that this is only valuable for its age and ſcarcity. He takes notice of the Senatus Conſultum againſt Timotheus, but he has given us no copy of it, nor does he mention any other notation uſed by the Romans, in the time of Boethius, than that of the Greeks. There are ſeven or eight muſicians and muſical writers recorded by Walker in his muſical dictionary of the name of Faber, and Lefevre, but as neither muſic nor precepts of any uſe are come down to us from their labours, we ſhall let them go gently down the ſtream of oblivion, without endeavouring to check their courſe, or applying to the humane ſociety.

Faber, John, was born at Hailbron, on the Necker, about the year 1500; the circumſtances of his early life have not come down to us, but we find him belonging to the Dominican order, and a doctor in theology at Cologne; after which he went to reſide at Augſburgh, where he acquired conſiderable reputation as a preacher and writer againſt the Proteſtant doctrines. His writings are chiefly polemical, among which is "Fructus quibus dignoſcuntur Hæretici," a work highly regarded by the Catholics of his own day on account of the facts, or perhaps fables, which it details concerning Luther. He wrote alſo in the German language "An illuſtration of the Prophecy of Joel," and a collection of prayers compiled from the ſcriptures and the works of St. Auguſtin. Moreri.

Faber, John, ſurnamed from his own principal work, "Malleus Hæreticorum," was born at Leutkirchen, a town of Suabia, towards the end of the 15th century: he was zealouſly attached to the cauſe in which he had been educated, and was admitted to the degree of doctor in theology. In 1518 he was appointed by the biſhop of Conſtance his official, and in the following year his vicar-general, and in that character he was appointed to examine the tenets of Zuingle and his fellow reformers in Switzerland. In this buſineſs his zeal outſtript all ſenſe of moderation and propriety, and he exclaimed at one of the debates in which he was engaged "that the world might very well live in peace without the goſpel." This was in reply to thoſe who contended that the ſcriptures were the only rule of faith and good conduct. The reformers carried their point, an edict was iſſued favourable to their opinions, againſt which Faber had the temerity to enter his proteſt. He was next appointed confeſſor to Ferdinand, who at that time was king of the Romans, and afterwards emperor, who ſent him as envoy to the court of Henry VIII. of England. In the year 1531 he was advanced to the biſhopric of Vienna as a reward for his zeal and exertions in the Catholic cauſe. To this inſtance of promotion Eraſmus alluded when he ſaid "that Luther, notwithſtanding his poverty, found means to enrich his enemies." He died in the year 1542, leaving behind works which were publiſhed at different times, but which after his death were collected in three volumes folio. Moreri.

Faber, Basil, another learned German born in the year 1520 at Sorau, in Lower Luſatia: he paſſed through many degrees of church preferment, and died at Erfurt in 1576. He publiſhed works ſufficient for two volumes folio, but his moſt celebrated piece was "Theſaurus Eruditionis Scholaſticæ," which has gone through many editions, augmented and improved by the labours of the learned. The beſt edition is that of the Hague in 1735, in two vols. Moreri.

Faber, Honoratus, was born in the year 1626, at a period when the ſcholaſtic philoſophy declined. He was profeſſor of mathematics and philoſophy at Lyons, and wrote upon philoſophy, logic, and phyſics. He implicitly followed neither the Scholaſtics nor the Ariſtotelians, but borrowed light from modern philoſophers, particularly the Carteſians. His innovations, however, brought him under a ſtrong ſuſpicion of hereſy, and produced little effect.

Faber, Pierre-Jean, a phyſician of the faculty of Montpellier, and the author of numerous works relative to medicine, ſurgery, and chemiſtry, publiſhed chiefly between the years 1624 and 1626, at Toulouſe. Little more is known reſpecting him, than that he practiſed his profeſſion at Caſtelnaudary, in Languedoc, with great reputation; ſo that he was frequently ſent for to the cities of that province, eſpecially to Toulouſe. The titles of his treatiſes will be found enumerated by Eloy. In one of theſe, "Inſignes Curationes Variorum Morborum, Toloſæ, 1627," he informs us that he ſucceeded in curing a rich and noble young lady of an hyſterical diſeaſe, mixed with occaſional attacks of epilepſy, and that ſhe married him in reward of his ſervices. Eloy Dict. Hiſt.

Several phyſicians of the name of Faber, of leſs note, are mentioned by Mangetus and Eloy: one of whom, named Albert, after having practiſed his profeſſion at Lubeck about the year 1641, and ſubſequently at Hamburgh, became phyſician to Charles II., to whom he dedicated his only work, written in Engliſh. A Latin tranſlation of this work is extant, under the title of "Practica recenſitio de Auro potabili medicinali, ejuſque virtute," printed at Francfort in 1678. He ſurvived his royal maſter but one year, having died in 1686.

Faber, in *Ichthyology*, the Engliſh *Doree*, a ſpecies of *Zeus*; which ſee.—Alſo, a ſpecies of *Chætodon*; which ſee.

FABIAN, Robert, in *Biography*, an Engliſh hiſtorian, born in London in the 15th century, and brought up to active buſineſs. In the purſuits of commerce he was ſo diſtinguiſhed as to be choſen ſheriff of the city in 1493. His leiſure hours were devoted to literature, and particularly to the ſtudy of hiſtory. He employed himſelf in compiling a chronicle, which was printed after his death, entitled "A Concordance of Stories." It is divided into ſeven parts, of which ſix refer wholly to the hiſtory of England previouſly to William the Conqueror; the ſeventh brings the Engliſh and French hiſtories down to the reign of Henry VII. He is copious in the affairs of London, in which the work is chiefly valuable, and on that account it is called by Stow "a painful labour, to the great honour of the city and the whole realm." To each of his books are prefixed a metrical prologue and other pieces in verſe, which led biſhop Tanner to ſtyle him, "poeta haud infelicis ingenii." His chronicle was printed in the year 1516, four years after the author's death. Biog. Brit.

FABIANE, in *Geography*, a river of Louiſiana, which runs into the Miſſiſſippi. N. lat. 39° 31′. W. long. 91° 47′.

FABIANS, Fabii, in *Antiquity*, a part of the Luperci. Thoſe prieſts conſiſted of two colleges, the firſt of which was called the Fabii, and the ſecond the Quintilii, from their reſpective chiefs. The Fabii were for Romulus, and the Quintilii for Remus.

FABIANUS, Papyrius, in *Biography*, an intelligent naturaliſt, who lived in the reign of Tiberius, and wrote a treatiſe "On Animals." Pliny calls him "naturæ rerum peritiſſimus." He is alſo mentioned by Seneca and other writers. Le Clerc, Hiſt. de la Med.

Fabianus, pope, was a native of Rome, to the biſhopric of which he ſucceeded in the year 236. He preſided in that high ſtation till the year 250, when he fell a martyr to the Decian perſecution. He is characterized by St. Cyprian as "an excellent man, the glory of whoſe death had anſwered the purity, holineſs, and integrity of his life." According to Tillemont, and others, a great part of Gaul was indebted to Fabianus for its knowledge of Chriſtianity, which was taught by the biſhops that he trained up and ſent out in miſſions for the propagation of religion. Moreri.

FABIO, Signor, in the year 1770 was leader of the opera band at Naples; a muſician who knew and performed his buſineſs admirably. As his name or his merit can be little known in England, he would not perhaps have been recorded here but to relate a circumſtance which did him honour, in our opinion, at Naples, but which in England would have degraded him to the rank of a ticket-porter. Having been invited to dine with a gentleman who loved muſic, we obſerved that he was ſo obliging and ſo humble as to bring with him his violin. It is very common in the great cities of Italy to ſee performers of the firſt eminence carry their own inſtruments through the ſtreets. This ſeems a trivial circumſtance to mention, yet it ſtrongly marks the difference of manners and characters in two countries not very remote from each other. In Italy, the leader of the firſt opera in the world carries the inſtrument of his fame and fortune about him, with as much pride as a ſoldier does his ſword or muſquet; while, in England, the indignities he would receive from the populace would ſoon impreſs his mind with ſhame for himſelf and fear for his inſtrument.

FABIUS, Maximus Q. an eminent Roman commander, whoſe hiſtory and deeds are incorporated with that part of his country's annals which are devoted to the period in which he flouriſhed. He was maſter of the horſe to the dictator Papirius, who, jealous of the ſuperiority of an inferior officer, ſought revenge in the death of Fabius; but having eſcaped, he was himſelf made conſul five times, and rendered his country very ſignal ſervices. In the year B. C. 304, he ſerved the important office of cenſor, and reformed an abuſe introduced by Appius Claudius, who, to obtain influence in elections, had diſtributed a great number of freedmen, and perſons of the meaneſt condition, among the country tribes. Theſe Fabius incorporated into four tribes, and thus nearly deſtroyed their influence. On this account he received the appellation of "Maximus," which was made hereditary in his family. The victories which he obtained were very numerous, and many of them of the utmoſt importance to the welfare of Rome; for that over the Gauls and Samnites he obtained a triumph. He afterwards gave a ſignal proof of the love which he bore his country, by oppoſing the elevation of his ſon Fabius Gurges to the conſulate, becauſe he deemed him to be inadequate to the office, from habits of intemperance. Gurges was, however, choſen; and, marching againſt the Samnites, underwent a ſevere defeat. The father immediately went out as lieutenant to his ſon, and by his valour reſcued him, and obtained a ſignal victory over the enemy. Farther ſucceſſes crowned their exertions, for which Gurges, as conſul, was decreed a triumph. The joyful parent followed the triumphal car on horſeback, and was hailed by the citizens as their great champion and deliverer. This was the concluſion of his military exploits. He was again nominated dictator in the year B. C. 287.

Fabius, Maximus, Q. ſurnamed the Cunctator, on account

count of his great prudence in war, was either the grandſon or great grandſon of the former, and attained the honour of the conſulſhip for the firſt time in the year B. C. 233, when he obtained a triumph for a victory over the Ligurians. In his youth he had diſplayed very moderate talents; the meekneſs of his diſpoſition, and the gravity of his manners were imputed to want of character; it was, however, afterwards diſcovered that he had been diligently laying up ſtores of civil and military knowledge. When he was conſul the ſecond time he had to contend with the great Hannibal, and to his ſkill, and well-timed caution, the ſafety of the ſtate was owing. His plan was to hazard nothing, but to hover round the enemy, watching his motions, cutting off his ſupplies, and perpetually haraſſing him with ſmall detachments, while he himſelf, with the main body, remained in poſts of ſafety. This conduct, though the beſt that could be adopted, was very diſpleaſing to the Romans, who recalled him to the city, and refuſed to ratify a convention for the mutual exchange and ranſom of priſoners, which he had made with Hannibal. To enable him to make good his engagements, he ordered his own lands to be ſold, and thus raiſed a ſufficient ſum of money to anſwer the purpoſe.

On departing from the army, he gave orders to Minucius, his maſter of the horſe, not to riſk a battle; but, regardleſs of the command, he attacked the enemy, gained ſome advantages, and was raiſed to an equal rank with Fabius. In a ſhort time he was attacked by Hannibal, and would have been entirely cut off but for the prompt aſſiſtance of Fabius. "On this occaſion," ſays the hiſtorian, "whatever honour Minucius might loſe as a general, he recovered as a man. At the head of his ſoldiers he returned thanks to Fabius for his deliverance, called him father, and reſigned moſt willingly his authority into the hands of the dictator." Fabius embraced him as his friend, and continued him in the poſt of maſter of the horſe. When his dictatorſhip expired, he left his example and advice to the conſul P. Æmilius, who, not being able to reſtrain the raſhneſs of his colleague, Varro, ſuſtained a defeat at the fatal battle of Cannæ. Æmilius, when at the point of death, requeſted a friend to acquaint Fabius that he had never ceaſed to follow his counſel, and was innocent of the misfortune. This diſaſter juſtified the caution of Fabius, and gave him a juſt and high pre-eminence in the ſtate. In the ſubſequent years of warfare he was thrice made conſul; but his moſt conſiderable action was the recovery of Tarentum, which had been baſely given up to Hannibal. His ſucceſs here was ſullied by an indiſcriminate ſlaughter of the defenders, and by great ſeverity towards the inhabitants, who were ſold for ſlaves, after they had been ſtripped of their wealth. While Fabius was collecting with great care all the gold and ſilver for the public treaſury, he was regardleſs of the admirable ſpecimens of the fine arts which abounded in that Grecian colony; and being aſked what ſhould be done with them, he replied, "Let us leave to the Tarentines their angry gods." Fabius lived to an old age, and was much diſconcerted at the ſucceſs which attended the meaſures of Scipio againſt Hannibal, though he did not live to witneſs the triumphant cloſe of the war. His ſon who had been conſul died before him, for whom he himſelf pronounced a funeral oration. By Ennius, Fabius is deſcribed as

"Unus qui nobis cunctando reſtituit rem."

And by Cicero he is repreſented as not leſs uſeful in the toga than at the head of the army. Univer. Hiſt.

Fabius, in *Geography*, one of the military townſhips in Onondago, New York; in which is a poſt-office, and containing 844 inhabitants.

FABLE, a tale or feigned narration, deſigned either to inſtruct or divert; or, as Monſ. de la Motte defines it, an inſtruction diſguiſed under the allegory of an action.

Fable ſeems to be the moſt ancient way of teaching: the principal difference between the eloquence of the ancients and that of the moderns conſiſts, according to Pere Boſſu, in this, that our manner of ſpeaking is ſimple and proper, and theirs full of myſteries and allegories: with them the truth was uſually diſguiſed under thoſe ingenious inventions, called, by way of excellence, μοθοι, *fabulæ*, *fables*; that is, words, as intimating that there was the ſame difference between theſe fabulous diſcourſes of the learned and the common language of the people, as between the words of men and the voices of beaſts.

At firſt fables were only employed in ſpeaking of the Divine Nature, as then conceived; whence the ancient theology was all fable. The Divine attributes were ſeparated, as it were, into ſo many perſons, and all the economy of the Godhead laid down in the feigned relations and actions thereof; either becauſe the human mind could not conceive ſo much power and action in a ſingle and indiviſible being; or, perhaps, becauſe they thought ſuch things too great and high for the knowledge of the vulgar; and as they could not well ſpeak of the operations of this Almighty Cauſe without ſpeaking likewiſe of its effects, natural philoſophy, and at length human nature, and morality itſelf, came thus to be veiled under the ſame fabulous allegoric expreſſion; and hence was the origin of poetry, and particularly of epic poetry.

The critics, after Aphthonius and Theon, reckon three kinds of fables, rational, moral, and mixed.

Fables, *Rational*, are called alſo parables: theſe are relations of things ſuppoſed to have been ſaid and done by men, and which might poſſibly have been ſaid and done, though in reality they were not. Such in the ſacred writings, are thoſe of the ten virgins, of Dives and Lazarus, the prodigal ſon, &c. Of theſe rational fables we have likewiſe about a dozen in Phædrus. See Parable.

Fables, *Moral*, called alſo apologues, are thoſe wherein not only beaſts, but trees, and other inanimate ſubſtances, are introduced as actors and ſpeakers. Theſe are alſo called Æſopic fables; not that Æſop was their inventor, for they were in uſe long before him, *viz.* in the times of Homer and Heſiod, but becauſe he excelled in them. Such was Jotham's fable of the trees, the moſt ancient of any that are now extant. See Apologue.

The rational differs from the moral fable in this, that the former, though it be feigned, might be true; but the latter is impoſſible, as it is impoſſible for brutes or ſtocks to ſpeak.

Fables, *Mixed*, are thoſe compoſed of both ſorts, rational and moral, or wherein men and brutes are introduced converſing together. Of theſe we have a fine inſtance in Juſtin. lib. xxxiii. cap. 4. made by a petty king to alarm the ancient Gauls againſt the Maſſilians, who, arriving out of Aſia into Spain, charmed with the place, begged leave of the inhabitants to build a city. To this effect: A bitch big with young begged of a ſhepherd a place to lay her whelps in; which when ſhe had obtained, ſhe farther begged for leave to rear them there. At length the whelps being now grown up, depending on the ſtrength of her own family, ſhe claimed the property of the place. So the Maſſilians, who are now only ſtrangers, will hereafter pretend to be maſters of this country.

As to the laws of fable, the principal are, 1ſt. That to every fable there be ſome interpretation annexed, to ſhew the moral ſenſe or deſign thereof. This interpretation, if it be placed after the fable, is called επιμυθιον, or *affabulatio*; if before it, ϖρομυθιον, *præfabulatio*. 2. That the narration be clear, probable, ſhort, and pleaſant. To preſerve this probability the manners muſt be expreſſed and cloſely kept to, as in poetry. See Probability and Manners.

M. de la Motte has ſome fine remarks on the ſubject of fables, at the beginning of his "Fables Nouvelles, dediées au Roi, 1719." A fable, according to this polite writer, is a little epic poem, differing in nothing from the great one but in extent: and that in being leſs confined as to the choice of its perſons, it may take in all ſorts at pleaſure, as gods, men, beaſts, or genii, or even, if occaſion be, create perſons; *i. e.* perſonify virtues, vices, rivers, trees, &c. Thus, M. de la Motte very happily introduces virtue, talent, and reputation as perſons making a voyage together. See Epopoeia and Personifying.

That author ſuggeſts two reaſons why fables have pleaſed in all ages and places. The firſt is, that ſelf-love is ſpared in the inſtruction. The ſecond, that the mind is exerciſed by the allegory. Men do not love direct precepts; too proud to condeſcend to thoſe philoſophers who ſeem to command what they teach, they require to be inſtructed in a more humble manner; they would never amend, if they thought that to amend were to obey; add, that there is a ſort of activity in the mind which muſt be humoured; it pleaſes itſelf in a penetration which diſcovers more than is ſhewn; and in apprehending what is hid under a veil, fancies itſelf in ſome meaſure the author of it. The fable muſt always imply or convey ſome truth; in other works, delight alone may ſuffice, but the fable muſt inſtruct. Its eſſence is to be a ſymbol, and of conſequence to ſignify ſomewhat more than is expreſſed by the latter. This truth ſhould for the generality be a moral one; and a ſeries of fictions conceived and compoſed in this view would form a treatiſe of morality preferable to any more direct and methodical treatiſe: accordingly, Socrates, we are told, had a deſign to compoſe a courſe of morality in this way. This truth ſhould be concealed under the allegory, and, in ſtrictneſs, it ought not to be explained either at the beginning or end.

The truth or idea intended ſhould ariſe in the reader's mind from the fable itſelf. However, for the conveniency of the leſs diſcerning readers, it may be a good way to point out the truth or moral in preciſer terms. To have the moral at the end of the fable ſeems much better than at the beginning; the mind is apt to be foreſtalled in the latter caſe; I carry the key along with me, ſo that there is no room to exerciſe my mind in finding any thing myſelf.

The image, M. de la Motte obſerves, muſt be juſt, and expreſs the thing intended directly, and without any equivoque: it muſt be one; *i. e.* all the parts muſt be viſibly acceſſary to one principal end; and it muſt be natural; *i. e.* founded on nature, or at leaſt on opinion.

The writers of fables are not many. If there were any before Æſop, who lived in the time of Solon, about the fifty-ſecond Olympiad, his ſucceſs has quite effaced their memory; and even occaſioned all the good things of that kind to be aſcribed to him. His life, as written by Planudes, is itſelf a thorough fable. It muſt be owned to be very happily imagined to make the inventor of fables a ſlave, and his maſter a philoſopher: the ſlave has his maſter's pride and ill-humour to deal with throughout. His leſſons were all contained in the fables themſelves, and the readers were left the pleaſure of diſcovering them.

It is generally allowed among the learned, that though the matter and invention of the fables be Æſop's, the turn and expreſſion are not. The Greek is of Planudes; and bad Greek it is, in the judgment of F. Vavaſſor, De Ludica Dict. Some authors will have Socrates the author of the fables of Æſop; others attribute them to Solomon, and others to Homer. See Æsop.

Phædrus was a ſlave too, and a freed-man of Auguſtus; but he had the advantage over Æſop in education: he is only a fabuliſt, as he tranſlates and copies. Though his fables be generally ſhort, yet he is prolix compared with his author. His ſtyle, however, is always florid, his deſcriptions conciſe, and his epithets ſuitable: he frequently adds graces never dreamed of by the inventor, and everywhere enriches the ſimplicity of Æſop in the moſt delicate manner.

Pilpay, another fabuliſt, governed Hindooſtan a long time under a powerful emperor; but he was not the leſs a ſlave, for the prime miniſters of ſuch princes are always more ſo than the meaneſt ſubjects. Pilpay comprized all his politics in his fables; and accordingly his work long continued the book of ſtate, or the diſcipline of Hindooſtan. It was tranſlated into Perſian and Arabic, and ſince into the modern languages. His fables, M. de la Motte obſerves, are rather famous than good; but he is the inventor, and the merit of invention will always compenſate for many faults. His fables are often wild and artleſs: and the collection is a ſort of romantic aſſemblage of men and genii, compoſed in its kind like Cyrus or Orlando, where the adventures are continually thwarting and claſhing with each other.

We ſay nothing of the fables of Gabrias, or Babrias, Avienus, who lived towards the end of the fourth century under the empire of Gratian, Abſtemius, &c.

Among the moderns, the moſt celebrated writers are Meſſ. de la Fontaine and De la Motte: the firſt of whom has picked out all the beſt things in Æſop, Phædrus, and Pilpay, and giving them anew in French, with a delicacy and ſimplicity peculiar to himſelf: and which, in the judgment of his countrymen, ſets him even above Phædrus.

The latter, rather than content himſelf with what De la Fontaine had left, choſe to be an inventor. He has ſucceeded. His fables are many of them very happy, though ſome think them too full of thought and reaſoning. His verſification is infinitely more correct than that of La Fontaine, and more ſuitable to the ſubject than that of Le Noble.

We have likewiſe ſome fables much eſteemed of Mr. Gay and Mr. Moore.

Fable is alſo uſed for the plot of an epic or dramatic poem, or the action which makes the ſubject of ſuch a poem or romance. See Poem, Drama, Epic, and Action.

The fable, according to Ariſtotle, is the principal part, and as it were the ſoul of a poem. It muſt be conſidered as the firſt foundation of the compoſition, or the principle which gives life and motion to all the parts. In this ſenſe the fable is defined, "a diſcourſe invented with art, to form the manners by inſtructions diſguiſed under the allegory of an action." The fable is perfect or imperfect, as the action which it relates is more or leſs ſo. For the requiſite qualifications of this action, ſee Action.

The fable of every poem, according to Ariſtotle's diviſion, is either ſimple or implex. It is called ſimple when there is no change of fortune in it; and implex, when the fortune

tune of the chief actor changes from bad to good, or from good to bad. The latter is thought to be the moſt perfect; probably becauſe it is more proper to ſtir up the paſſions of the reader, and to ſurpriſe him with a greater variety of accidents. The implex fable is, therefore, of two kinds. In the firſt the chief actor makes his way through a long ſeries of dangers and difficulties, till he arrives at honour and proſperity, as we ſee in the ſtory of Ulyſſes. In the ſecond, the chief actor in the poem falls from ſome eminence of honour and proſperity into miſery and diſgrace. Thus, in the Paradiſe Loſt, we ſee Adam and Eve ſinking from a ſtate of innocence and happineſs into the moſt abject condition of ſin and ſorrow. The moſt intereſting tragedies among the ancients were founded on this laſt ſort of implex fable, particularly the tragedy of Œdipus, which proceeds upon a ſtory, if we may believe Ariſtotle, the moſt proper for tragedy, that could be invented by the wit of man. Mr. Addiſon, however, is of opinion, (Spectator, N 297,) that this kind of implex fable, in which the event is unhappy, although it is the moſt perfect in tragedy, is not ſo proper for an heroic poem. Milton ſeems to have been ſenſible of this imperfection in his fable, and has therefore endeavoured to remedy it by ſeveral expedients, particularly by the mortification, which the great adverſary of mankind meets with upon his return to the aſſembly of infernal ſpirits, as it is deſcribed in a beautiful paſſage of the tenth book; and likewiſe by the viſion, in which Adam at the cloſe of the poem ſees his offspring triumphing over his great enemy, and himſelf reſtored to a happier paradiſe than that from which he fell.

The epic fable, according to Boſſu, is confined to the rational kind; *i. e.* the actors and perſons are to be gods and men; and yet it admits of great latitude; it may be either grave, illuſtrious and important, or low and popular; either whole or defective; in verſe or in proſe; much epiſodified, or brief; rehearſed by an author, or repreſented by actors on the ſtage; all which are ſo many circumſtances which do not make any alteration in the nature and eſſence of the fable.

The characters that ſpecify the epic fable are theſe: it is rational and probable; it imitates a whole and an important action; and it is long and related in verſe: none of which properties affect the nature of the fable, or make it leſs a fable than thoſe of Æſop.

The fable, according to Ariſtotle, conſiſts of two eſſential parts, *viz.* truth, as its foundation; and fiction, which diſguiſes the truth, and gives it the form of fable. The truth is the point of morality intended to be inculcated; the fiction is the action, or words under which the inſtruction is covered.

To make a plot or fable, the firſt thing, according to the great critic juſt mentioned, is to pitch on ſome moral inſtruction to be exemplified.

E. gr. I would exhort two brothers, or other perſons, who have ſome common intereſt, to live in amity, in order to preſerve it. This is the end of the fable, and the firſt thing I have in view. In order to this, I endeavour to impreſs this maxim on our minds, that "ill underſtanding ruins families and all kinds of ſociety." This maxim is the moral or truth which is to be the ground of the fable; which moral truth is now to be reduced into action, and a general action to be framed from ſeveral ſingle and real actions of ſuch as were ruined by ill underſtanding.

Thus, *e.g.* I ſay, that certain perſons united together for the preſervation of ſomething that belonged to them in common, coming to diſagree, their diviſion left them open to an enemy who ruined them: ſuch is the firſt plan of a fable. The action preſented by this narration has four conditions; it is univerſal, imitated, feigned, and contains a moral truth under an allegory.

The names given to the ſeveral perſons begin to ſpecify the fable. Æſop uſes thoſe of brutes. Two dogs, ſays he, appointed to watch a flock, fall out, fight, and leave all open to the wolf, who carries off what he pleaſes.

If you would have the action more ſingular, and render the fable rational, take the names of men. Pridamant and Orontes, brothers by a ſecond venter, were left very rich by their father's will; but diſagreeing about the partition of their effects, they engaged themſelves ſo far againſt each other that they took no care of their common intereſt againſt Clitander, their eldeſt brother by the firſt venter; which laſt, artfully enflaming their quarrel, and feigning he had no view but to ſome moderate augmentation, which might be made him without oppreſſing them, in the mean time, gets the judges on his ſide, and the other perſons intruſted with the affair, procures the will to be affirmed, and becomes entitled to the whole eſtate about which the brothers were at variance. Now, this fable is rational; but the names being feigned as well as the things, and beſides, the perſons being only of a private rank, it is neither epic nor tragic. However, it may be employed in comedy, it being a rule laid down by Ariſtotle, that epic and tragic poets only invent things, but comic poets invent both names and things. See COMEDY, &c.

To accommodate this comic fable more to the mode and taſte of the town, ſome Dorinda muſt be imagined to have been promiſed to Clitander; but her father, finding him diſinherited by the will, changes his reſolution, and will have her marry one of the rich, ſenſeleſs young brothers, whom ſhe deſpiſes, &c.

But to return. The fiction may be ſo diſguiſed with the truth of hiſtory that there ſhall not appear any fiction at all. To effect this the poet looks back into hiſtory for the names of ſome perſons to whom the feigned action either really or probably did happen, and relates it under thoſe known names, with circumſtances which do not change any thing of the ground of the fable.

As for the fable, it matters but little whether the perſons be called dogs, or Orontes and Pridamant, or Robert of Artois and Ralph de Neſſe, or Achilles and Agamemnon.

Ariſtotle obſerves, that the fable of an epic poem ſhould abound in circumſtances that are both credible and aſtoniſhing; in other words, the fable ſhould be filled with the probable and the marvellous. If the fable is only probable, it does not differ from a true hiſtory; if it is only marvellous, it is no better than a romance. The great ſecret, therefore, of heroic poetry, is to relate ſuch circumſtances as may produce in the reader at the ſame time both belief and aſtoniſhment. This is brought to paſs in a well-choſen fable, by the account of ſuch things as have actually happened, or at leaſt of ſuch things as have happened according to the received opinions of mankind. Milton's fable is a maſter-piece of this kind; as the war in heaven, the condition of the fallen angels, the ſtate of innocence, the temptation of the ſerpent, and the fall of man, though they are very aſtoniſhing in themſelves, are not only credible, but regarded by many as objects of faith. Another method of reconciling miracles with credibility is by a happy invention of the poet; as in particular, when he introduces agents of a ſuperior nature, who are capable of effecting what is wonderful, and what is not to be met with in the ordinary courſe of things. Ulyſſes's ſhip being turned into a rock, and Æneas's fleet into a ſhoal of water-nymphs, though they are very ſurpriſing accidents, are nevertheleſs probable, when we are told that they were thus transformed by the gods. It is this kind of machinery which fills the poems both of Homer and Virgil with ſuch circumſtances as are wonderful, but not impoſſible, and ſo frequently produce in the reader the moſt pleaſing paſſion that can riſe in the mind of man, which is admiration. If we look into the fiction of Milton's fable, though we find it full of ſurpriſing incidents, they are generally ſuited to our notions of the things and perſons deſcribed, and tempered with a due meaſure of probability. We ſhould, indeed, except the "Limbo of Vanity," with his epiſodes of "Sin" and "Death," and ſome of the imaginary perſons in his "Chaos." Theſe paſſages are aſtoniſhing, but not credible; they are the deſcription of dreams and ſhadows, not of things or perſons. The appearance of probability is ſo abſolutely requiſite in the greater kinds of poetry, that Ariſtotle obſerves the ancient tragic writers made uſe of the names of ſuch great men as had actually lived in the world, though the tragedy proceeded upon adventures in which they were never engaged, on purpoſe to make the ſubject more credible. In a word, beſides the hidden meaning of an epic allegory, the plain literal ſenſe ought to appear probable. The ſtory ſhould be ſuch as an ordinary reader may acquieſce in, whatever natural, moral, or political truth may be diſcovered in it by men of greater penetration.

We ſhall devote the ſequel of this article to ſome remarks on the fable of the Iliad, as being the fineſt plan of an epic poem in the world, and at the ſame time the moſt uſeful ſyſtem of the precepts of the art, it being hence that Ariſtotle was furniſhed with all his reflections: reſerving for other articles obſervations on the fable of thoſe poems to which we have referred under the article Epic *Poem*.

In every diſcreet undertaking the end is the firſt thing propoſed; and by this the whole work and all its parts are regulated; conſequently, the deſign of the epopœia being to form the manners, it is with this firſt view the poet muſt begin. Now, the philoſopher dwelling on virtues and vices in general, the inſtructions he gives ſerve equally for all ſtates and all ages; but the poet has a more immediate regard to his countrymen, and the preſſing occaſions of his fellow-citizens. On this view it is that he chooſes his moral, which he is to inſinuate into the people by accommodating himſelf to their peculiar cuſtoms, genius, and inclinations. See how Homer has acquitted himſelf in theſe reſpects.

He ſaw the Greeks, for whom he wrote, divided into as many ſtates as cities, each whereof was a body apart, and had its government independent of the reſt. Yet were theſe different ſtates frequently obliged to unite into one body againſt their common enemies. Here then were two ſorts of government too different to be commodiouſly treated in one poem; the poet accordingly had recourſe to two fables; the one for all Greece, conſidered as confederated together, only conſiſting of independent parts; the other for each particular eſtate, ſuch as they are in time of peace, and without the firſt relation. The firſt is the ſubject of the Iliad, the ſecond of the Odyſſey.

For the firſt kind of government all experience agrees, that the only thing which can render it happy, and its deſign ſucceſsful, is a good underſtanding, and due ſubordination among the ſeveral chiefs that compoſe it; and that miſunderſtandings, a deſire of ſway, &c. are the inevitable bane of ſuch confederacies. The beſt inſtruction, therefore, that could be given them, was to ſet before their eyes the deſtruction of the people, and even of the princes themſelves, through the ambition and diſcord of the latter. Homer, therefore, for the ground or moral of his fable, choſe this great truth, that the miſunderſtandings of princes ruin their ſtates. "I ſing," ſays he, "the wrath of Achilles, ſo fatal to the Greeks, and which deſtroyed ſo many heroes, occaſioned by a diſagreement between king Agamemnon and that prince."

To enforce this truth, he repreſents divers confederate ſtates firſt at variance and unproſperous; then reconciled and victorious: all which he thus includes in one univerſal action. Several independent princes league againſt a common enemy; he whom they chooſe as their leader affronts the braveſt of all the confederacy; upon which the offended prince withdraws, and refuſes any longer to fight for the common cauſe. This miſunderſtanding gives the enemy ſo much advantage, that the confederates are ready to relinquiſh the enterpriſe. The diſaffected perſon himſelf becomes a ſharer in the calamities of his allies, one of his chief friends and favourites being killed by the chief of the enemies. Thus, both parties grown wiſe by their own injury, are reconciled. Upon which the valiant prince, joining again in the war, turns the ſcale to his own party, and kills the enemy's chief.

Such is the firſt general plan of the poem. To render this probable and more intereſting, circumſtances of time, place, perſons, &c. are to be added; that is, the poet looks into hiſtory or tradition for perſons to whom ſuch actions may with truth or probability be attributed.

He pitches on the ſiege of Troy, and ſuppoſes the action to have paſſed there. The brave, choleric character, he calls Achilles; the general, Agamemnon; the chief of the enemies, Hector, &c. To inſinuate himſelf into his readers, he accommodates himſelf to their manners, genius, views, and to render his fable more intereſting, makes his chief perſons, and thoſe who remain victorious, to be Greeks, the fathers of thoſe very people. The courſe of the work is filled up and extended with other uſeful leſſons and inſtructions.

That the epopœia in all its glory is juſtly and ſtrictly a mere fable in the ſame ſenſe as the fictions of Æſop are, is ſhewn by F. Boſſu, in a parallel between the fable of the Iliad and that of Æſop already mentioned. The moral inſtruction is viſibly the ſame in both; ſo is the fiction. All the difference lies in the names and qualities of the perſons.

Homer's are kings; he calls them Achilles, Patroclus, &c. and the general good to be preſerved, he calls the Greeks. Æſop, after his manner, gives his perſons the names of beaſts; the dogs are confederated, the wolf is their enemy; and what Homer calls Greeks, Æſop calls ſheep. One ſays, that while the confederate princes were at variance, Hector ruſhes on the Greeks, and makes them pay dear for the folly of their ſovereigns (delirant reges, plectuntur Achivi); but that the allies, brought by misfortunes to themſelves again, re-unite, repulſe Hector, and kill him. The other, that while the dogs are together by the ears the wolf falls on the ſheep; and that the dogs ſeeing the havoc he makes, join together, drive him away, and kill him.

The two fables were capable of a ſtill nearer reſemblance. Homer has extended his by long ſpeeches, deſcriptions, compariſons, and particular actions; that of Æſop might be amplified after the like manner, without corrupting or altering it. It is neceſſary only to relate what cauſe ſet the dogs at variance, and ſhew the riſe of the fatal wrath in all its circumſtances; to make fine deſcriptions of the plain wherein the ſheep fed, and of ſome neighbouring wood where the wolf was ſheltered; to give this enemy whelps to rear, make them follow their ſire in ſearch of prey, and
deſcribe

deſcribe the carnage they made at divers expeditions. Nor ſhould the genealogy of the heroes be forgotten; the wolf ſhall boaſt himſelf a deſcendant of Lycaon, and one of the dogs be ſprung in a direct line from Canicula; which laſt would be the proper hero of the poem, as being hot, and apt to be enraged. He would repreſent the perſon of Achilles to admiration; and the folly of ſome Ajax, his couſin, would afford a good proof of ſo divine an extraction. Nothing more were required to engage heaven in the cauſe, and divide the gods; which, no doubt, have as much right in Æſop's republic as in the ſtates of Homer. Witneſs Jupiter taking care to give a king to the nation of the frogs.

The reader has here field enough for an epopœia; if he have any thing of fancy and expreſſion, and do but take care to repeat as often as Homer does,

Τον δ' απαμειβομενος προσεφη ποδας ωκυς.

See Iliad and Odyssey.

FABOMIT Lake, in *Geography*, a lake of Canada. N. lat. 52° 28′. W. long. 88° 15′.

FABRA, a town of Italy; 9 miles N.N.W. of Orvieto.

FABRAGAS, a town of Spain, in Catalonia; 13 miles weſt of Gerona.

FABRE, John Claude, in *Biography*, a French eccleſiaſtic, was born at Paris in the year 1688, where he received his education, and was admitted to the degree of bachelor in theology by the faculty of Paris. He afterwards filled the office of profeſſor in ſeveral ſeminaries in France. He died at the advanced age of 85, highly regretted by his brethren and friends for his candour, talents, and learning. He was author of very many works, among which is a Latin and French dictionary, in 8vo. He gave a new edition of the ſatirical dictionary of Richelet in two vols. fol.: for the execution of ſome of the articles he was obliged to ſubmit to exile for a few years. On his return he publiſhed a continuation of the eccleſiaſtical hiſtory of the abbé Fleury; and a tranſlation of all the works of Virgil, accompanied with notes and diſſertations. He gave alſo a proſe tranſlation of the fables of Phædrus, and a ſummary of M. de Thou's hiſtory. Moreri.

FABRETTI, Raphael, a celebrated antiquarian, was born of a good family at Urbino, in 1619. He ſtudied juriſprudence in his native city, and after graduating he went to Rome, and became diſtinguiſhed for his great erudition, and for his knowledge of ſtate affairs. He was nominated to ſeveral diplomatic ſtations, in which he acquired much reputation. His leiſure hours were ſpent in the ſtudy of antiquities, and particularly in the examination and collection of all the inſcriptions, and ancient monuments diſperſed through Latium, for which purpoſe he traverſed the whole of that province alone, and on horſe-back, leaving no part unexplored. In 1680, he publiſhed a work, "De Aquis et Aquæductibus veteris Romæ," which obtained for him high credit among the literati. His next work was a diſſertation "De Columna Trajani," 1683, which contained the particulars concerning the naval and military eſtabliſhments of the ancients. In 1699 was publiſhed at Rome his great work, entitled "Inſcriptionum Antiquarum Explicatio;" of this, it has been ſaid, "that it was the firſt collection which was not filled with fictitious inſcriptions." The author died in the following year, univerſally regretted. His cabinet of ancient monuments was depoſited in the old palace of the dukes of Urbino. Nouv. Dict. Hiſt.

FABRI, John, a phyſician of diſtinction at Rome during the papacy of Urban VIII., was born at Bamberg in Franconia. He took the degree of doctor of medicine at Rome, where he ſettled himſelf, and afterwards became profeſſor of medicine, and botaniſt to the pope. Fabri was particularly diſtinguiſhed by his knowledge of anatomy and natural hiſtory, of both of which ſciences he diſplayed an extenſive knowledge, in his "Commentary on the Natural Hiſtory of Mexico," written by Francis Hernandez. This work contains eſpecially ſome curious facts relative to the anatomy of monſters, and to comparative anatomy. He is ſaid to have been the firſt to oppoſe the generation of certain beings from putrefaction; and he deſcribed with great accuracy the ſtomachs of ruminating animals. He publiſhed alſo an eſſay "De Nardo et Epithymo," in which he refutes ſome opinions of Scaliger.

Fabri Honoré, an induſtrious and learned Jeſuit, was born in the dioceſe of Bellay in the year 1606 or 1607. He for a long time held the chair of profeſſor of philoſophy in the college de la Trinité at Lyons; but in conſequence of his profound knowledge of theology, he was called to Rome, where he was made a penitentiary. He died in that city on the 9th of March, 1688. He was a man of moſt extenſive and univerſal knowledge, and ſtudied medicine and anatomy with conſiderable ardour. He aſſumed the credit of the diſcovery of the circulation of the blood, and father Regnault, and other credulous perſons, have ſupported his aſſumption, on the grounds that he had maintained the fact of the circulation in a diſcuſſion in 1638: but Harvey had publiſhed his diſcovery in 1628.

The works of this Jeſuit conſiſt of an apology for the Peruvian bark, in anſwer to Plempius, which he publiſhed at Rome in 1655, under the title of "Pulvis Peruvianus Febrifugus Vindicatus;" and two other eſſays, one, "De Plantis, et Generatione Animalium," the other, "De Homine," publiſhed at Paris in 1666, and at Neuremberg in 1677.

FABRIANO, Gentile Da, was a painter who rendered himſelf famous in the early ſtage of the art after its reſtoration. He was born at Verona in 1332, and was a diſciple of Giovanni da Fieſole. His moſt conſpicuous work was a picture in the great council chamber of the ſtate of Venice, executed by order of the doge and ſenate, who regarded the work in ſo extraordinary a degree of eſteem, that they granted him a penſion for life, and conferred upon him the privilege of wearing the habit of a noble Venetian; the higheſt honour in the power of the ſtate to beſtow.

Many of his pictures adorn the pope's palace of St. Giovanni Laterano, and the churches in Florence, Urbino, Perugia, Sienna, and Rome. One of them in the church of Santa Maria Nuova, placed over the tomb of cardinal Adimari, repreſenting the Virgin and child, with St. Joſeph and St. Benedict, was highly commended by Michael Angelo; whom Vaſari repreſents as being accuſtomed to ſay that in painting the hand of Gentile was correſpondent with his name. He died in 1412, 80 years old.

Fabriano, in *Geography*, a town of Italy, in the marquiſate of Ancona, at the foot of the Apennines, containing ſeveral rich monaſteries; called one of the four caſtles of Italy, and celebrated for its excellent paper; 33 miles S.W. of Ancona.

FABRIC, the ſtructure or conſtruction of any thing, particularly of a building.

The word is formed of the Latin, *fabrica*, which originally ſignifies a ſmith's ſhop, or forge.

In Italy, the word fabric is applied to any conſiderable building; in France it rather ſignifies the manner of building.

Fabric *Lands*, are lands given towards the maintenance, rebuilding, or repair of cathedrals or other churches, mentioned in the Act of Oblivion, 12 Car. II. cap. 8.

In ancient times almoſt every one gave by his will more or leſs to the fabric of the cathedral or pariſh-church where he lived.

FABRICIA, in *Botany*, (ſo named by Gærtner in honour of the celebrated John Chriſtian Fabricius, late profeſſor of Rural Economy in the Daniſh univerſity of Keil, a pupil of Linnæus, from whoſe manuſcript notes profeſſor Giſeke derived much and important aſſiſtance in his edition of Linnæus's lectures on the Natural Orders of plants, publiſhed in Latin at Hamburgh in 1792. This able man is, however, far more known as the founder of a new ſyſtem in Entomology, in which he purſued the Linnæan idea, with reſpect to quadrupeds and birds, of making the organs of feeding ſubſervient to the purpoſes of arrangement. But however this principle may lead to a natural ſyſtem in thoſe tribes, in inſects it often fails, becauſe in their perfect ſtate eating is by no means their primary or neceſſary occupation. See Entomology. Gærtn. v. 1. 175. t. 35. Sm. Tr. of Linn. Soc. v. 3. 265. Willd. Sp. Pl. v. 2. 951. Claſs and order, *Icoſandria Monogynia*. Nat. Ord. *Heſperideæ*, Linn. *Myrti*, Juſſ.

Gen. Ch. *Cal.* Perianth turbinate, half inferior, attached to the germen, with five deciduous teeth. *Cor.* Petals five, rounded, concave, equal, ſeſſile, inſerted into the rim of the calyx. *Stam.* Filaments numerous, diſtinct, awl-ſhaped, inſerted into the rim of the calyx, ſhorter than the petals; anthers roundiſh, incumbent. *Piſt.* Germen half ſuperior, turbinate, its baſe attached to the calyx; ſtyle cylindrical, ſhort, erect; ſtigma capitate. *Peric.* Capſule orbicular, depreſſed, umbilicated, of eight or ten cells, opening vertically; partitions from the centre of each valve, meeting at the column. *Seeds* one or two in each cell, compreſſed, with a membranous, rounded, terminal wing.

Eſſ. Ch. Calyx half ſuperior, with five teeth. Petals five, ſeſſile. Stigma capitate. Capſule of many cells. Seeds winged.

Obſ. This genus is next akin to *Leptoſpermum*, from which it differs in having numerous cells to the capſule, and very eſſentially in having winged ſeeds, which are only one or two, not many, in each cell. Both were confounded with *Philadelphus* by Dr. Solander, merely becauſe he never happened to have examined the latter, and referred them to it, during his voyage, truſting to future opportunities of inveſtigation, as in many other inſtances. For ſuch apparent inaccuracies therefore the memory of this excellent man is no way reſponſible.

The ſpecies of *Fabricia* at preſent known are two.

1. F. *myrtifolia*. Gærtn. t. 35. f. 4. Capſule of ten cells. Calyx-teeth nearly orbicular.—Native of New Holland. *Stem* ſhrubby. *Leaves* ſcattered, an inch and half long, obovato-lanceolate, entire. *Flowers* ſolitary, on ſhort ſtalks, apparently terminal.

2. F. *lævigata*. Capſule of eight cells. Calyx-teeth triangular.—Native of New South Wales near Port Jackſon. It is now not uncommon in green-houſes about London, where it ſometimes flowers. *Stem* ſhrubby. *Leaves* ſcarcely an inch long, obovate, obtuſe, rather glaucous. *Flowers* white, axillary, ſolitary, on ſhort thick ſtalks.

FABRICIO, Geronimo, in *Biography*, more commonly known by the name of *Hieronymus Fabricius ab Aquapendente*, was born at the town of this name, in the territory of Orvieto, in Italy, in the year 1537. His parents were but poor, yet they found the means of procuring him a good education. He was ſent to Padua, where he acquired a knowledge of the Latin and Greek languages, and, after having gone through the uſual courſe of philoſophy, he began the ſtudy of anatomy and ſurgery under Gabriel Fallopio, one of the moſt intelligent profeſſors of his time. His progreſs under this excellent tutor was ſuch as to acquire for him a character not leſs diſtinguiſhed than that of his maſter, whom he afterwards ſucceeded in the profeſſor's chair, in which he taught the ſame ſciences for nearly half a century, in the univerſity of Padua. During the whole of this long period he maintained an uniform character for eloquence and ſound knowledge, and continued to excite great intereſt in his lectures. He died univerſally regretted in 1619, at the age of 82 years.

The kindneſs and diſintereſted generoſity of Fabricio gained him the eſteem of the principal families of Padua. The republic of Venice conferred many marks of their attention on him; they built a ſpacious anatomical amphitheatre, on the front of which his name was inſcribed; they alſo decreed him an annual ſtipend of a thouſand crowns, and the honour of a ſtatue, and created him a knight of St. Mark. But the celebrity which he obtained for the univerſity of Padua by his talents, afforded him a gratification above that which accrued from all thoſe flattering favours.

His attention was chiefly directed to anatomy and ſurgery, both of which his reſearches materially contributed to elucidate. He is ſaid to have been the firſt to notice the valves of the veins, having demonſtrated their ſtructure in the year 1574. The honour of this diſcovery has alſo been given to Paul Sarpi; but Albinus and Morgagni are of opinion that he was anticipated by Fabricius. Theſe anatomiſts, however, were ignorant of the uſe of this valvular apparatus; but Fabricius has given excellent views of its ſtructure in his engravings. He was exceedingly methodical in his writings, firſt deſcribing the ſtructure of each part of the body, and then its uſes. Valuable as his anatomical writings were, however, his ſurgical works obtained for him a ſtill higher reputation. The improvements which he introduced into the practice of his art, in conſequence of his accurate anatomical knowledge, and the conſiſtent form which he gave to it, have, in fact, gained him the appellation of the father of modern ſurgery. His works are numerous: the firſt, intitled “Pentateuchus Chirurgicus,” publiſhed at Francfort, in 1592, contains five diſſertations on tumours, wounds, ulcers, fractures, and luxations. 2. “De Viſione, Voce, et Auditu,” Venice, 1600. 3. “Tractatus de Oculo, viſûſque Organo,” Padua, 1601. 4. “De Venarum Oſtiolis,” ibid. 1603. 5. “De Locutione, et ejus Inſtrumentis,” ibid. 1603. It is ſaid that, in one day, all the Germans deſerted the ſchool of Fabricius, becauſe, in explaining the mechaniſm of the muſcles of ſpeech, he had ridiculed their mode of pronunciation. 6. “Opera Anatomica, quæ continent de formato Fœtu, de formatione Ovi et Pulli, de Locutione et ejus Inſtrumentis, de Brutorum loquela,” Padua, 1604. The eſſay on the language of brute animals, in this work, is curious, and worthy the attention of naturaliſts. 7. “De Muſculi Artificio, et Oſſium Articulationibus,” Vicentia, 1614. 8. “De Reſpiratione et ejus Inſtrumentis, libri duo,” Padua, 1615. 9. “De Motu locali Animalium ſecundum totum,” Padua, 1618. 10. “De Gula, Ventriculo, et Inteſtinis, Tractatus,” ibid. 1618. 11. “De Integumentis Corporis,” ibid. 1618. 12. “Opera Chirurgica in duas Partes diviſa,” ibid. 1617. This work, in which all the diſeaſes of the body, which are cureable by manual operation,

tion, are treated, paſſed through ſeventeen editions, in different languages. 13. "Opera omnia Phyſiologica et Anatomica," Leipſic, 1687. 14. The whole of his works were alſo publiſhed at Leyden, in 1723, and in 1737, in folio. We have mentioned only the original editions of the works of Fabricius ab Aquapendente, moſt of which have been ſeveral times reprinted.

FABRICIUS, Caius, a Roman commander, diſtinguiſhed for valour and great integrity, was conſul the firſt time B. C. 282, when he gained a complete victory over the enemies of his country, and gained ſo large booty, that after liberally rewarding his ſoldiers he brought four hundred talents to the public treaſury on the day he triumphed, and this glory was all the recompence he reſerved for himſelf. He is particularly diſtinguiſhed for his conduct as ambaſſador to Pyrrhus, king of Epirus, who attempted to gain him over to his cauſe by magnificent preſents. Theſe the general rejected with indignation and contempt, which excited the ſurpriſe of the monarch, who was accuſtomed to ſuppoſe every man venal that approached a court. He was, however, more aſtoniſhed at the virtue of Fabricius, who, when his opponent in the field, refuſed the offer of the royal phyſician to poiſon his maſter, and cauſed the treachery to be made known to the king. Fabricius, in the year 275, ſerved the office of cenſor, and diſplayed that rigour againſt luxury which had been cuſtomary among the ancient Romans. What he enjoined by precept and the authority of his office, he gave weight to by his own example. He contemned riches during the whole of his life, and died ſo poor that a dowry was given to his daughters out of the public treaſury. Out of pure reſpect to his memory, a law of the 12 Tables was diſpenſed with, which prohibited burials within the city. To ſimplicity of manners he added conſummate ſkill as a general, and an extenſive knowledge of whatever related to public affairs. Univer. Hiſt. Plutarch.

Fabricius, George, was born at Kemnitz, in Miſnia, in 1516, and entitled to notice in this work on account of his poetical talents. He publiſhed twenty-five books of ſacred poems, printed at Baſil in two vols. 8vo. 1567. He wrote "The art of poetry in ſeven books;" "A deſcription of Rome and Travels," in plain proſe: likewiſe "Rerum Germaniæ magnæ et Saxoniæ univerſæ memorabilia," 2 vols. fol. "Saxonia illuſtrata ſeu Origines Saxonicæ," 2 vols. fol. and "Rerum Miſnicarum," fol. He publiſhed a collection of the Chriſtian Latin poets, with alterations. He died in 1571; and is much extolled by his countrymen for eaſe and purity of ſtyle; and ſo nice was he in the choice of language, that in his ſacred poems he refuſed to employ a term which referred to Pagan mythology. Moreri.

Fabricius, John Albert, who is celebrated for his great erudition, was born at Leipſic in 1688, and left a helpleſs orphan at a very early age. His education was not neglected, and having borrowed of his ſchool-maſter the Adverſaria of Gaſpar Bartheus, he was ſo aſtoniſhed at the learning diſplayed in that work, that he determined, though at that time only 16 years old, to rival the author in his erudition. On his return to Leipſic, in 1686, he entered vigorouſly upon the ſtudy of theology, and began to conceive the project of his great work, and made collections for the purpoſe. His firſt publication was entitled "Miſcellaneous remarks on the ſeventy Interpreters of the Old Teſtament." During the next ſeveral ſucceſſive years he diſtinguiſhed himſelf as a preacher, a writer, and an able diſputant in theology. In 1693 he went to Hamburgh, and undertook the ſuperintendance of the Library of John Frederick Mayer, devoting all his leiſure to literary purſuits. In 1697 he publiſhed the firſt edition of the "Bibliotheca Latina," in a ſingle volume 8vo. In 1699 Fabricius was elected to the vacant chair of eloquence at Hamburgh, and ſoon afterwards took the degree of doctor of theology, and married the daughter of a ſchool maſter at Hamburgh, whom he eventually ſucceeded, and notwithſtanding the extent of his private ſtudies, no man was more aſſiduous in the inſtruction of his pupils, to whom he devoted ten hours a day for many of the firſt years in which he was engaged in that occupation. He died in the year 1736 in his 68th year, leaving behind him works that muſt perpetuate his name ſo long as learning is in eſteem. Of theſe the principal are:—"Bibliotheca Græca," in 14 vols. 4to. 2. "Bibliotheca Latina," in two vols. 4to. The former is an extenſive and accurate account of the works and lives of Greek authors, with extracts from their moſt rare and curious books: the latter is a ſimilar work with regard to Latin writers. 3. "Bibliotheca Latina Eccleſiaſtica," or a collection of Latin writers concerning eccleſiaſtical affairs. 4. "Codex Apocryphus Novi Teſtamenti," 3 vols. This is a curious compilation of all the falſe goſpels, &c. current in the early ages of Chriſtianity. 5. "Bibliographia Antiquaria," in two vols. containing a notice of all the Hebrew, Greek, Roman, and eccleſiaſtical antiquities. Fabricius was a very modeſt man, and mild in his diſpoſition, and it is thought that he was ſcarcely ever ſurpaſſed in a knowledge of books, ſo that he obtained the title of Bibliothecarius Republicæ literariæ." Moreri.

There is no hiſtorian, biographer, or artiſt, who has been in ſearch of Greek and Roman literature and ſcience but has had great obligations to the indefatigable labours, learning, accuracy, and good taſte of this moſt excellent writer, who is one of the few that can never have been conſulted unprofitably. So ample is the information he affords on every ſubject which he treats, that the enquirer is not only ſure of finding what he ſeeks, but ſtill more ſure of its authenticity and exactitude, when found.

Fabricius, William, better known by his ſurname *Hildanus*, was born at Hilden, a village of Switzerland, whence he was thus ſurnamed, on the 25th of July, 1560. Like his predeceſſor of the ſame name, Fabricius of Aquapendente, he became one of the moſt eminent ſurgeons of his age, and contributed not a little to the improvement of the art. He repaired to Lauſanne in the year 1586, where he completed himſelf in the art of ſurgery, under the inſtruction of Griffon, an intelligent teacher in that city. Here he purſued his reſearches with indefatigable induſtry, and undertook the cure of many difficult caſes, in which he was ſingularly ſucceſsful. He combined a knowledge of medicine with that of his own art, and began to practiſe both at Payerne in 1605, where he remained ten years, and in 1615 ſettled himſelf at Berne, in conſequence of an invitation from the ſenate, who granted him a penſion. Here he enjoyed the univerſal eſteem of the inhabitants. But in the latter period of his life he was prevented by ſevere and frequent attacks of the gout from rendering his ſervices to his fellow-citizens with his accuſtomed aſſiduity. At length, however, this malady left him, and he was ſeized with an aſthma, of which he died on the 14th of February, 1634, at the age of ſeventy-four. His works were written in the German language, but moſt of them have been tranſlated into the Latin. He publiſhed five "Centuries of Obſervations," which were collected after his death, and printed at Lyons in 1641, and at Straſburgh in 1713 and 1716. Theſe "Obſervations" preſent a conſiderable number of curious facts, as well as deſcriptions of a great number of inſtruments of his invention. His collected treatiſes were publiſhed in Latin, at Frankfort, in 1646, and again in 1682 in folio, under the title of "Opera Omnia." And a German edition appeared at Stutgard in 1652. Mangetus. Eloy.

Fabricius, James, an eminent phyſician, was born at Roſtock on the 28th of Auguſt, 1577. Following the advice of Hippocrates, he joined the ſtudy of the mathematics with that of medicine, and was a pupil of Tycho Brahé. His medical ſtudies were not confined to his own country; for he travelled through England, Germany, and the Low Countries, in order to obtain the inſtructions of the moſt celebrated profeſſors; and afterwards repaired to Jena, where he was diſtinguiſhed by the extent of his acquirements, and obtained the degree of doctor at the age of 26. He ſoon gained extenſive employment in his profeſſion, and at length received ſeveral lucrative and honourable appointments. He filled the ſtations of profeſſor of medicine and of the mathematics at Roſtock during forty years, was firſt phyſician to the duke of Mecklenburgh, and afterwards retired to Copenhagen, where he was appointed chief phyſician to the kings of Norway and Denmark, Chriſtian IV. and Frederick III. He died at Copenhagen on the 16th of Auguſt, 1652, in the ſeventy-fifth year of his age; and his remains were carried to Roſtock for interment, by his ſons-in-law and daughters.

His works are entitled,—1. "Periculum Medicum, ſeu Juvenilium Fæturæ priores," Halæ, 1600. 2. "Uroſcopia, ſeu de Urinis Tractatus," Roſtochii, 1605. 3. "De Cephalalgia Autumnali," ibid. 1617. 4. "Inſtitutio Medici practicam aggredientis," ibid. 1619. 5. "Oratio Renunciationi novi Medicinæ Doctoris præmiſſa, de Cauſis Cruentantis cadaveris præſente Homicidâ," ibid. 1620. 6. "Diſſertatio de Novo-antiquo Capitis Morbo ac Dolore, cum aliis Diſquiſitionibus Medicis de diffic. nonnul. Materiis Practicis," ibid. 1640. Eloy. Manget. Biblioth. Med. Pract.

Fabricius, Philip Conrad, profeſſor of medicine in the univerſity of Helmſtadt, was the author of ſeveral uſeful works on the ſubjects of anatomy and ſurgery, which have obtained for him the praiſe of the judicious Haller. His firſt treatiſe was entitled "Idea Anatomes Practicæ," Wetzlariæ, 1741, and contained ſome new directions reſpecting the art of injection, a deſcription of ſeveral branches of the portio dura of the ſeventh pair of nerves, &c. 2. "Sciagraphia Hiſtoria Phyſico-Medicæ," Wetzlariæ, 1746, in which are ſome good obſervations relative to the abuſe of the operation of trepanning. 3. "De Cognitionis Anaſtomoſeos Vaſorum inſigni Uſu," Helmæſtadii, 1750. 4. "Obſervationes nonnullæ Anatomicæ," 1754. 5. "Sylloge Obſervationum Anatomicarum," 1759. Haller. Bibl.

Fabricius, John Lewis, a learned Swiſs divine, was born at Schauffhauſen in the year 1639. Great care was taken of his education, and he obtained the uſual degrees. In 1656 he was admitted to the exerciſe of the miniſtry, and created profeſſor extraordinary of the Greek language at Heidelberg. In theſe characters, and as tutor to the baron de Rothenchild, and to the electoral prince, he diſplayed ſo much integrity and wiſdom, that he was, in 1664, nominated to the honour of eccleſiaſtical counſellor to the elector, who made uſe of his great talents in a political embaſſy to Schaffhauſen. He was afterwards employed in Switzerland by William III. king of England, and the States General, to aſſiſt the Engliſh envoy to the cantons, and to watch over the intereſts of the Dutch republic. He was likewiſe ſucceſsfully engaged in other diplomatic buſineſs, and having completed the work which he undertook he returned to Heidelberg, and from thence he went to Frankfort, where he died in the year 1697. He acquired much reputation for political talents; and for theological learning; but he was deſtitute of that Chriſtian charity which his religion ſhould have taught him, and was active in the perſecution of the Unitarians who were driven out of Poland, becauſe they refuſed to renounce their principles. His works are numerous, and written in the Latin language; they are entitled, "De Viis Dei, an et quouſque ſint ſimiles Viis Hominum;" "De Ludis Scenicis;" "De Controverſia circa Perſonam Chriſti," &c. Moreri.

Fabricius, Charles, a painter of portrait and pieces of perſpective, born at Delft in 1624. His promiſing talents had raiſed conſiderable expectations, which were unhappily fruſtrated by his ſudden and early death in 1654, which happened by the blowing up of the great powder magazine ſituated near his houſe.

FABRICO, in *Geography*, a town of Italy, in the principality of Corregio; nine miles N. of Corregio.

FABRIS, Lucca, in *Biography*, a young ſinger of Naples with a ſoprano voice, who, at the age of twenty-four, the laſt of his life, was the delight and wonder of the Italian theatre. His voice and manner of ſinging were equally perfect, and he was able to contend with the celebrated Guadagni when at the ſummit of his glory; till a fatal effort to ſing a very high and difficult paſſage, which a Neapolitan compoſer had injudiciouſly and cruelly given him to execute in the great theatre of San Carlo, coſt him his life. It is aſſerted that this maſter, merely to encourage him to try to ſurpaſs another ſinger, compoſed an air beyond his natural compaſs and powers of execution; and though the unfortunate Fabris proteſted to him that he could only attempt it at the riſk of his life, the maſter inſiſted on his performing it; by which he burſt a blood-veſſel, that brought on a hæmorrhage, which all the art of medicine and ſurgery being unable to ſtop, ſoon put an end to his exiſtence!" Eſſai ſur la Muſ. tom. iii. p. 317. This melancholy cataſtrophe is related here, not without a hope that it may a little alarm and aſſuage the ambition of our fair country-women who never hear a muſical phenomenon, without trying night and day to rival thoſe powers which nature gives to ſo very few, and at which art can never arrive without endangering the health and exiſtence of thoſe who aſpire at impoſſibilities.

Fabris, in *Ancient Geography*, an iſland of Greece, over-againſt Attica.

FABRISTAN, in *Geography*, a town of Perſia, in the province of Mazanderan; 50 miles E. of Caſbin.

FABROT, Charles Annibal, in *Biography*, a learned juriſt, was born at Aix, in Provence, in the year 1581, and after a liberal education he took the degree of doctor of laws in 1606, and was admitted an advocate in the parliament of Provence. He was afterwards elected profeſſor of law at Aix, and from thence he went to Paris, where he printed his notes on the Greek paraphraſe of Juſtinian's Inſtitutes. This work obtained for him the patronage of the chancellor Seguier, with a penſion. He remained in the metropolis for the purpoſe of tranſlating the Baſilics or collection of Roman laws in uſe in the eaſtern empire, which he finiſhed in ſeven vols. folio, with the title of Baſilicon. He edited other learned works, which he enriched with valuable notes. His application was almoſt inceſſant, and is ſaid to have ſhortened his days, though he did not die till he had attained his 78th year. Moreri.

FABULINUS, in *Mythology*, the god of ſpeech, was the tutelary deity of children, and invoked by them, when they began to ſpeak.

FABULOUS, denotes ſomething that has a relation to fable. Varro divides the duration of the world into two earlier ſtates or periods, called the dark and fabulous. See Age.

Fabulous *Philoſophy* of the Greeks was introduced among them by the firſt founders of their ſtates. Having obſerved, in countries already ſettled, the effect of that mode of delivering the doctrines of religion to the people under the diſguiſe of fable, which univerſally prevailed in Egypt, and which was not unknown to the Phœnicians, Thracians, and other barbarous nations, they found it particularly ſuitable to their deſign of bringing ſtates newly-formed under the yoke of authority. "It was not poſſible," ſays Strabo, (l. i.) "to lead a promiſcuous multitude to religion and virtue by philoſophical harangues; this could only be effected by the aid of ſuperſtition, by prodigies and fables. The thunderbolt, the ægis, the trident, the ſpear, torches and ſnakes, were the inſtruments made uſe of by the founders of ſtates to terrify the ignorant vulgar into ſubjection." Indeed, it cannot be doubted, that the firſt authors of the Grecian fables intended them to be vehicles of inſtruction. But it is now become almoſt impracticable to decipher their meaning; becauſe we are imperfectly acquainted with the hiſtory, opinions, manners, and other circumſtances of the times, when Grecian mythology was formed, and from what a variety of ſources it was derived. Of theſe the two principal were, the cuſtom of ranking public benefactors, after their death, among the gods (Plin. Hiſt. Nat. l. ii. c. 17.) and the practice of applying allegories and fables to natural objects and appearances. (Dion. Halic. Antiq. l. i.) The origin of the world, and the production of natural bodies, were very early clothed in fable, in the coſmogonies of the Egyptians, Phœnicians, Thracians, and other nations; and theſe were afterwards imitated by the Greeks. (See Cosmogony.) Another cuſtom, which has very much contributed to caſt a veil of obſcurity over the fabulous philoſophy of the Greeks, is that which prevailed among them in early times, of giving their mythological doctrines a poetical dreſs. Theſe were commonly choſen as ſubjects of verſe, and every poet enlarged and moulded the ancient fables, according to the fertility and luxuriancy of his own fancy. See the articles Prometheus, Linus, Orpheus, Musæus, Amphion, Melampus, Hesiod, Epimenides, and Homer. See alſo Chaos and Theogony.

FABURDEN, in *Muſic*, is an old Engliſh term, and uſed at the beginning of diſcant, to expreſs what has ſince been ſtyled *counterpoint*. If this ſpecies of harmony had its admirers, it had likewiſe its enemies, when it was introduced independent of the Gregorian chant, or when this chant was corrupted by it; and if many ſtatutes remain for celebrating feſtivals "cum cantu, et diſcantu, à haute voix, à chant et à dechant," there are others to cenſure the art, and keep it within certain bounds. It was thought ſo licentious at the beginning of the fourteenth century, that the uſe of it was prohibited in the maſs by a bull of pope John XXII. 1322. However, there is at the end of it this favourable clauſe: "It is not our intention wholly to prevent the uſe of concords in the ſacred ſervice, particularly on great feſtivals, provided the eccleſiaſtical chant or plain-ſong be carefully preſerved." The Abbé Lebeuf obſerves, that thoſe who drew up this bull, which is inſerted in the body of canon laws, erroneouſly confined diſcant to fourths, fifths, and eighths, from the peruſal of ancient authors on the ſubject of muſic, particularly Caſſiodorus, where they had found the following definition: "Symphonia eſt temperamentum ſonitus gravis ad acutum, vel acuti ad gravem, modulamen efficiens, ſive in voce, ſive in percuſſione, ſive in flatu. Symphoniæ ſunt ſex: prima, diateſſaron: ſecunda, diapente: tertia, diapaſon: quarta, diapaſon et diateſſeron: quinta, diapaſon et diapente: ſexta, diapaſon et diapaſon." "Symphony, or muſic in conſonance, is the mixing grave ſounds with acute, or acute with grave, either in ſinging or playing upon ſtringed or wind inſtruments. Symphonic concords are ſix; the fourth, fifth, and eighth, with their octaves." It is hardly poſſible to read this paſſage, and not give up the conteſt concerning ancient counterpoint; or, at leaſt, reduce it to that meagre kind, of which an example has been given in the firſt volume, (Hiſt. Muſic by Burney, p. 145.)

It is eaſy to ſuppoſe, ſays the Abbé Lebeuf, that the deſign of thoſe who firſt permitted chants in faburden to be ſung in the churches of France, was to diſtinguiſh feſtivals and holy times, by the ornaments and graces with which they were ſung; as, in others was done by allowing particular portions of the ſervice to be performed in faux-bourdon, or counterpoint. Traité Hiſtorique ſur le Chant Eccles. See Falso-bordone.

FAC, in *Italian Muſic*, is an abbreviation of *facciata*, a ſide, or page. See Carta.

FAÇADE, in *Architecture*. See Face.

Facade *Cliff, or Mural Aſcent*, in *Geology*, is a term for the precipitous face of a rock; theſe, in ſome few inſtances, are occaſioned by the ſtrata below having ſunk down at a fiſſure or fault, in others, on the ſea ſhore, they are occaſioned by the waves having undermined and let down the ſtrata, and ſucceſſively waſhed away the ſame; but more commonly facades are occaſioned either by the violent excavation which vallies have undergone, or by the *abruption* of the ſtrata in certain diſtricts, as Dr. W. Richardſon calls it (Phil. Tranſ. 1808), but which had previouſly been called in our work *denudation*, which ſee. According to the obſervations of Mr. Farey, nearly all the lime-ſtone facades in the Derbyſhire mountains appear to have been the ſkirts of veins, and their being coated with the ſpars peculiar to vein-ſkirts, ſeems to have preſerved them from mouldering down or decay, in moſt inſtances.

FACATA, or Fucate, in *Geography*, a ſea-port of Japan, in the iſland of Ximo, where the Jeſuits had formerly a conſiderable eſtabliſhment, and a church; 27 miles W. N. W. of Taiſero.

FACAUT, a town of Aſiatic Turkey, in Caramania; 63 miles N. N. W. of Cogni.

FACE, the ſurface or firſt ſide which a body preſents to the eye. See Surface.

Face, in *Anatomy*, denotes the ſame part of the body as the ſame term ſignifies in common language. Our arrangement of the anatomical department of this work has rendered it neceſſary to deſcribe the various parts of the face in different articles. The mouth, lips, and cheeks are deſcribed in the article Deglutition; the eye-brow, eye-lids, and eyes in the article Eye; and the noſe in the article Nose.

Face is particularly uſed for the viſage of an animal, and eſpecially of a man, as being in him the only part of the body that ordinarily appears to the eye.

The Latins call it *facies*, *vultus*, *os*, &c.

The great variety obſervable in men's faces, voices, and hand-writings, furniſhes a noble argument of a Providence.

The human face is called the image of the ſoul, as being the ſeat of the principal organs of ſenſe; and the place where the ideas, motions, &c. of the ſoul are chiefly ſet to view. Pride and diſdain are ſhewn in the eye-brows, modeſty on the cheeks, majeſty on the fore-head, &c. It is the face which ſhews the ſex, age, temperament, health, or diſeaſe, &c.

The face, conſidered as the index of the paſſions, habits, &c. of the perſon, makes the ſubject of phyſiognomy.

FACE, or *Façade*, in *Architecture*, is ſometimes uſed for the front of a building, or the ſide on which the chief entrance is; as alſo for the ſide it preſents to a ſtreet, garden, court, &c. and ſometimes for any ſide oppoſite to the eye.

FACE, *Facia*, or *Faſcia*, alſo denotes a flat member having a conſiderable breadth, and but a ſmall projecture.

Such are the bands of an architrave, larmier, &c. See FASCIA.

FACE *of a Stone*, is the ſurface or plain part which is to lie in the front of the work. The face is eaſily known when the ſtone is ſcalped, as being always oppoſite to the back, and the back going rough as it comes from the quarry.

The workmen generally chooſe to make one of thoſe ſides the face which, when in the quarry, lie perpendicular to the horizon, and conſequently the breaking, and not the cleaving way of the ſtone.

FACE *of a Gun*, in the *Artillery*, the ſurface of the metal at the extremity of the muzzle of a piece.

FACE, in *Aſtrology*, is uſed for the third part of a ſign. Each ſign is ſuppoſed to be divided into three faces: the ten firſt degrees compoſe the firſt face; the ten following ones the ſecond; and the laſt ten the third. Venus is in the third face of Taurus; that is, in the laſt ten degrees thereof.

FACE *of a Plant*. See HABIT.

FACE *of a Baſtion*, in *Fortification*. See FACE, in a *Military Senſe*, and BASTION.

FACE *of a Place*, denotes the interval between the points of two neighbouring baſtions, containing the curtain, the two flanks, and the two faces of the baſtions that look towards one another.

This is otherwiſe called the *tenaille* of the place.

FACE *Prolonged*, is that part of a line of defence raſant, which is between the angle of the epaule or ſhoulder of a baſtion and the curtain; or the line of a defence raſant diminiſhed by the face of the baſtion.

FACE, *External*, *Facies externa*, in *Ichthyology*, is uſed to expreſs a general form or figure in certain fiſhes, by means of which they agree with ſome and diſagree with others; and according to which likeneſs or diſſimilitude ſome authors of the late ages have arranged them into genera. This general figure in fiſhes conſiſts in the ſhape of the head and body, and the ſhape, ſize, and proportion of the fins and tail, and though very obvious, is very indiſtinct; it being in many caſes, where two fiſhes have the ſame general external face, yet hard to ſay, on a cloſe examination, in what it is that the likeneſs conſiſts. The authors who founded the diſtinction of the genera of fiſhes on theſe external reſemblances ran into very great errors; for it is not enough in a generical diſtinction for the character to be obvious, but it muſt alſo be preciſe and determinate. What this facies had in the firſt of theſe requiſites is often wanted in the laſt; and, in general, it has been found to be no true baſis of diſtinction.

Many fiſh have the facies externa, or general appearance ſo much alike, as to be eaſily coupled at ſight into the ſame genus; and that juſtly, as they really belong to the ſame when more preciſely referred to it, according to their natural and more eſſential character. Of this kind are the gadi, the clupeæ, the ſalmons, the petromyzæ, the coregones, the pleuronectæ, the rays, and many of the cyprini. In theſe the facies externa is of real uſe, as it is an obvious mark, and leads to the road of truth; but there are beſide theſe many other fiſhes which, though they are truly of the ſame genus, yet differ extremely in their ſeveral external appearances, ſo that any method founded on the facies externa muſt ſeparate them, though nature had really joined them in their real characters. The tench and the trutta lacuſtris, or lake-trout, are in regard to their facies externa extremely alike one to the other, yet here this obvious character deceives us; for the tench is a ſpecies of the cyprinus, and the other a true and genuine ſalmon, two genera of fiſhes eſſentially and very widely different, though this method of judging by the external appearance would have coupled together fiſh belonging to them both. In the ſame manner the ſcorpæna and cottus are very like one to the other in their external appearance; but when nicely examined, according to the rules of ichthyology, they are found to belong to two very different genera, and to have very little real likeneſs. From theſe, and numerous other examples of a like kind, it evidently appears, that as the facies externa cannot be depended on for eſtabliſhing the genera of fiſhes, ſome more eſſential characters muſt be enquired after for the regular and natural completion of this neceſſary buſineſs. Therefore, the generical characters of fiſh are to be ſought after in their external and invariable parts, and they are to be arranged into families and genera, according to the agreement of theſe in number, ſituation, figure, and proportion. Among all theſe, the characters taken from the number of the parts, where that is certain and invariable, are moſt valuable, as they moſt readily offer themſelves to the eye, and are leaſt of all liable to errors.

FACE, in the *Manege*. See CHANFRIN.

FACE, in a *Military Senſe*, means that front which is ſhewn by a body of troops, or the general bearings of any particular defences in a fortified place: in the former inſtance, reference is had to the line of front, and not to any change of individual poſition, whether by turning (*i. e.* facing) to the right or to the left, for the purpoſe of marching by files; nor does an echellon movement in any wiſe alter the meaning, it being even underſtood that the line of pivots, on which the wheel was made, denotes the true front or face of that part of a line; though to an enemy there will be preſented an equivocal definition, or diſplay, in conſequence of the tendency of an echellon movement to produce a rapid change of front. For a further inſight into this part of our ſubject, we refer our readers to ESCHELLON and EVOLUTION.

The face of any lines, or fortified works, is to be aſcertained by a conſideration of what proportion of any real figure, or of any imaginary one, the ſeveral defences may occupy. Thus, in a ſquare, there will be four diſtinct faces; in a pentagon, (or figure of five ſides,) there will be five; in a hexagon, (or figure of ſix ſides,) there will be ſix; and thus of any number of portions into which a circle, an ellipſis, (or oval,) or any other perimeter, or circumference, may be divided. In all theſe we judge by the chords, ſubtending the ſeveral portions reſpectively, without adverting to their being either equal or ſimilar, as they ſhould properly be in all works coming under the deſignation of "regular fortification," of which an ample deſcription has been given under the head of CONSTRUCTION, *Military*. It may be proper in this place to obſerve, that our beſt engineers make it a rule not to extend a face beyond certain limits, proportioning the width of the curtain to the magnitude of the area to be encloſed. Conſequently, large areas, which give a greater circumference, are neceſſarily defended by more faces than thoſe of ſmaller compaſs, whereby the flanked angles of the baſtions be-ſome more obtuſe, it being evident, that the angles of a triangle inſcribed in a circle will be more acute than thoſe of a ſquare, (under ſimilar circumſtances,) thoſe of a ſquare more acute than thoſe of a pentagon, and thus, *ad infinitum.*

The firſt ſyſtem of Monſieur Vauban is that generally acted upon: it divides fortification into three claſſes, namely, the little, the mean, and the great. The exterior ſide of the little gives from 120 to 175 toiſes (or fathoms); that of the mean includes from 175 to 185 toiſes; and that of the great ranges from 185 to 260 toiſes. Hence, we readily eſtimate the number of faces into which the circumference of an area ſhould be divided, obſerving, that whenever any portion of that circumference impoſes on us a long ſide, that is, above 280, but not exceeding 340 toiſes, there muſt be formed two faces, covering ſuch long front, or face. This is done by adopting each extremity of the latter as a centre, and deſcribing from them reſpectively an arc, having 180 toiſes for the radius: the interſection of thoſe arcs oppoſite the centre of the front will be the point of union of two faces, of which the ends of the front, whence the arcs were drawn, will be the other extremities.

If the front ſhould exceed 360 toiſes, it ſhould be divided into as many portions, from 175 to 185 toiſes each, as the ground may permit; each ſuch portion being conſidered a ſeparate face, and to be defended by flat baſtions. It has, however, been always conſidered expedient to protect all ſuch diſproportioned faces, by means of whatever outworks may be moſt applicable to local circumſtances. Thus, if there be three ſuch conjunct faces, the centre one ſhould be covered by a horn-work, of which the flanks ought to be thrown at ſuch an angle as might not admit of their acting in behalf of the beſiegers, ſhould they ſucceed in wreſting them from the garriſon. If only two conjunct faces are to be defended, the central baſtion ſhould be well covered by exterior defences; ſuch as a counter-guard, well flanked by lunettes, tenaillons, a fleche, &c.; ſo as to give full effect to the defences, but without ſubjecting them to become obnoxious thereto, when poſſeſſed by the enemy.

The faces of any particular work, ſuch as a raveline, or a baſtion, are thoſe parts which form an angle projecting outwards from the place, towards the eſplanade, or country: conſequently, the faces of works that are mutually parallel, muſt have the ſame line of fire, or aſpect; and, in the ſame degree, flank all other works ſtanding at an angle of not leſs than 60° nor more than 120°.

FACE *of the Meaſures,* in *Mining,* is that part of a mine bounded by the length-way or principal vertical joints, or natural cracks of the meaſures. In coal mines, theſe principal joints are called *ſline back,* or *face joints,* and are generally parallel to each other; and, according to the recent obſervations of Mr. Farey in Derbyſhire and Nottinghamſhire, theſe ſeem to tend towards the ſame point of the compaſs, without regard to the direction in which the meaſures may dip or incline; ſo that the face of the work in the collieries there, is generally towards the two o'clock ſun, or its oppoſite direction, which ſeems a curious circumſtance, and may prove of importance, if more extended obſervations ſhould ſhew it to be a general fact: the leſſer joints which croſs the ſlines, almoſt at right angles, are called *end-joints,* or *cutters,* which ſee.

FACE, *Fr.* in *Muſic,* is uſed to diſtinguiſh the different forms of the triad, or ways of taking the common chord; as 1re face $\begin{smallmatrix}8\\5\\3\end{smallmatrix}$, 2de face $\begin{smallmatrix}3\\8\\5\end{smallmatrix}$, and 3^{me} face $\begin{smallmatrix}5\\3\\8\end{smallmatrix}$; or, as we ſhould ſay, firſt *ſtage* or *ſtation* of a chord, &c. A chord has as many faces or forms as it has notes. The chord of the 7th to G, for inſtance, may be played four ſeveral ways on a keyed inſtrument, placing the thumb on the loweſt note, as $\begin{smallmatrix}8\\7\\9\\3\end{smallmatrix}$, $\begin{smallmatrix}3\\8\\7\\5\end{smallmatrix}$, $\begin{smallmatrix}5\\3\\8\\7\end{smallmatrix}$, $\begin{smallmatrix}7\\5\\3\\8\end{smallmatrix}$.

FACE, *the Human,* to the painter and ſculptor is an object of the utmoſt importance among their various ſtudies. In endeavouring to convey in their repreſentations of the human figure the influence of thoſe emotions of the mind which ariſe from the ſubject adopted, and which are ſuppoſed to occupy the boſoms of the perſons repreſented, much is done by the general action of the figure; but it is the expreſſion or action of the features of the face which identify the paſſion, convey the fulleſt idea of its influence, and literally "give to airy nothing a local habitation and a name." A regard of the eye, a motion of the lip, or of the noſtril, ſometimes ſpeaks a language more forcible than words. An intimate acquaintance therefore with the ſtructure of thoſe ſilent monitors, the features of the face, with the beſt proportions either for their expreſſion or beauty, appears to be abſolutely neceſſary to obtain excellence in the art of repreſenting the different expreſſions cauſed by their variations.

It will be neceſſary, in order to treat this ſubject fully, to trace the growth of the human face from its ſtage of childhood to its maturity and decline, each ſtage having its peculiar variations, and the knowledge of each being requiſite for the exhibition of the painter's and ſculptor's art.

That kind of character which marks the years of childhood is ſo clearly diſcernible, that it admits of no diſpute. The form of the faces and features of children is as peculiar to themſelves as the ſimplicity of their minds; yet we frequently obſerve, even in very young ones, certain indications of genius or ſtupidity, which ripening time afterwards juſtifies. The form of the faces of children inclines to the circle, in contradiſtinction to that of the adult, which is oval, or rather egg-ſhaped, with the apex downwards. The features, when young, are alſo round and ſoftened; the iris of the eye is very large in proportion to the face. Mr. Hogarth, in his "Analyſis of Beauty," obſerves, "that it ever continues the ſame ſize, ſo that you may ſometimes find it in a new-born babe as large as in a man ſix feet high:" it ſerves, therefore, as a ſtandard to meaſure the growth of the other parts of the face. The noſe is flat, the cheeks plump and round, making the mouth appear flattened in the face; the ears are large, and the whole expreſſion heavy. During infancy the faces of boys and girls have no conſiderable difference, but as they grow up the features of the boy take upon themſelves more marks of peculiar character, and grow faſter in proportion to the iris of the eye than thoſe of the girl, thus ſhewing the diſtinction of ſex in the face. A manly featured boy therefore has his features larger than ordinary in proportion to the iris, whilſt thoſe who have the contrary look younger and more childiſh than they really are.

In the progreſs of the face to maturity the features loſe much of their roundneſs, and partake more of the oval, the noſe riſes, the cheeks retire, the mouth forms, and the diſpoſition of the mind begins to ſhew itſelf in the air of the face, and more eſpecially we now perceive a difference in the ſexes, in the more ſpeedy advance of the female towards that form which conſtitutes beauty.

> ———" By degrees
> The human bloſſom blows, and every day
> Soft as it rolls along ſhews ſome new charms,
> The father's luſtre, or the mother's bloom."

That diſtinguiſhing peculiarity, the growth of the beard, alſo takes place in the male; now indeed with us (the inhabitants of ſouthern Europe,) under ſentence of exciſion, but once univerſally eſteemed the proudeſt diſtinction of man, and cultivated with all imaginary care by ſaints and heroes. See BEARD.

Arrived at maturity, the face poſſeſſes the whole character of the man, both phyſical and intellectual, and either ſhines diſtinguiſhed by its character of ſenſe or beauty, or appears odious in its groſſneſs and deformity.

But the viciſſitudes to which all the productions of this world are ſubject forbid a permanence of that maturity, and having now no farther progreſs to make in advance, the beauties of the face gradually change, wither, and die. Imperceptibly at firſt alteration takes place in the features, they loſe their ſoftneſs and fullneſs; lines ſteal upon the cheeks and forehead; the colour of the face declines, and the countenance becomes more and more marked with the repetitions of the actions and expreſſions of the paſſions. Advancing in life the change becomes more viſible, and at length even rapid; and the continued action of the muſcles of the face increaſing the marking of its various parts, they become more angular, and broken into many forms; the projections of the bones become more apparent by the ſinking in of the cheeks, from the loſs of the teeth, which cauſes alſo the lips to diſappear, by folding over the gums; and when the teeth are all gone, the mouth cloſing, brings the jaws nearer together, and ſhortens the ſpace between the noſe and chin; till at laſt time triumphant, overcomes all that deſignated the vigour and ſenſe of man, or the beauty and amiability of woman, and renders thoſe who bore ſo much reſemblance to each other in infancy, again ſimilar in intellect and in perſon; till the laſt earthly ſcene cloſes and mingles them in their common duſt.

The varieties of the human countenance are not confined to theſe diſtinctive marks of the different periods of its exiſtence. Every country, every climate, has its peculiarity; it would require a copious diſſertation to deſcribe all the peculiarities that are nationally characteriſtic; a few of the principal ones will anſwer our purpoſe. (See *Plate* III. *Painting*, *figs*. 1, 2, 3, 4, and 5.) Among them none are ſo obvious as the difference of the negro and the white man, in colour more particularly; for as to form, though the thick lips, broad flat noſe, the want of beard, and the woolly texture of the hair of the former, are powerfully diſtinct from the appearance of the European; they are not more ſo than are the features of the Tartar or the Chineſe, who have round faces pointed at the chin, ſmall eyes, with the outer angle inclining upwards, giving ſtrongly the character of cunning. In the North another race of men are found likewiſe diſtinct in their faces as well figure. The Laplander, and his oppoſite in North America, the Eſquimaux Indian. Hideous deformity to the eyes of an European characterizes their countenances, large, flat, and broad faces; broken and ſunk noſes; thick eye-brows drawn back towards the temples; high cheek bones; thick lips; and large mouths, conſpire to diſguiſe the "human face divine," as the poet has termed it, and conceal the expreſſion of all that is amiable or inviting.

The ſucceſſive approaches to union of theſe countries produce alſo the ſame ſucceſſion of approach in countenance. From the Eaſt, the Chineſe, the Hindoo, the Perſian, the Turk, the Hungarian, the German, &c.: and from the North, the Laplander, the Ruſſian, the Pole, the German, &c. have each their diſtinct claſſes of feature gradually receding from, and approaching to, each other: and on the ſouthern ſide of Africa, the union of the features of the Negro and Chineſe are found in the Hottentot (Barrow's Inland Tour from the Cape of Good Hope.) Add to theſe the different features of the various tribes of North and South America, and ſome idea may be formed of the almoſt infinite varieties of the human face. To ſuch a wonderful extent is this carried, that it is probable that from the firſt formation of man to the preſent time, no two human beings have been exactly ſimilar in feature and form of face.

This ſpeculation, however, is carrying the matter much farther than is abſolutely neceſſary for the purpoſe of the hiſtorical painter. Though it is not amiſs to be thus informed on this head, yet as it has been ſaid, and juſtly too, "that his principal buſineſs is to paint man, not men; the generic character, not the individual ſpecies," we will point out thoſe proportions of the face which are allowed to be the moſt effective in exhibiting beauty or manly character. For this we muſt turn our eyes to the Greeks, who appear to have ſyſtematically arranged their ideas and practice in the production of their ſtatues.

Audran, in a work publiſhed in Paris, has given the following comparative ſcale of proportions of the faces of the Apollo Belvidere, and of an antique Venus, from actual meaſurement. Taking the length of the noſe, which he calls a part, and dividing that in twelve parts, which he calls minutes, he ſtates the faces of the Apollo and of the Venus to have each three parts from the growth of the hair on the forehead to the bottom of the chin. Dividing the lower part into three, the uppermoſt gives the line of diviſion of the lips; the other parts are proportioned as follow:

	Apollo.		Venus.	
	p.	m.	p.	m.
Width of the face from ear to ear -	2	2	2	2
The eye, ſeen in front - - - -		6		5½
Space between the eyes - - - -		6		6
Eye in profile, and the pupil in width		2		2
Width acroſs the noſtrils - - - -		7⅔		6½
Noſe in profile - - - - - -		6½		6
Width of mouth in front - - -		9		7¼
———— in profile - - -		4½		3⅔
From the noſtril to the ear, in profile -	1	8½	1	6
Length of the ear - - - - - -	1		1	

See *Plate* I. *Painting*, *figs*. 1, 2, 3, 4.

The greater part of the Greek ſtatues of the higher claſs have nearly the ſame proportions, and in ſculpture theſe rules are moſt uſually adhered to, particularly where the ſubject is either a perſonification of divine or heroic character, which are indeed the only proper ſubjects for the diſplay of this art. But painting having a wider range, both in ſubject and action, cannot always be bound by them, and in many views of the face it would be abſolutely impoſſible to apply them. As the practice of the painter calls for more individuality than that of the ſculptor, ſo is he more or leſs at liberty to diſpenſe with theſe proportions in a degree; and it muſt never be forgot that men of different characters have differing countenances, their peculiar expreſſions requiring, or rather, perhaps, producing, different proportions. The painter who makes all his faces of the ſame ſtandard can never excite an intereſt in his works, or ever enjoy the praiſe of ſelecting with judgment, or feeling the productions of nature for his imitation. This diverſity in the form of the faces and features ariſing from internal character is the baſis of phyſiognomy, to which, for farther illuſtration upon this ſubject, we refer the reader.

The general proportions mentioned above are, nevertheleſs, of eſſential ſervice to the painter; for if they cannot be ſaid to have a binding influence over him to cauſe him to adhere to them alone, they ſerve him excellently as a rule to ſwerve from, conſtantly checking his caprice, and preventing his running into too common-place an imitation of nature, and producing caricature, inſtead of that character, conſiſtent with the dignity of ſtyle, which ſhould accompany all grand works aiming at ſuperiority of effect.

In drawing the face there are ſome regulations which facilitate the progreſs of it. Having made the oval, or general ſhape of the head, it is uſual to draw a perpendicular line down the centre when ſeen in front, and that is croſſed by an horizontal one in the middle, for the ſtation of the eyes. The perpendicular line being divided into four equal parts, the three lower ones give the ſpace for the face, and according to the above-mentioned rules all the various parts may be ſet off upon theſe lines, it being remembered, that the eyes, noſe, and mouth, are always parallel, and the bottom of the ears on a level with that of the noſe; and in whatever view the face may be required to be drawn, theſe lines, though varying in their directions, will ſtill be of uſe in determining the poſitions of the features. In a head looking downwards thoſe which were horizontal in a direct front view will be found to become concave, or the inferior part of a circle, and the reverſe takes place in one looking upwards; and the impoſſibility of the painter applying in every caſe the rules of proportion will be clearly ſeen, when it is known, that in moſt views of the face ſome of the features are ſeen fore-ſhortened, (ſee Fore-shortening,) and of courſe others appear larger in line than their natural ſize.

When a face is directed to the ground, the forehead and the noſe will appear far too large for the cheeks and chin; and by their projection hide ſomewhat of the other parts of the face. That of the forehead and eye-brows conceals part of the eyes; the noſe hides the mouth partially, or totally, according to the degree of depreſſion of the face, or elevation of the view: the mouth, if not itſelf rendered inviſible, hides a part of the chin; and on the contrary, in the elevation of the face, the upper lip hides the ſpace between it and the noſe; the baſe of the noſe conceals its length, and the eye-brows in part conceal the forehead as we ſee under them, conſequently they project before it in the view.

In all theſe caſes, as has been already obſerved, it is impoſſible to apply the rule, but the artiſt will do well always to keep it in view, as it will facilitate his labour, and generalize his characters, without confining him too ſtrictly, or preventing his reſearch after the more grand and juſt impreſſions of phyſiognomical character, or accidental effects of paſſion or expreſſion; which give the higheſt value to works of art.

For the variations that take place in the face of a man whoſe mind is under the influence of the ſtronger paſſions, ſee Expression, in *Painting*, and Physiognomy for the variations of the lines and features indicative of the peculiarities of natural character in mankind.

Of thoſe peculiarities in the characters of countenance, found among the higher claſs of the Greek ſtatues, we have ſpoken under the word Beauty, as relative to the arts of deſign; of their oval ſhape in front; of the ſtraight, or nearly ſtraight line in profile formed by the forehead and noſe; of thin, full lips, and round chin. Theſe are the forms which were ſelected by thoſe elegantly minded and wiſe men, the Greek artiſts, as moſt impreſſive of grandeur and of beauty in the human face, and the propriety of this ſelection ſtill remains unimpeached, though it is very rarely approached by Nature, and perhaps has never been completely produced by her in one countenance; yet as theſe various features were found ſeparately in her works, and viewed with gratification, the artiſts judiciouſly united them; thus outſhining in perfection the model they imitated, and producing another more pure for her imitation, which ſhe has never yet been found to equal; ſo that to be as beautiful as the Venus in the language of the poets, is to poſſeſs that quality in a ſuper-human degree.

In the productions of nature the human face varies in every direction from this definitely beautiful form. In our own nation (where countenances are not in general lacking either in ſenſe or beauty, and often poſſeſſing both to a very conſiderable degree,) we find among them ſome faces tending to the round, others to the longer proportion, ſome are flat, others prominent, ſome ſquare, others indefinitely ſhaped; the features in ſome are large in proportion to the face; in others, ſmall and cloſe together, occupying only the centre of the face; or elſe, far apart, and with large ſpaces between them. (See *Plate* II. *Painting*, *figs.* 1, 2, 3, 4.) Theſe, with other variations of the like kind, are highly neceſſary to be obſerved by the portrait painter, or the ſculptor, occupied in producing individual reſemblance: and endeavouring to form in the mind a clear idea of the peculiar claſs of arrangement of feature in the face before them, is the readieſt and ſureſt way of producing its like on the canvas or marble. See Portrait *Painting*.

FACELLI, in *Geography*, a town of Naples, in Lavora; 18 miles N.E. of Capua.

FACET, or Facette, a little face or ſide of a body, cut into a great number of angles.

Multiplying-glaſſes are cut in facets, or facet-wiſe. Diamonds are alſo cut in facets or tables.

In brilliants there are two ſorts, ſkew, or ſkill-facets, and ſtar-facets. Skill-facets are divided into upper and under. Upper ſkill-facets are wrought on the lower part of the bezil, and terminate in the girdle.

Under ſkill-facets are wrought on the pavillions, and terminate in the girdle.

Star-facets are wrought on the upper part of the bezil, and terminate in the table. Jeffries on Diamonds. See Diamonds.

Facets *of a hill*, in *Geology*, or face of a hill, are thoſe parts which preſent a plane or flat ſurface. It has often been remarked, that hills and mountains have generally one flat ſide, and which, in moſt caſes, faces towards the eaſt; and a careful examination convinces us that the ſame is occaſioned by this plane being the uppermoſt ſtratum of matter of which the hill is compoſed. In examining the geology of a diſtrict, it is of the utmoſt conſequence to attend to the facets of the hills, becauſe they invariably point out the poſition of the ſtrata, and ſhew us where to look for the uniform top of the ſtrata, and where to expect to ſee the edges and alternation of different ſtrata, expoſed to view, wherever the vegetable ſoil and alluvial depoſits are removed. Some few hills and mountains are compoſed of volcanic matters, ſucceſſively and pretty evenly diſtributed on their ſurfaces, but the number of ſuch hills is exceeding ſmall; other hills owe their origin, in a few inſtances, to alluvial depoſits of the ruins of ſtrata, thrown together without order, or any diſcoverable law; but it is far more common in alluvial countries to find ſtratified hills, with heaps of gravel and alluvial matter on them, generally raiſing them higher than they were before; but ſome parts of the facets of the ſtrata are generally in ſuch caſes ſtill to be diſcovered.

FACETANUS Lacertus, in *Zoology*, the name of a peculiar ſpecies of lizard, called at Rome and Naples the tarantula.

FACIA, in *Architecture*. See Fascia.

FACIAL Artery, in *Anatomy*, is ſynonymous with the external maxillary. See Artery.

Facial *Nerve*, is the portio dura of the ſeventh pair. See Nerve.

Facial *Veins*. See Vein.

FACIES Hippocratica, in *Medicine*, is when the noſtrils are ſharp, the eyes hollow, the temples low, the tips of the ears contracted and cold, the forehead dry and wrinkled, and the complexion pale or livid.

The facies Hippocratica is chiefly obſerved towards the period of phthiſes and other conſumptions, and is held a ſure prognoſtic of death. If it appears within three days after the attack of an acute diſeaſe, it is deemed to indicate death.

FACILE Harbour, in *Geography*, a harbour of New Zealand, in Duſky Bay, on the weſt coaſt of Reſolution iſland, recommended by Capt. Cook to thoſe who are ſailing ſouthward. S. lat. 45° 40′. E. long. 166° 18′.

FACING, in *Engineery*, is the name for a ſmall thickneſs of the common earth, ſoil, or ſtuff of a canal, laid in front of the ſide-lining or puddle, on the ſloping ſides C F and I G, *figs.* 14 and 15, *Plate* I. *of Canals.* Its uſe is to hold up the puddle, while the ſame is working and chopping in the act of puddling, and afterwards to guard the puddle from being penetrated by the hitchers and poles uſed by the bargemen. See Canal.

Facing, in *Military Language*, is that part of the uniform of a profeſſional man, whether commiſſioned, non-commiſſioned, or private, which is contraſted with the colour of his coat, &c. and this relates as much to the collar and the cuffs, as to thoſe parts uſually called lapels, which fold back from the throat down to the waiſt. With the exception of one or two regiments, all our military corps are diſtinguiſhed by facings of various colours; all bearing any royal deputation being of garter-blue, as are alſo the ſeveral corps of marines. For the moſt part, yellow, buff, white, grey, and light green are in uſe; a few may be ſeen of black, pompadore, or ſcarlet. Few regiments wear lapels, but confine themſelves to the uſe of capes and cuffs of the appointed colour, to which their regimental ſtandards, and the ſeveral ornamental parts of equipage invariably conform. It has been conſidered a rule, though not adhered to in modern times, that whenever a regiment loſes its colours, its facings ſhould be diſcontinued until the corps may have regained its credit by taking the colours of ſome oppoſing corps. This does not relate to that kind of privation reſulting from a ſurrender, whether in the field, or in a fortified place, but merely to the act of abandoning the field in ſuch diſorder as ſubjects the enſigns to that moſt heart-breaking misfortune, which, to the honour of the Britiſh army, may be ſaid not to be familiar to our ſervice.

The mode now in uſe, of making lapels, or facings, to fold over to ſuch extent as ſhould afford comfort to the ſoldier, cannot be too much commended: we are ſurpriſed to ſee any deviation from a practice ſo evidently conducive not only to health, but to that compactneſs which facilitates the various movements of the firelock. Conſidering the breaſt and ſtomach to be peculiarly ſubject to derangement, from expoſure to inclement weather, it appears to us a deſideratum, that in lieu of the many expenſive, but frivolous parts of a ſoldier's equipment, ſome device ſhould be adopted, whereby both exceſſive heat, and pinching cold, ſhould be precluded at pleaſure from parts ſo eaſily affected thereby; if our information be correct the total abſence of facings, ſuch as might occaſionally be either buttoned back, or be lapped over, a deficiency to be ſeen in many inſtances, has been the occaſion of very ſerious illneſs, and of no brief obituary liſt, among ſeveral of our expeditions.

Facing, *Façade*, or *Revetement*, in *Fortification*, means that portion of maſonry, or other binding, given to ramparts, with the view to prevent the ſoil of which they are compoſed from crumbling or giving way. When of maſonry, the wall ſhould be five feet thick at the top, with an increaſe or talus, equal to one-ſixth of its height: buttreſſes, called counter-forts, ſhould be built within, at about fifteen feet apart, to ſtrengthen the facing. In order to prevent eſcalade, the facing is generally made full twenty-ſeven feet high, from the bottom of the ditch to the cordon. When the facing is carried up as high as the ſoles of the embraſures, it is called a whole revetement; but when confined to the ditch only, it is termed a half-revetement. Theſe muſt depend on the nature of the ſoil, the facility of obtaining materials, the time that can be beſtowed, the importance of the poſt, &c. Where difficulties occur, as alſo in temporary works, the facings are made with turf; in which caſe they are ſaid to be gazoned. For field-works, and eſpecially in the conducting of ſieges, faſcines, which are faggots made of various materials, are very generally employed, and are found to anſwer the intention. (See Fascine.)

Facing, in *Ship Carpentry*, denotes letting one piece into another with a rabbet.

FACINI, Pietro, in *Biography*, a painter of hiſtory, born at Bologna in 1560. He began to paint when already grown up to manhood, at the advice of An. Caracci, who, on ſeeing a whimſical deſign of his in charcoal, concluded he would be an acquiſition to his ſchool. Of this advice he had reaſon to repent, not only becauſe Facini rouſed his jealouſy by the rapidity of his progreſs, but becauſe he ſaw him leave his ſchool, become his rival in the inſtruction of youth, and even lay ſnares for his life. Facini had two characteriſtics of excellence, a vivacity in the attitudes and heads of his figures, that reſembled the ſtyle of Tintoretto, and a truth of carnation which made Annibal himſelf declare that his colours ſeemed to be mixed with human fleſh.

Beyond this he has little to ſurpriſe; his deſign is weak, his bodies vaſt and undefined, his heads and hands ill ſet on, nor had he time to correct theſe faults, as he died young, in 1602. At St. Franceſco, in Bologna, is an altar-piece of his, the Marriage of St. Catherine, attended by the four tutelary ſaints of the city, and a number of infant angels, which ſhews the beſt of his powers. His children carolling, or at play, in the gallery Matvezzi, and elſewhere at Bologna, are equally admired; they are in the manner of Albani, but with grander proportions. Fuſeli's Pilkington.

FACIO, ut Facias, and *ut des*, in *Law*. See Consideration.

FACK, *in a Ship*. See Fake.

FACKER See, in *Geography*, a lake of Carinthia; 3 miles S.E. of Villach.

FACTEUR, Fr. in *Mechanics*, a maker; as in muſic, a flute or fiddle-maker, an organ-builder. How great a demand there was for flutes in Athens, may be conceived from a circumſtance mentioned by Plutarch in his life of Iſocrates. This orator, ſays he, was the ſon of Theodorus, a flute-maker, who acquired wealth ſufficient by his employment not only to educate his children in a liberal manner, but alſo to bear one of the heavieſt public burdens to which an Athenian citizen was liable, that of furniſhing a choir or chorus for his tribe, or ward, at feſtivals and religious ceremonies. Each tribe furniſhed their diſtinct chorus; which conſiſted of a band of vocal and inſtrumental performers, and dancers, who were to be hired, maintained, and dreſſed during the whole time of the feſtival: an expence conſiderable in itſelf, but much increaſed by emulation among the richer citizens, and the diſgrace conſequent to an inferior exhibition. The fluctuations of trade and public favour have rendered the buſineſs of boring flutes far leſs profitable at preſent than it was in the time of Theodorus. But then we have had a harpſichord-maker in our own country (old Kirkman) who died worth 100,000*l.* and who was as able to maintain a choir as Theodorus, or any dean and chapter of a cathedral.

FACTION, a cabal or party formed in a ſtate to diſturb the public repoſe.

The moſt celebrated factions were that of the Guelphs and Gibelins, who kept Italy in alarm for many ages; and with us that of the Whigs and Tories.

Faction was originally an appellation given to the divers troops or companies of combatants in the games of the circus.

Of theſe there were four, *viz.* the green faction, the blue faction, the red faction, and the white faction. The emperor Domitian is ſaid to have added two others, *viz.* the purple and the yellow.

Theſe factions, with their liveries and badges, were at length aboliſhed; the emulation which was at firſt between them growing to ſuch a height, that in Juſtinian's time 40,000 men were killed in a conteſt between the green and blue factions.

FACTITIOUS, ſignifies any thing made by art, in oppoſition to what is the produce of nature.

FACTO, De. See the article De Facto.

FACTOR, in *Agriculture*, is a term which in ſome places, eſpecially in the northern parts of the kingdom, ſignifies an agent or perſon who has the overlooking and management of an eſtate for another. Perſons of this deſcription are ſomething more than bailiffs, and have commonly a knowledge of the law, in ſo far as landed property is concerned.

Factor, in *Commerce*, an agent or perſon who acts and negociates for a merchant by commiſſion; called alſo commiſſioner, and on ſome occaſion broker, and throughout the Levant, coagis.

Factors are either charged with the buying or the ſelling of goods, or with both.

Thoſe of the firſt kind are uſually fixed in places of conſiderable manufactories, or cities of great trade. Their office is to buy up commodities for merchants reſiding elſewhere; to ſee them packed, and ſend them to the perſons for whom they were bought.

Factors *of ſale* are uſually eſtabliſhed in places where there is a great vent. To theſe, merchants and manufacturers ſend their goods to be ſold for them according to the price and other conditions expreſſed in the orders delivered them; and they are authorized by a letter of attorney, with a ſalary or allowance for their care.

The wages or allowances for ſelling are uſually clear of all expences of carriage, exchange, remittances, &c. excepting poſtage of letters, which are never put to account.

Factors ſhould ſtrictly obſerve the orders of their principals, or elſe they are liable to the damage accruing from the neglect of them. When factors have unlimited commiſſion to do for their conſtituents the beſt they can, they are excuſable, though their tranſactions are attended with loſs to their principals; but no factor, who has merely a commiſſion to ſell, &c. for another, is excuſable for entruſting another perſon beyond the uſual time allowed in the ſale of the commodities which he diſpoſes of; in ſuch a caſe he is anſwerable to the principal out of his own eſtate. (1 Bulſt. 102.) In commiſſions at this time, it is common to give the factor power, in expreſs words, to diſpoſe of the merchandize, and deal therein as if it were his own; by which the factor's actions will be excuſed, though they occaſion loſs to his principal. Goods remitted to a factor ought to be carefully preſerved, and he is accountable for all lawful goods that ſhall come to his hands; yet if the factor buy goods for his principal, and they receive damage after in his poſſeſſion, not through his negligence, the principal ſhall bear the loſs; and if a factor be robbed, he ſhall be diſcharged in account brought againſt him by his principal. (4 Rep. 83.) If a factor ſells on the uſual truſt to a perſon of good credit, who afterwards becomes inſolvent, he is diſcharged; but not if the man's credit was bad at the time of ſale. A factor ſhould always be punctual in the advices of his tranſactions, ſales, purchaſes, freights, and draughts by exchange: he ſhould never deviate from the orders he receives in the execution of a commiſſion for purchaſing goods, either with reſpect to price or quality: if goods that are bought are ſent to a different place from that to which they were ordered, they become the factor's, unleſs the merchant allows them. If a factor buy goods on account of his principal, where he is authorized ſo to do, the contract of the factor ſhall oblige the principal to the performance of the bargain; and the principal is the proper perſon to be proſecuted on non-performance; but if the factor enters into a charter-party of affreightment with a maſter of a ſhip, the contract obliges him only; unleſs he lades aboard generally his principal's goods, then both the principal and lading become liable for the freight, and not the factor. (Goldſb. 137.) It is a general rule, that where a factor, who is authorized to ſell goods in his own name, makes the buyer debtor to himſelf, though he is not anſwerable to his principal for the debt, if the money be not paid; yet he has a right to receive it, if it be paid, and his receipt is a diſcharge to the buyer. The factor may compel ſuch payment by action, and the buyer cannot defend himſelf by ſaying, that the principal was indebted to him more than the amount. (Cowp. 255, 6.) Where goods are ſold by the factor at his own riſk, for which he has an additional allowance, the vendor is not anſwerable to the owner. (Stra. 1182.) Though a factor has power to ſell, and thereby bind his principal, yet he cannot bind or affect the property of the goods by pledging them as a ſecurity for his own debt, though there be the formality of a bill of parcels and a receipt. (Stra. 1178.) A factor that ſells a commodity under the price ordered by his principal ſhall be obliged to make good the difference; and if he purchaſes goods for another at a limited price, and they riſe in value, and he ſecures to himſelf the advantage, he is obliged to ſatisfy his principal for damages; or if he makes any advantage of the ſale of goods which his principal directed him to purchaſe, the principal ſhall recover it from him, and he is liable to be amerced for the fraud. When factors have obtained a profit for their principal, they muſt be cautious how they diſpoſe of it; for if they act without commiſſion they are reſponſible; and if a merchant remits goods to his factor, and about a month after draws a bill on him, and the factor having effects in his hands, accepts the bill, but the principal breaks, and the goods are ſeized in the factor's hands, on behalf of the creditors, it has been judged that the factor muſt anſwer the bill, and come in as a creditor for ſo much as he was obliged by reaſon of his acceptance to pay. If one employs a factor, and entruſts him with the diſpoſal of merchandize, and the factor receives the money, and dies, indebted in debts of a higher nature, and it appears by evidence that this money was veſted in other goods, and remains unpaid, thoſe goods ſhall be taken as part of the merchant's and not of the factor's eſtate; but if the factor has the money, it ſhall be conſidered as the factor's eſtate, and muſt firſt anſwer the debts of ſuperior creditors, &c. (1 Salk. 160.) If a perſon employs a factor to ſell goods, who ſells them on credit, and before the money is paid dies indebted more than his eſtate will pay, this money ſhall be paid to the principal merchant, and not to the factor's adminiſtrator, deducting his commiſſion; for a factor is only as truſtee for his principal. (2 Vern. 638.) Bills remitted to a factor or banker, while unpaid, are in the nature of goods unſold; and if the factor become bankrupt muſt be returned to the principal, ſubject to ſuch lien as the factor may have thereon. (2 Blac. Rep. 1154.) A factor has a lien on goods conſigned to him, not only for incident charges, but as an *item* of mutual account, for the general balance due to him, ſo long as he retains the poſſeſſion; if he parts with the poſſeſſion, he parts with his lien. (1 Burr. 489. 1 Blac. Rep. 104.) If he be ſurety in a bond for his principal, he has a lien on the price of the goods ſold by him for his principal to the amount of the ſum for which he is bound. (Cowp. 251.) A factor has no lien on goods for a *general* balance, unleſs they come into his *actual* poſſeſſion; and if in conſideration of goods being conſigned to him he accept bills drawn by the conſignor, and pay part of the freight, and become inſolvent before the bills are due, and before the goods get into his actual poſſeſſion, the conſignor may ſtop them *in tranſitu*. (1 Term Rep. 119.) If a factor accept bills drawn by his principal upon the faith of conſignments agreed to be made by the principal to the factor, and both of them become bankrupts before a cargo conſigned came into poſſeſſion of the factor; the factor's aſſignees have no property in ſuch cargo, and cannot recover the produce of it againſt the aſſignees of the principal, if the latter have ſold it, and received the purchaſe-money. (1 Term Rep. 783. 4 Bro. P. C. 47.) The conſignor may ſtop goods *in tranſitu* before they get into the hands of the conſignee, in caſe of the inſolvency of the conſignee; but if the conſignee aſſign the bills of lading to a third perſon for a valuable conſideration, the right of the conſignor as againſt ſuch aſſignee is diveſted. There is no diſtinction between a bill of lading indorſed in blank, and an indorſement to a particular perſon. (4 Bro. P. C. 57. 2 Term Rep. 63. 1 H. Blac. Rep. 357. 2 Term Rep. 674. 3 Term Rep. 465.) If a factor ſell goods as his own, by indorſement of the bill of lading, though no delivery is made, the goods being at ſea, the vendor ſhall keep poſſeſſion, unleſs fraud appears between him and the factor. (4 Burr. 2046. 1 Blac. Rep. 629.) A factor who has money in hand belonging to his principals, and who neglects to inſure a ſhip and goods according to order, ſhall make good the damage if the ſhip miſcarry; and if he make any compoſition with the inſurers after inſurance without orders, he is anſwerable for the whole inſurance. As fidelity and diligence are required from the factor, ſo the law requires the like from the principal: if, therefore, a merchant remits counterfeit jewels to his factor, who ſells them as true ones, and ſuſtains loſs or damage by impriſonment or other puniſhment, the principal ſhall not make ſatisfaction to the factor but to the party who purchaſed them. Buſineſs of this kind is called commiſſion-buſineſs; and traders in this way have current as well as commiſſion accounts conſtantly between them, and draw on, remit to, and ſend commiſſions to each other only by the intercourſe of letters, which, among men of honour, are as obligatory and authoritative as all the bonds and ties of law.

Factors, in *Arithmetic*, is a name given to the two numbers which are multiplied one into another; that is, the multiplicand and multiplier; ſo called becauſe they are to facere productum, make or conſtitute the product.

FACTORAGE. The factorage or wages, called alſo commiſſion, is different at different places, and for different voyages: at a medium it may be fixed at about three *per cent.* of the value of the goods bought, beſide the charge of package, which is paid over and above. When factors make themſelves anſwerable for the debts of thoſe perſons with whom they deal, the charges of commiſſion or factorage are, of courſe, enhanced.

FACTORY, a place where a conſiderable number of factors reſide, to negociate and officiate for their maſters or principals.

The term is chiefly uſed in ſpeaking of the Eaſt Indies, and other parts of Aſia, Turkey, Italy, Portugal, &c. whither the European nations ſend their ſhips every year, and where they keep factors to buy the commodities of the country, and ſell thoſe brought from Europe.

Factory is alſo a denomination applied in ſome of our manufacturing counties to the places where particular proceſſes of the manufacture are carried on.

FACTUM, in *Arithmetic*, the product of two quantities multiplied by each other.

Factum, in *Law*. See Fait.

FACULÆ, in *Aſtronomy*, a name given by Scheiner, and others after him, to certain ſpots on the ſun's diſk that appear brighter and more lucid than the reſt of the body.

The word is Latin, being a diminutive of *fax, torch*, and ſuppoſed to be here applied from their appearing and diſſipating by turns.

The faculæ or bright ſpots differ very conſiderably from the maculæ or dark ſpots, in light, colour, figure, magnitude, and duration.

Hevelius aſſures us, that July the 20th, 1634, he obſerved a facula that took up a third part of the ſun's diameter; and from the obſervations of the ſame Hevelius we learn, that the maculæ frequently change into faculæ; but the faculæ into maculæ rarely, if ever. Some authors even contend that all the maculæ degenerate into faculæ before they quite diſappear.

Huygens, however, declares he was never able to diſcover any faculæ, though the maculæ occurred to him very frequently. All the foundation he could ſee for the notion of faculæ, he ſays, was, that in the darkiſh clouds which frequently ſurround the maculæ, one ſometimes diſcerns little points or ſparks brighter than the reſt.

Many authors after Kircher and Scheiner have generally repreſented the ſun's body full of bright, fiery ſpots, which they conceive to be a ſort of volcanoes in the body of the ſun; but Huygens, and others of the lateſt and beſt obſervers, finding, that the beſt teleſcopes diſcover nothing of the matter, agree to explode the phenomena of faculæ. Their cauſe theſe authors attribute to the tremulous agitation of the vapours near our earth; the ſame as ſometimes ſhews a little unevenneſs in the circumference of the ſun's diſk when viewed through a teleſcope. Strictly, then, the faculæ are not eructations of fire and flame, but refractions of the ſun's rays in the rarer exhalations, which, being condenſed in the neighbourhood of that ſhade, ſeem to exhibit a light greater than that of the ſun. See Spots.

FACULTY, a power or ability of performing an action. The term is much uſed by the ancient philoſophers, and ſtill retained in the ſchools for explaining the actions of natural bodies. Thus, to account for the act of digeſtion, they ſuppoſe a digeſtive faculty in the ſtomach; to account for motion, they imagine a motive faculty in the nerves, &c. which is only a ſubſtituting of one name of an unknown phenomenon for another.

The Faculties or *powers of the ſoul* are commonly reputed two, *viz.* the underſtanding and will,

Faculty is alſo applied in the *Schools*, to the divers parts or members of an univerſity, divided according to the arts or ſciences taught or profeſſed there.

There are four faculties in moſt univerſities; that of arts, which includes the humanities and philoſophy, and is much the moſt ancient and extenſive; the ſecond is that of theology; the third, medicine; and the fourth, juriſprudence, or laws. See each under its proper article.

The degrees in the ſeveral faculties in the univerſities are thoſe of Bachelor, Maſter, and Doctor.

The Faculty is frequently uſed abſolutely, and by way of eminence, for that chiefly ſtudied and taught in any particular place.

Faculty, in *Law*, denotes a privilege or ſpecial power granted to a man by favour, indulgence, and diſpenſation, to do that which regularly by law he cannot; as to eat fleſh upon days prohibited, or to marry without banns firſt aſked, &c.

Faculties, *the Court of.* See Court *of Faculties.*

Faculty *of Advocates*, in Scotland. See Advocate.

FACUSIM, in *Geography*, a town of Japan, in the iſland of Niphon; 55 miles N.E. of Meaco.

FADELA, a town of Fez; 28 miles S.W. of Salee.

FADEN-HOTUN, a town of Corea, on the river Oula. N. lat. 41° 3′. E. long. 125° 44′.

FADLA, a town of Arabia, in the province of Nedsjed; 180 miles N.E. of Mecca.

FADOAL, a ſmall iſland in the Eaſt Indian ocean. S. lat. 5° 51′. E. long. 132° 37′.

FÆCES, in *Phyſiology*, the reſidue of the food, which is expelled from the body, after the nutritious parts have been abſorbed by the inteſtines. See Digestion.

Fæces, in *Chemiſtry*. Excrement, feces, or fecal matter, is the indigeſtible reſidue of the food, both liquid and ſolid, mixed or combined with bile and other ſecretions, during its paſſage through the alimentary canal.

The eager and unwearied ſearch after gold, which diſtinguiſhed and diſgraced the ancient alchemiſts, rendered them liable to be impoſed upon by the ſlighteſt and moſt fooliſh coincidences and analogies: hence doubtleſs it was that the caſual and ſlight reſemblance in colour between gold and the moſt diſguſting of all ſubſtances led them to ſubmit human ordure to various chemical proceſſes, with the expectation of obtaining from it an oil which ſhould have the property of fixing mercury. The details of moſt of theſe experiments have ſuffered the oblivion which they merited, and the diſcovery of pyrophorus by Homberg is the only known fact of any importance which has reſulted from them. This preparation, which is now obtained by a perfectly inoffenſive proceſs, was firſt procured from the matter remaining in the retort after dry diſtillation of human excrement.

In the year 1806 a laborious inveſtigation of this ſubſtance was undertaken by Berzelius with a view of illuſtrating the chemical hiſtory of the proceſs of digeſtion, from which we have ſelected the following particulars. Recent excrement appears to contain neither acid nor alkali in an uncombined ſtate. Its odour is peculiar and remarkably fetid, but by time it becomes ſenſibly ſouriſh. When of a medium conſiſtence it loſes about three-fourths of its weight, by being dried in a water bath. It is diffuſible in water by agitation and maceration, and if ſtrained through a linen cloth in this ſtate, it may be divided into a ſomewhat turbid fluid and an inſoluble reſidue. This latter is of a greyiſh brown colour, and a very permanently fetid odour. When dried it appears to conſiſt principally of the undigeſted reſidue of vegetable, and perhaps alſo animal food. It amounts to about 7 *per cent.* of the entire matter. The ſtrained liquid by ſtanding depoſits a ſlimy matter of a yellowiſh-green colour, which is ſeparable from the more fluid portion by filtration. It appears to conſiſt, firſt of a matter ſoluble in alcohol, and much reſembling the reſin of bile; ſecondly, of a matter inſoluble in alcohol, but ſoluble in water, poſſeſſing many of the properties of mucus, and readily putrefying at the ſame time, exhaling the odour of urine; thirdly, of a greeniſh-grey reſidue inſoluble in water and alcohol, and affording by incineration ſilex and phoſphat of pot-aſh.

The clear liquor, after ſeparation of the ſlimy matter, is of a light yellow colour, which, by expoſure to the air, becomes brown and turbid. By gentle evaporation it depoſits cryſtals of ammoniaco-phoſphat of magneſia.

The conſtituent parts of the remaining fluid are, 1, albumen; 2, reſin of bile combined with ſoda; 3, a peculiar ſubſtance of a reddiſh brown colour, that appears to be reſin of bile ſomewhat altered.

The proportions of the above ſubſtances, according to Berzelius, are the following:

Water	73.3
Vegetable and animal undigeſted reſidue	7.0
Bile	0.9
Albumen	0.9
Extractive matter	2.7
Carbonat of ſoda	0.9
Muriat of ſoda	0.1
Sulphat of ſoda	0.05
Ammon. phoſphat of magneſia	0.05
Phoſphat of lime	0.1
Slimy matter	14.0
	100.0

The excrements of ſtall-fed cattle have been examined by M. M. Thaer and Einhof. The colour of this ſubſtance is yellowiſh green; its odour is ſomewhat like that of muſk. It contains no exceſs of acid or alkali; when ſubmitted to the agency of ſulphuric acid there is a diſengagement and production of acetic acid.

100 parts of recent excrement are reduced, by drying on a water-bath, to 28.

When diffuſed through water and ſtrained, there remains behind a yellowiſh fibrous matter, which appears to be vegetable fibre but little altered. The ſolution depoſits, by ſtanding, a ſlimy ſubſtance, to which the fæces owe their peculiar odour and colour. It is inſoluble in water or alcohol; when heated it gives out an odour like that of ox-bile. It is ſcarcely affected by the alkalies; but ſulphuric acid developes from it acetic acid, and the oxymuriatic acid renders it yellow.

The fluid remaining, after ſeparation of the above ſlimy ſubſtance, is at firſt colourleſs, but, by expoſure to the air, becomes firſt of a wine yellow, and then of a brown colour. When evaporated to dryneſs, there remains a browniſh matter, of a bitteriſh taſte, inſoluble in alcohol, but ſoluble in water. It is not precipitated by infuſion of galls; it ſoon becomes putrid, exhaling an ammoniacal odour, and during combuſtion exhibits the uſual characteriſtics of animal matter,

ter. The fixed parts, after incineration of eight ounces of the entire excrement, were as follow :

Lime	12.
Phoſphat of lime	12.5
Magneſia	2.
Iron	5.
Alumine with ſome manganeſe	14.
Silex	52.
Muriat and ſulphat of potaſh	1.2

The excrements of carnivorous animals have not hitherto been examined. The dung of dogs (called album Græcum) merits notice on account of its remarkable efficacy in ſome of the proceſſes of leather-dreſſing. The great conſumption of dung of all kinds is in agriculture as a manure. It is alſo largely employed in the conſtruction of artificial nitre-beds. The dung of the larger domeſtic graminivorous quadrupeds is dried and made uſe of as fuel in thoſe countries that are deſtitute of coal and wood: the ſoot ariſing from this combuſtion is the ſubſtance from which the Egyptians procure ſal ammoniac by ſimple ſublimation; and it is probable that a ſimilar advantage might be taken of it in other countries.

FAECHDT, in *Geography*, a river of France, which runs into the Ill, near Guemar, in the department of the Upper Rhine.

FÆCULA. See Fecula.

FAENZA, in *Geography*, a city of Italy, and capital of the department of the Amone, the ſee of a biſhop, ſuffragan of Ravenna; anciently called *Faventia*. It was ravaged by Totila, king of the Goths, in the 6th century, and in the 13th ruined by the emperor Frederick II. becauſe it eſpouſed the intereſt of the pope; but afterwards reſtored by Manfredi. It afterwards fell under the power of the Venetians, the Bologneſe, and, at length, under that of the church. In 1708 it was taken by the Imperialiſts; in 1796 by the French, and afterwards by the troops of the pope, who garriſoned it. In 1797 the pope's troops were defeated and expelled. Although it has an old fortreſs, it has no other defence beſides a plain covered curtain with its ditch. It had formerly 15 or 16 churches, or convents. The cathedral ſtands in the great ſquare, and is adorned with a handſome ſteeple five ſtories high, with baluſtrades. Near the church is a fountain, the baſon of which is ſurrounded by four fine lions of braſs, and encompaſſed with a wrought iron rail. Faenza was famous for its pottery, which took its name from that of the town. It is 20 miles S.W. of Ravenna. N. lat. 44° 18′. E. long. 11° 51′.

FÆOE, an iſland of Denmark, in the Baltic, near the north coaſt of Laland, about 12 miles in circuit, with two or three villages. N. lat. 54° 52′. E. long. 11° 20′.

FAERNO, Gabriel, in *Biography*, a Latin poet and philologiſt, was a native of Cremona. His great learning obtained for him the employment of corrector and reviſor of the books in the Vatican library. He was afterwards patronized by the cardinal de Medicis, both while he was cardinal, and when he was elevated to the popedom by the name of Pius IV. Faerno employed all his influence in ſupport of men of worth, integrity, and learning; but he did not long enjoy the opportunity of being thus uſeful; he died in the prime of life, in 1561, much reſpected for the amiableneſs and ſimplicity of his character. His chief work, as a literary man, is entitled "Fabulæ centum ex antiquis auctoribus delectæ." Faerno was a ſkilful critic, and took pains in collating the beſt MSS. of ancient authors. He edited the Philippics of Cicero and the comedies of Terence. Moreri.

FAES, Vander. See Lely.

FÆSTING Men. See Fastermans.

FÆSULÆ, Fiesoli, in *Ancient Geography*, a town of Etruria, N.E. of Florentia; whence, it is ſaid, the Augurs paſſed to Rome. Catiline made it a place of arms. The Goths, when they entered Italy under the conſulate of Stilicon and Aurelian, A.D. 400, were defeated near this town.

FÆTOR. See Foetor.

FAFAA, in *Geography*, one of the ſmall Friendly iſlands, four miles N. of Obſervatory point, on the coaſt of Tongataboo.

FAG, is uſed for a knot or excreſcency in cloth. Stat. 4 Edw. IV. cap. 1. The *fag-end* of a piece of cloth, or linen, is that in which the weaver ends his piece, and works up his worſt materials.

Fag-*end*, in *Sea Language*, denotes the end of any rope or cord which is become untwiſted and looſened by frequent uſe; to prevent which, the ends of ropes are generally well-faſtened by winding a piece of ſmall line or packthread around them, which operation is called whipping.

FAGAGNA, in *Geography*, a town of Italy, in Friuli, eight miles W. of Udina.

FAGAN, in *Conchology*. Adanſon denominates the Arca ſenelis fagan in his Hiſt. Senegal.

FAGARA, in *Botany*. The name ſeems to be of Arabian origin, and not, as the learned profeſſor Martyn ſuppoſes, from φαγω, *to eat*. Linn. Gen. 160. Schreb. 80. Willd. Sp. Pl. v. 1. 666. Mart. Mill. Dict. v. 2. Juſſ. 374. Gærtn. t. 68. Bauh. Pin. 412. Ger. em. 1548. (Pterota; Brown. Jam. 146. t. 5. f. 1. Euodia; Forſt. Gen. t. 7.) Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Dumoſæ*, Linn. *Terebintaceis affine*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, very ſmall, in four deep, concave, permanent ſegments. *Cor.* Petals four, oblong, concave, equal, ſpreading. *Stam.* Filaments four, longer than the corolla; anthers ovate. *Piſt.* Germen ſuperior, ovate; ſtyle thread-ſhaped, the length of the corolla; ſtigma of two bluntiſh lobes. *Peric.* Capſules one, two, four, or five, ovate, of one cell and two valves. *Seeds* ſolitary, roundiſh, poliſhed.

Eſſ. Ch. Calyx four-cleft. Petals four. Capſules ſuperior, of two valves and one cell. Seeds ſolitary.

A genus of aromatic, ſometimes prickly, ſhrubs, with ternate or pinnate leaves. Willdenow has twelve ſpecies, found in various of the warmer parts of the globe, none of them in Europe.

Linnæus confounded with his *F. Pterota*, which is Browne's Jamaica plant, the *F. Avicennæ*, Cluſ. Exot. 185. Lob. Ic. v. 2. 133. Lamarck Encycl. v. 2. 445, which is the original officinal one, a native of China. Lamarck ſaw a ſpecimen of this laſt, gathered by Father d'Incarville, in Juſſieu's herbarium, and corrected the above error. The qualities of this fruit are ſomewhat aromatic and acrid, whence it was formerly thought an uſeful ſtomachic, or ſtimulant, but it is now entirely laid aſide in practice.

Fagara, in the *Materia Medica*, the name of a fruit reſembling the cubebs found in the Philippine iſlands. The part of this fruit which contains the principal virtue is the outer rind; this is tender and blackiſh, and of an aromatic and ſomewhat acid taſte. When the berries are ripe they eaſily break, and diſcloſe a black, ſhining, ſolid kernel, void of taſte and ſmell. The berries, according to Avicenna, are heating and drying, and good for a cold weak ſtomach, to help digeſtion, and are aſtringent to the bowels. They were once much uſed, but of late are ſcarce known in the ſhops.

FAGERHULT, in *Geography*, a town of Sweden, in the province of Smaland; 35 miles N.W. of Calmar.

FAGGOT, in *Agriculture*, is a bundle of any ſort of ſmall wood tied up cloſely together by means of a with, or other kind of ligature. They are moſtly made up from the cuttings or thinnings of under-woods, coppices, and hedges, being ſold in many diſtricts to the bakers, for the purpoſe of heating their ovens. They uſually fetch a good price in many ſituations, eſpecially near large towns. In making up theſe bundles the workmen trim off the ſuperfluous ſpreading branches from the ſides and ends, which gives them a neater appearance. Theſe trimmings are put in the middles of the faggots which are to be made up, by which they appear to greater advantage.

Theſe trimmings are of little or no uſe in the faggots, and ought to be left on the ground; for being ſmall, they would ſoon rot there, and would manure the ground ſo as to be of more advantage to the next growth than is eaſily imagined. The leaves of the trees falling to the earth, manure it very much; but this is nothing to the advantage of theſe little pieces of wood; any rotten wood, but in a moderate quantity, will turn a common bad earth into good garden mould; and the growth of the young trees is more forwarded by this manure where it is left, than by any other means that can be uſed to it. We always ſee the land where wood-ſtacks have ſtood enriched to a ſurpriſing degree by them, and the ſame advantage will occur wherever wood of any kind is left to moulder and rot upon the ground. That ſort of ſmall wood which is bound up in faggots is called faggot-wood, and ſometimes buſh-wood. Faggots for fuel are required by 43 Eliz. cap. 14, to contain in compaſs, beſides the knot of the bond, twenty-four inches of aſſize; and every faggot-ſtick within the bond ſhall contain full three feet of aſſize, except only one ſtick, which is to be but one foot long, to ſtop or harden the binding.

Faggot, or *Fagot*, in *Fortification*. See Fascine.

Faggot *of Steel*, expreſſes the quantity of 120lb. weight.

Faggot, in the times of Popery in theſe kingdoms, was a badge wore on the ſleeve of the upper garment by ſuch as had recanted and abjured what was then deemed hereſy; being put on after the perſon had carried a faggot, by way of penance, to ſome appointed place of ſolemnity. The leaving off this badge was ſometimes interpreted a ſign of apoſtacy.

Faggots, among *Military Men*, are ineffective perſons who receive no regular pay, nor do any regular duty, but are hired occaſionally to appear at a muſter, to fill up the companies, hide the real deficiencies thereof, and cheat the king of ſo much pay, which goes into the officer's pocket.

FAGIANO, in *Geography*, a town of Naples, in the province of Otranto; ſix miles E.S.E. of Tarento.

FAGIUS, Paul, in *Biography*, a learned German divine, was born at Reinzabern, a town in the Palatinate, in the year 1504. In the courſe of his education he recommended himſelf to the notice and eſteem of his preceptors by great diligence in his ſtudies. At a very early period he was diſtinguiſhed for his proficiency in the learned languages and in the Hebrew tongue. He became intimate with Bucer, and the other celebrated reformers. At the age of twenty-three he was obliged to engage in the buſineſs of ſchool-maſter, in which he acquired great reputation, but he was bent on the work of the miniſtry, to which he looked as the conſummation of his wiſhes, and in 1537 he was invited by the ſenate of Iſne to undertake the paſtoral office in that town, and for ſeveral years he diſcharged the duties connected with it with high reputation. Here the plague broke out with violence, during the ravages of which he diſplayed a noble and benevolent ſpirit, by reproving the rich, who, from their apprehenſions, were led to deſert the poor and the afflicted; by eſtabliſhing a fund for the relief of the diſtreſſed, and by engaging the magiſtrates to make ſuch wiſe and humane regulations as contributed to leſſen the horrors of that dire calamity: and it is related, to his great honour, that Fagius never quitted the ſcene of infection, but devoted his whole time to the ſervice of the afflicted, perſonally viſiting them, and affording them every relief in his power. He was, however, ſpared by the hand of Providence, although he ſaw multitudes falling on his right hand and on his left. The plague reached to Straſburg, and numbered Wolfgang Capito among its victims, whom he afterwards ſucceeded in the miniſterial functions: and at the ſame time he exerted all his powers in publiſhing ſuch works as eminently conduced to the promotion of the intereſts of religion and literature. In 1546 Frederic II., elector palatine, ſent for him to Heidelberg, to conduct the meaſures proper to bring about a reformation of religion in his dominions, a project which, from ſome unfavourable circumſtances, was obliged to be ſuſpended. He returned to Straſburg, reſumed his miniſterial and literary employments, and aſſiſted Bucer and Martyr in the duties of the profeſſorſhip of theology. In 1548 he was obliged, by the treatment which the Proteſtant divines experienced from the emperor, to quit Straſburg, and he fled for ſafety to England with Bucer, both of whom had received preſſing invitations from Cranmer, archbiſhop of Canterbury. They reſided for ſome time at Lambeth, and it was intended that they ſhould proceed from thence to Cambridge, where they were to be employed as profeſſors, and engaged in completing a new tranſlation of the ſcriptures. Fagius died, before he had made any progreſs in the work, in 1550, at the age of 45. During the infamous reign of Mary, his remains, and thoſe of Bucer, were dug up and burnt, a paltry kind of revenge, and worthy of thoſe who inflicted it. His works are chiefly theological, and connected with biblical literature. Moreri.

FAGLOE, in *Geography*, one of the Faroer iſlands, in the North ſea.

FAGNANO, a town of Italy, in the department of the Amona; 10 miles S. of Faenza.

FAGO, a town of Spain, in Aragon; 18 miles N.W. of Iaca.

FAGONA, in *Anatomy*, a conglomerate gland, called alſo thymus.

FAGONIA, in *Botany*, ſo called by Tournefort, in compliment to Monſ. Fagon, principal phyſician to Louis XIV. and a great patron of botany. He was one of the chief promoters of Tournefort's journey to the Levant, which he ſtrongly and repeatedly recommended to the conſideration of his ſovereign. Tourn. Inſt. 265. t. 141. Linn. Gen. 212. Schreb. 289. Willd. Sp. Pl. v. 2. 565. Mart. Mill. Dict. v. 2. Juſſ. 296. Gærtn. t. 113. Claſs and order, *Decandria Monogynia*. Nat. Ord. *Rutaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of five lanceolate, upright, ſmall, deciduous leaves. *Cor.* Petals five, alternate with the calyx, rounded, equal, with claws about as long as its leaves, the limb ſpreading beyond their points. *Stam.* Filaments ten, ſimple, awl-ſhaped, ſmooth, erect, longer than the claws; anthers roundiſh. *Piſt.* Germen ſuperior, with five angles; ſtyle awl-ſhaped, as long as the ſtamens; ſtigma ſimple. *Peric.* Capſule ovate, with five deep furrows, and as many obtuſe prominent angles, of five compreſſed cells, and ten valves. *Seeds* ſolitary, ovate, ſmooth.

Eſſ. Ch. Calyx of five leaves. Petals five, rounded, with claws. Stamens ſimple. Capſule ſuperior, of ten valves and five cells. Seeds ſolitary.

1. F. *cretica.* Linn. Sp. Pl. 553. Curt. Mag. t. 241. "Spinous. Leaflets lanceolate, flat." Annual, native of Crete, beſt preſerved in the green-houſe, or even ſtove. *Stem* often procumbent, branched, divaricated. *Leaves* oppoſite, ternate, ſtalked, dark green; leaflets all ſeſſile, nearly equal, acute, rough-edged. *Stipulas* ſpinous. *Flowers* ſolitary, from the forks of the ſtem, or terminal, of an elegant purple, with yellow ſtamens. Linnæus compares them to thoſe of a *Malpighia*, which they ſomewhat reſemble, but without any real affinity.

2. F. *hiſpanica.* "Not ſpinous." Native of Spain. Biennial.

3. F. *arabica.* "Spinous. Leaflets linear, convex." Found by Shaw in Arabia, who deſcribes it with very long prickles.

4. F. *indica.* Linn. Mant. 238. Burm. Ind. t. 34. f. 1. "Spinous. Leaves ſimple, oval." Gathered in Perſia by Garçin. Annual, with yellow flowers.

FAGOPYRUM. See POLYGONUM.

FAGOTTINO, *Ital.* in *Muſic*, a little baſſoon.

FAGOTTO, the Italian name for a baſſoon, is derived from the manner in which it is tied up when taken to pieces, at which time it reſembles a faggot, or bundle of ſticks; and its French appellation is derived from its low pitch, *Baſ-ſon.*

FAGRÆA, in *Botany*, ſo named by Thunberg in honour of his friend and countryman Jonas Theodore Fagræus, M.D. whoſe highly complimentary and florid effuſions are prefixed to the *Flora Japonica.* Thunb. Nov. Gen. part 2. 34. Act. Holm. ann. 1782. 132. t. 4. Schreb. 112. Murr. Syſt. Veg. ed. 14. 198. Willd. Sp. Pl. v. 1. 830. Juſſ. 150. Mart. Mill. Dict. v. 2. Claſs and order, *Pentandria Monogynia.* Nat. Ord. *Gentianæ*, Juſſ. and not *Apocineæ*, as he and Thunberg made it.

Gen. Ch. *Cal.* Perianth inferior, of one leaf, bell-ſhaped, in five obtuſe, rounded, imbricated, equal ſegments, membranous at their margin. *Cor.* of one petal, funnel-ſhaped; tube round, gradually dilated upward, pervious, naked at the mouth, five times as long as the calyx; limb ſpreading, in five elliptic-oblong, obtuſe, oblique, equal ſegments, about one-third as long as the tube. *Stam.* Filaments five, capillary, equal, inſerted into the tube, rather ſhorter than the limb; anthers incumbent, ovate, two-lobed, furrowed, externally convex. *Piſt.* Germen ſuperior, roundiſh; ſtyle ſimple, thread-ſhaped, the length of the corolla; ſtigma peltate, orbicular, flat. *Peric.* Berry ovate, fleſhy, coated, of two cells. *Seeds* orbicular, ſmooth.

Eſſ. Ch. Calyx five-cleft. Corolla funnel-ſhaped; limb oblique. Berry coated, of two cells. Seeds globoſe. Stigma peltate.

1. F. *zeylanica*, the only known ſpecies, was gathered by Thunberg in the iſland of Ceylon, between Columbo and Galle. The *ſtem* is ſhrubby, with thick, leafy, ſmooth, obtuſely quadrangular branches. *Leaves* oppoſite, croſſing each other in pairs, on very ſhort dilated foot-ſtalks, obovate, obtuſe, entire, ſmooth, ſomewhat fleſhy, a ſpan long, and three inches wide, tapering at the baſe. *Stipula* ſmall, cloven, crowning the inſide of each footſtalk, juſt above its inſertion. *Flowers* terminal, three together, in a ſort of umbel, with ſmall, acute, oppoſite *bracteas*, and thick, round, fleſhy, ſmooth ſtalks. Of their colour we have no account, but they are large and handſome, about three inches long, with the aſpect of a *Gardenia*, to which genus Juſſieu, with great appearance of probability, gueſſed the genus might belong, and conſequently to his natural order of *Rubiaceæ.* A fine ſpecimen, however, preſerved unnamed in the herbarium of the younger Linnæus, has enabled us to correct, as we hope, what has been ſaid before us upon this ſubject. By this ſpecimen the affinity of the plant to *Liſianthus* is evident. Its ſtipulation is like the little intrafoliaceous rim or border, obſervable in the larger ſpecies of that genus, which perhaps deſerves the ſame name; but in the *Fagræa* a poſitive cloven intrafoliaceous ſtipula is viſible. We cannot, however, detect much of a bitter taſte in this plant, nor is that flavour ſtrong in *Liſianthus.* S.

FAGUS, from φαγειν, *to eat*, becauſe its fruit, or at leaſt that of an oak which bore the ſame name, is ſuppoſed to have made a part of the food of mankind in the early ages of the world. Linn. Gen. 496. Schreb. 647. Willd. Sp. Pl. v. 4. 459. Mart. Mill. Dict. v. 2 Sm. Fl. Brit. 1027. Juſſ. 409. Gærtn. t. 37. (Caſtanea; Tourn. t. 352. Gærtn. t. 37. Willd. Sp. Pl. v. 4. 460.) Claſs and order, *Monoecia Polyandria.* Nat. Ord. *Amentaceæ*, Linn. Juſſ.

Gen. Ch. Male *Cal.* Perianth bell-ſhaped, in five, ſix or ſeven deep, equal, acute ſegments. *Cor.* none. *Stam.* Filaments from five to twelve or more, capillary, longer than the calyx; anthers ovate-oblong, vertical, of two cells, burſting longitudinally.—Female *Cal.* Involucrum of one leaf, in four deep, acute, externally muricated ſegments, containing two or three flowers, permanent; perianth (according to Gærtner) ſuperior, of five or ſix ſmall, linear, equal, withering leaves. *Cor.* none. *Piſt.* Germen ſomewhat triangular, of three or ſix cells, with the rudiments of two ſeeds in each; ſtyle ſhort, in three or ſix deep diviſions; ſtigmas ſimple, oblong. *Peric.* none, except the enlarged, thick, prickly involucrum. *Seeds* two or three, ovate or triangular, pointed, coriaceous.

Eſſ. Ch. Male, Calyx bell-ſhaped, five-cleft. Corolla none. Stamens five to twenty. Female, Calyx four-cleft. Corolla none. Styles in three or ſix deep diviſions. Nuts two or three, inveſted with the leathery prickly calyx.

Obſ. Some authors ſeparate *Caſtanea* from *Fagus*, chiefly becauſe the male flowers in the former are diſpoſed in a ſpurious ſort of catkin, but it is by no means a "naked catkin," neither can the ſame part be termed corolla in this inſtance and calyx in the other. See the various writers quoted above.

The ſpecies are five.

1. F. *Caſtanea.* Cheſnut. Linn. Sp. Pl. 1416. Engl. Bot. t. 886. (Caſtanea veſca; Gærtn. v. 1. 181. Willd. Sp. Pl. v. 4. 460.) "Leaves lanceolate, ſharply ſerrated, ſmooth beneath. Prickles of the fruit compound and entangled."—Native of the warmer, rather mountainous parts of Europe, where it often compoſes large foreſts. It is one of the largeſt and moſt long-lived of European trees, ſometimes enduring more than a thouſand years. The name *Caſtanea*, whence come all its modern appellations, is ſaid to be derived from Καϛανις, a town in Theſſaly, the neighbourhood of which abounded with theſe trees. The timber is extremely durable, at leaſt under cover: the foliage umbrageous, rich and beautiful. In the landſcapes of Salvator Roſa cheſnut trees are very conſpicuous, but moſt painters prefer the oak for beauty. The nuts produced in England are much ſmaller than in Spain or Italy. They are uſed in thoſe countries as a ſubſtitute for flour, in bread or puddings, but chiefly by the poor.—The *bark* of the trunk abounds in deep reticulated fiſſures. *Leaves* alternate, ſtalked, ſix or eight inches long, veiny, ſmooth and ſhining, with numerous ſharp ſhallow ſerratures. *Flowers* in long pendulous yellowiſh ſpikes; the males unpleaſantly ſcent-

ed; produced in May. The fruit ripens rather late in autumn.

2. F. *pumila*. Chinquapin. Linn. Sp. Pl. 1416. Sm. Inſ. of Georgia, t. 57. Leaves lanceolate, ſharply ſerrated, downy beneath. Prickles of the fruit ſimple and ſtraight.—Native of North America, from Maryland to Florida. A tree ſcarcely above fourteen feet high, known by the white backs of its *leaves*. The *nuts* are eatable.

3. F. *ſylvatica*. Beech. Linn. Sp. Pl. 1416. Engl. Bot. t. 1846.—Leaves ovate, obſoletely ſerrated, ſmooth. Prickles of the fruit ſimple, wavy.—Common in Europe, eſpecially on a rich calcareous ſoil, bloſſoming in April or May. Graſſes do not thrive beneath its ſhade, but ſeveral of the *Orchideæ* are there in perfection. The wood is hard, but neither tough nor laſting in the open air. This tree makes excellent cut hedges for ſhelter, as the leaves remain, though faded, through the winter, and the twiſted branches form a very firm fence. The nuts, called Beech Maſt, are eaten by hogs. An oil has been extracted from them, which is ſweet, and Hill the poet had a project for bringing it into general uſe for ſeveral purpoſes, but his ſcheme failed. The *leaves* are alternate, ſpreading, about two inches long, ovate, wavy rather than ſerrated, ſhining, finely fringed. *Flowers* in ovate, long-ſtalked, hairy heads, the males lateral, the females terminal. *Nuts* with ſharp dilated angles, the prickles of their covers ſimple and pliant.—The purple-leaved beech is a variety.

4. F. *ferruginea*. American Beech. Ait. Hort. Kew. v. 3. 362. Sm. Inſ. of Georgia, t. 75. "Leaves ovate, pointed, downy beneath, widely ſerrated."—Native of North America. Meſſrs. Lee and Kennedy are recorded as having introduced it into our gardens in 1766. *Leaves* broader, and much more diſtinctly ſerrated than in the laſt. *Fruit* ſmaller, tawny.

5. F. *antarctica*. Antarctic Beech. G. Forſt. Magell. 32. Willd. Sp. Pl. v. 4. 460.—Leaves ovate, ſmooth, doubly and obtuſely ſerrated, reticulated with veins.—Native of Terra del Fuego. A ſhrub, with ſpreading irregular branches. *Leaves* ſcarcely an inch long, ovate, moſtly obtuſe, thick and rigid, ſmooth, doubly and bluntly ſerrated, reticulated with innumerable veins; their baſe running down into the footſtalk. *Flower-ſtalks* ſcattered, above an inch long, ſingle-flowered. *Calyx* reddiſh. *Anthers* long and narrow. *Fruit* unknown. The young branches are downy, and young leaves glutinous.—We ſuſpect that the *Betula antarctica* of Solander, enumerated by G. Forſter, among others from the Bankſian herbarium, at the end of his paper on Magellanic plants, is no other than this *Fagus*. His *Celaſtrus venuſtus* we know to be our *Eſcallonia ſerrata*. See ESCALLONIA.

FAGUS, in *Gardening*, contains plants of the tree kind, of which the ſpecies cultivated are; the common beech-tree (F. ſylvatica); the common cheſnut-tree (F. caſtanea); and the dwarf cheſnut-tree, or Chinquapin (F. pumila.)

It is remarked by Martyn, that ſome ſuppoſe there are two ſpecies of the common beech tree, the mountain beech, and the wild beech; "the firſt of which has a whiter wood than the ſecond; but that this difference ariſes only from the ſoil."

The nurſeries have two varieties, one with yellow, and the other with white-ſtriped leaves. And in Germany there is another variety common with dark red leaves, which is called the purple beech. In woods there is likewiſe a ſort with a rougher bark, which is termed hay beech by woodmen in general.

And of the ſecond ſort there is a variety cultivated with gold-ſtriped leaves, which is very ornamental.

Method of Culture.—Theſe trees are capable of being increaſed without much difficulty in the methods deſcribed below.

Modes of Culture in the Beech kind.—Theſe are eaſily raiſed by ſowing the well-ripened ſeed, or maſt, on beds of fine mould prepared for the purpoſe, either in the early autumnal or ſpring ſeaſon, in ſlight drills, or broadcaſt, covering them well in by raking. When the plants come up they ſhould be kept perfectly clean from weeds, and, after two years' growth, be planted out in nurſery rows, two feet, or two feet and a half apart, and from a foot to eighteen or twenty inches diſtant in the rows; in which ſituation they ſhould be kept properly cleared from weeds, and have the intervals of the ground well dug over annually, in the autumn or very early ſpring. Some adviſe cutting the roots under with a ſharp ſpade at the depth of four or five inches once or twice while in the ſeed-bed. When they have attained the growth of four or five feet in height, they are proper for being planted out in plantations, ſhrubberies, and other places, where they are to grow for ornament or timber.

The varieties with ſtriped leaves are to be continued by budding or grafting on common beech ſtocks, taking care not to plant them where the ſoil is of the very rich kind.

Modes of Culture in the Cheſnut kind.—Theſe trees are capable of being increaſed by ſowing or planting the nuts, which have been well ripened here, or ſuch as have been brought from abroad, without being dried in kilns, in the early ſpring, on beds of freſh earth, in drills two or three inches deep, and about a foot aſunder, placing them three or four inches diſtant, and covering them well in. When the plants appear, they ſhould be kept clear from weeds, and, after they have had two years' growth in theſe beds, they ſhould be removed into nurſery rows in the beginning of autumn, being planted two feet and a half from row to row, and from one to two feet diſtant in the rows, great care being taken not to injure their roots in taking them up, unleſs they happen to have tap roots, which muſt be cut off in a careful manner.

After they have remained in this nurſery four or five years, and have been kept perfectly free from weeds, by hoeing or ſlightly digging over the intervals between the rows, they will be in a proper ſtate for being finally planted out as ornamental fruit, or foreſt trees. When they are intended to be planted for the fruit, they ſhould be more frequently tranſplanted before they are finally ſet out where they are to grow, but they are not of much importance in this view, as the fruit does not always ripen well in this part of the country.

The varieties with variegated or blotched leaves muſt be continued by budding or inarching them on ſtocks of the common kind, which anſwer perfectly well.

And the third ſort may be raiſed in the ſame manner from nuts brought in ſand from America, and have the ſame method of culture afterwards as the others.

The firſt ſort is frequently made uſe of as timber-trees, and in forming hedges, and the others as ornamental trees in lawns, clumps, borders, and other parts of pleaſure-grounds, where they have a fine effect. They ſucceed on almoſt any ſoil, but the beſt on thoſe of the loamy kind. They form good fences on the borders of the ſea in many ſituations, as well as for protection or ſhelter in gardens and other places.

FAGUTAL, in *Mythology*, a temple of Jupiter, ſo called from *fagus*, the *beech*, a tree ſacred to Jupiter; becauſe, as ſome ſay, the temple was erected in the neighbourhood of a foreſt of beech; and on this account they ſay that part of mount Eſquiline, which was formerly called Mons Appius, was afterwards called fagutalis; and that Jupiter Fagutalis was the ſame with Jupiter of Dodona.

FAHACA, in *Ichthyology*; the Arabians call the Tetrodon lineatus by this name, according to Haſſelquiſt.

FAHALFAHARA, in *Geography*, a town of Perſia, in the province of Mecran; 100 miles N. W. of Kidge.

FAHAU, one of the Carolina, or New Philippine iſlands, in the Pacific ocean.

FAHLERZ, in *Mineralogy*, is an ore of *copper*, which ſee.

FAHLUN, in *Geography*, a town of Sweden, in the province of Dalecarlia, ſituated in the midſt of rocks and hills, between the two large lakes of Run and Warpen, and containing 1200 houſes, and, including the miners, 7000 inhabitants. Excepting two churches of brick, roofed with copper, and a few other houſes of the ſame materials, the buildings are principally of wood and of ſtone. This town owes its celebrity to the copper mine on its eaſtern ſide. The great antiquity of this mine is proved by the earlieſt records of Sweden, and particularly in the charter of Magnus Smek, which renews its privileges, and conſiders it as exiſting from time immemorial; hence we may fairly conclude that it muſt have been worked eight or nine hundred years. The mine is private property, and conſiſts of 1200 ſhares, each worth 150 rix-dollars (37*l.* 10*s.*) The ore is divided four times a week into 11 equal heaps, eight of which are diſtributed among eight of the proprietors, and the remaining three are ſold by auction; one of which is appropriated to the repairs of the works, another to pay the ſalaries of the miners and other workmen, and the third, which formerly belonged to the king, is now employed in defraying the expence of new excavations. In this manner the ore is equally divided, until all the proprietors have had their reſpective ſhares; and then the rotation begins again. The copper of this mine is not found in veins, but in maſſes, and the bed does not extend an Engliſh mile in circumference. The matrix of the ore, or rock, is the Saxum of Linnæus and pyrites of iron. The richeſt part of the ore may perhaps yield 20 per cent. of copper; but as the poor and rich parts are blended, they give only two per cent. when firſt brought from the mine, and 12 per cent. when once ſmelted. Twelve hundred workmen are employed, 600 miners, and the ſame number in roaſting and ſmelting the ore, making charcoal, and other works above ground. The mouth, or opening of the mine, is perhaps the largeſt in the world, being 1200 feet in diameter, or near ¾ of an Engliſh mile in circumference. The deſcent is by ſteps cut in the rock, and ſloping ſo gently that horſes may be employed in bringing up the ore. The galleries are from ſix to 10 feet high, and ſufficiently ſpacious. The perpendicular depth of the mine from the top of the chaſm is 1020 feet. Coxe's Travels, vol. v.

FAHNELEN, Fanelen, or *Vanlehen,* among the Germans, a kind of greater fiefs which the emperor alone could confer.

This was done by the delivery of a ſtandard, whence they had the name of fahnelen; *i. e. feuda vexilli.* We find them mentioned in the golden bull of the emperor Charles IV. ann. 1356: "Feudis principum exceptis, & illis quæ vanlehen vulgariter appellantur, quorum inveſtituram & collationem ſoli imperatori, vel regi Romano ſpecialiter reſervamus." Du-Cange Gloſſ. Lat. in voc.

The word is more uſually written *fahnlehn.*

FAHR, in *Geography*, a town of Germany, in the principality of Wurzburg, five miles S. S. W. of Gemunden.

FAHRAG, a town of Perſia, in the province of Farſiſtan; 180 miles N. E. of Schiras.

FAHRENHEIT, Gabriel Daniel, in *Biography*, a native of Hamburgh, known for the thermometer which is graduated according to a ſtandard invented by himſelf. The time of his birth and that of his death are not accurately known. About the year 1720 the improvement in thermometers, of uſing mercury inſtead of ſpirit of wine, was brought into uſe, and in 1724 Fahrenheit publiſhed "A diſſertation on Thermometers." The ſcale he employed is chiefly uſed in this country, and in this, the freezing point is marked 32°, and the boiling point 212°, and the interval between theſe points is divided into 180 equal parts, the remainder of the tube, below 32° and above 212°, is divided into ſimilar parts as far as it extends. From 0 or zero, below the freezing point, the degrees are marked − or minus. Thus mercury freezes and becomes ſolid and malleable at −40° or at 72° below the freezing, a degree of cold never experienced naturally but in the very northernmoſt parts of the world. See Thermometer, Freezing-Mixture. Nouv. Hiſt. Dict.

FAHRLAND, a town of Germany, in the New Mark of Brandenburg; four miles N. of Potzdam.

FAID, or Feid, a town of Arabia, in the province of Nedsjed, 140 miles N. E. of Hagiar. N. lat. 26° 54′. E. long. 40° 36′.

FAIDA, in our *Old Writers*, is uſed for malice or deadly feud. Leg. Hen. 1. cap. 88.

FAIDIT, Anselm, or Gauselm, in *Biography*, a Troubadour, who had been much eſteemed by our Richard when he was count of Poitou, and reſided at the court of Provence during the life of his father Henry II. and who accompanied him to Paleſtine, in the holy war, has left a poem on the death of his benefactor, which we found in the Vatican, among the MSS. bequeathed to that library by the queen of Sweden, No. 1659, with the original muſic, by the bard himſelf, who was as much admired by his contemporaries for ſetting his poems to muſic, as writing them: having been ſaid, in the old language of Provence, to have compoſed de bons mots, & de bons ſons, good words, and good tunes. He ſeduced from a convent at Aix, and married, a beautiful nun, with whom he travelled on foot from one court to another, many years. This lady, beſides her perſonal charms and accompliſhments, had a remarkable fine voice, and was much admired for ſinging her huſband's ſongs. The melody to the verſes on the death of Richard is the moſt ancient which we have been able to find to Provençal words.

FAIDO, in *Geography*, a town of Switzerland, in the canton of Uri, ſituated on the Teſino; it is the reſidence of a bailiff, who remains in office four years with almoſt unlimited power; 12 miles N. of Bellinzona.

FAIFO, or Haifo, a ſea-port town of Cochinchina, ſituated in a bay of the Chineſe ſea. It is a place of great trade, and has an annual fair, which continues about four months. N. lat. 15° 50′. E. long. 108° 10′.

FAILDA, a town of Portugal, in the province of Tras los Montes; ſeven miles S. of Braganza.

FAILIS, in *Heraldry*, a French term, denoting ſome failure or flaw in an ordinary, as if it were broken, and a ſplinter taken from it.

FAILS, in *Mining*, are ſhort flat pieces of wood, laid on the croſs pieces or ſtemples, acroſs a vein, for forming a floor, on which to lay the refuſe of the mine, or for making a gate or gang-way, &c.

FAILURE, or Failing, a ſpecies of bankruptcy, popularly called breaking or ſtopping payment.

Failure *of Record*, in *Law*, is uſed when an action is brought againſt a man who alledges in his plea matter of record in bar of the action, and endeavours to prove it by the record. The plaintiff replies, *nul tiel record;* that is, he denies there is any ſuch record. Upon which the defendant has a day given him by the court to bring it in; and if he fails to do it, he is ſaid to fail of his record, and the plaintiff ſhall have judgment to recover. Terms de Ley.

Failure *of the Strata*, in *Geology*, is a term which Mr. Kirwan uſes (Geol. Eſſ. p. 162) ſeemingly to denote the ſinking down or depreſſion of maſſes of ſtrata; in which ſenſe it anſwers to the effect produced by a *fault*; ſee that article.

FAINT, or Faint-Action, in *Law*, is as much as *feigned action;* that is, ſuch an action as, though the words of the writ be true, yet, for certain cauſes, the party has no title to recover thereby. By which it differs from falſe-action, which is that where the words of the writ are falſe. Yet ſometimes the two are confounded.

Faint *Pleader*, a fraudulent, falſe, or colluſive manner of pleading, to the deceit of a third perſon; againſt which, among other things, was made the ſtatute 3 Edw. I. cap. 29.

Faints, in the *Diſtillery*, the weak ſpirituous liquor that runs from the ſtill in rectifying the low wines after the proof ſpirit is run off.

Faints denote alſo the laſt runnings of all ſpirits diſtilled by the alembic. The clearing the worm of theſe is ſo eſſential a point in order to the obtaining a pure ſpirit by the ſucceeding diſtillation, that all others are fruitleſs without it.

FAINTING. See Syncope.

FAIOUM. See Fayoum.

FAIR, a public place, where merchants, traders, and other perſons, from divers parts, meet on ſome fixed day in the year, to buy and ſell commodities, and to partake of the diverſions uſually accompanying ſuch aſſemblies: or it denotes the concourſe of perſons aſſembled on ſuch occaſions. See Market.

The word fair is formed of the French *foire*, which ſignifies the ſame thing; and *foire* ſome derive from the Latin *forum, market;* others from the Latin *feriæ*, becauſe fairs were anciently always held in the places where the wakes, or feaſts, of the dedications of churches, called *feriæ*, were alſo held; and becauſe it is incident to a fair, that perſons ſhall be privileged from being moleſted or arreſted in it, for any other debt or contract than what was engaged for in the ſame. (See ſtat. 17 Ed. IV. c. 2. made perpetual by 1 R. III. c. 6. See alſo ſtats. 2 Ed. III. c. 15. 5 Ed. III. c. 5. 27 Hen. VI. c. 5. 1 & 2 P. & M. c. 7. 13 Eliz. c. 21.) The Romans called them *nundinæ*. Eric Puteanus has a pretty little treatiſe on the fairs of the Romans, "De Nundinis Romanorum," which he calls *nova faſtorum facula*.

Fairs can only be eſtabliſhed by virtue of the king's grant, or by long and immemorial uſage and preſcription, which ſuppoſes ſuch a grant (2 Inſt. 220. 3 Mod. 123); he is alſo the ſole judge where fairs and markets ought to be kept; and if any perſon ſet up a fair without the king's authority, a *quo warranto* lies againſt him; and the perſons who frequent ſuch fairs, &c. may be puniſhed by fine to the king. Fairs are generally kept once or twice in the year; and it has been obſerved, that, as they were firſt occaſioned by the reſort of people to the feaſt of dedication, they are kept, in moſt places, on the ſame day with the wake or feſtival of that ſaint to whom the church was dedicated; and for the ſame reaſon they were held in the churchyard, till reſtrained by ſtat. 13 Ed. II. ſt. 2. c. 6. (2 Inſt. 221. Blount.) The reaſon of their being held near ſome cathedral, church, or monaſtery, on the anniverſary dedication of the church, or on the feſtival of the ſaint to whom it was dedicated, ſeems to have been as follows. When biſhops and abbots obſerved that crowds of people aſſembled from all places to celebrate the feſtivals of their patron ſaints, they took advantage of this circumſtance, and applied to the crown for charters to hold fairs at thoſe times, for the accommodation of ſtrangers, and with a view to increaſe their own revenues by the tolls which their charters authorized them to levy at theſe fairs. Hence the multitude of attendants increaſed, ſome of whom were actuated by religious, and others by commercial views. Many precautions were taken to preſerve good order, and to prevent theft and cheating in theſe eccleſiaſtico-commercial fairs, ſome of which are not a little ſingular. When a fair was held within the precincts of a cathedral or monaſtery, it was not uncommon to oblige every man to take an oath at the gate, before he was admitted, that he would neither lie, nor ſteal, nor cheat, while he continued at the fair. (Murator. t. 2. Diſſert. 30.) Many of theſe eccleſiaſtical fairs are ſtill kept in all Popiſh countries; and many of our own fairs are ſtill held on the ſame ſaint's days to whoſe honour they were originally inſtituted. Every fair is ſubject to the regulation of the court of piepowder. The duration of fairs is determined by proclamation, by ſtat. 2 Ed. III. c. 15; and if a perſon ſhall ſell any goods after the time of the fair expires, he ſhall incur a forfeiture of double the value of the goods ſold, one-fourth to the proſecutor, and the reſt to the king. (5 Ed. III. c. 5.) Any citizen of London may carry his goods to any fair or market in England at his pleaſure. (See ſtat. 3 Hen. VII. c. 9.) If any perſon is intitled to hold a fair or market, and another is ſet up within the diſtance of a third part of twenty miles, either on the ſame day, or a different day, it is a nuſance, and an action on the caſe lies; and alſo againſt perſons diſturbing ſuch as are coming to buy or ſell in the fair or market, ſo that the perſon holding the fair, &c. loſes his toll, (ſee Toll,) or receives prejudice in the profits ariſing from it. (2 Rol. Abr. 140. 2 Saund. 172. 1 Mod. 69. 1 Rol. Abr. 106. 2 Vent. 26. 28.)

Owners and governors of fairs are to take care that every thing be ſold according to juſt weight and meaſure; for which purpoſe they may appoint a clerk of the fair or market, who is to mark and allow all ſuch weights, and to take his reaſonable and juſt fees. (4 Inſt. 274. Moor. 523. 1 Salk. 327.) Fairs and markets are forfeitable franchiſes; as if the owners of them hold them contrary to their charter, as by continuing them longer than the charter admits, by diſuſer, and by extorting fees and duties where none are due, or more than are juſtly due. (2 Inſt. 220. Finch 164. 3 Mod. 108.) As to their intereſt, it ariſes chiefly from tolls. See Toll.

Fairs abroad are either free, or charged with tolls and impoſitions. The privileges of free fairs conſiſt chiefly, 1. In that all traders, &c. whether natives or foreigners, are allowed to enter the place, and are under the royal ſafeguard and protection in coming and returning, they and their agents, with their goods, &c. 2. In that the ſaid perſons, and their effects, are exempt from all duties, impoſitions, tolls, and ſervitudes. 3. That merchants in going to, or returning from, the fair, &c. cannot be arreſted, or their goods ſtopped, &c. It is the ſovereign alone that has a right, by his letters patent, to eſtabliſh fairs, whether free, or ſubject to duties, and the other ordinary laws and penalties.

Several fairs are held in the open fields, or on heaths and commons, under tents, booths, and barracks, erected for the purpoſe; as Stourbridge-fair, &c. others in places walled in for the purpoſe, and formed into regular ſtreets, lanes, &c. for the occaſion; as the fair of St. Laurence at Paris. Laſtly, others are held in the open places and ſtreets of cities; as Briſtol-fair, the fair of St. Germains, &c.

Fairs, particularly free fairs, make a very conſiderable article in the commerce of Europe, eſpecially that of the Mediterranean or inland parts; as Germany, &c. where the continual paſſage and re-paſſage of veſſels are impracticable.

The moſt celebrated fairs in Europe are thoſe: 1. Of Francfort, held twice a year, in ſpring and autumn; the firſt commencing the Sunday before Palm-Suday, and the other in September. Each is declared by ſound of bell, and laſts three weeks; the firſt of which is called the week of acceptance, and the ſecond the week of payment; though many bills of exchange are now payable in the third week, but this muſt be mentioned, becauſe every bill payable in the fair is, without ſuch a clauſe, deemed payable in the ſecond week. They are famous for the ſale of all kinds of commodities, but particularly an immenſe quantity of curious books, no where elſe to be found; and from whence the bookſellers throughout all Europe uſed to furniſh themſelves. Before each fair there is a catalogue of all the books to be ſold at it, printed and diſperſed, to call together purchaſers, though the learned have generally complained of divers unfair practices therein, as fictitious titles, names of books purely imaginary, &c. beſide great faults in the names of the authors, and the titles of the real books. 2. The fairs of Leipſic, which are held thrice a year; one beginning on the firſt of January, another three weeks after Eaſter, and a third after Michaelmas; they laſt twelve days each, and are, at leaſt, as conſiderable as thoſe of Francfort. 3. The fairs of Novi, a little city in the Milaneſe, under the dominion of the republic of Genoa. There are four of theſe in the year; commencing on the firſt of February, the ſecond of May, the firſt of Auguſt, and ſecond of November. Though the commodities bought and ſold here be very conſiderable, yet, what chiefly contributes to render them ſo famous is the vaſt concourſe of the moſt conſiderable merchants and negociants of the neighbouring kingdoms, for tranſacting affairs, and ſettling accounts in matters of bank and exchange. Each of theſe uſually laſts eight days. 4. The fairs of Riga, whereof there are two in the year; one in May, and the other in September. They are much frequented by the Engliſh, Dutch, and French ſhips; as alſo by others from all parts of the Baltic. The beſt time for the ſale of goods at Riga is during the fairs. Since the building of the famous city of Peterſburgh, theſe fairs have ſuffered ſome diminution. 5. The fair of Archangel; during which, all the trade foreigners have with that city is managed. It continues a month, or ſix weeks at moſt; commencing from the middle of Auguſt. The Muſcovite merchants attend here, from all parts of that vaſt empire; and the Engliſh, Dutch, French, Swediſh, Daniſh, and other ſhips in the port of that city, on this occaſion, ordinarily amount to three hundred. But this is no free fair, as the reſt are: the duties of exportation and importation are very ſtrictly paid, and on a very high footing. 6. The fair of St. Germain, one of the ſuburbs of Paris, commencing on the third of February, and holding till Eaſter; though it is only free for the firſt fifteen days. It is frequented by traders with various ſorts of cloths and ſtuffs; and the goldſmiths, jewellers, and toy-men of Paris, have well furniſhed and handſome ſhops in it. 7. The fairs of Lyons, which Monſ. Du Cheſne, in his "Antiquity of Cities," would inſinuate, from a paſſage in Strabo, were eſtabliſhed by the Romans; though it is certain, the fairs, as they now ſtand, are of a much later date. There are four in the year, each laſting twenty days, and free for ever. They begin on the firſt Monday after Low Sunday, the fourth of Auguſt, the third of November, and the firſt Monday after Eaſter. 8. Fair of Guibray, a ſuburb of the city of Falaiſe, in the Lower Normandy. It is ſaid to have been eſtabliſhed by our William the Conqueror, in conſideration of his being born at Falaiſe. It commences on the ſixteenth of Auguſt, and laſts fifteen days; free by charter, and longer by cuſtom. 9. Fair of Beaucaire, held partly in a city of that name, in Languedoc, and partly in the open country, under tents, &c. It commences on the twenty-ſecond of July, and only continues for three days; yet it is the greateſt, and moſt celebrated, of all the fairs in that part of Europe, both for the concourſe of ſtrangers from all parts of the world, and for the traffic of all kinds of goods: the money returned, in theſe three days, amounting ſometimes to above ſix millions of livres. Beſides theſe, there are, or there were, before the late revolution, in France, ſeveral other fairs of conſiderable note; as the four fairs of Rheims, the two of Rouen, two of Bourdeaux, two of Troyes, two of St. Dennis, that of Caen, of Dieppe, and of Toulon, &c.

The fairs of Porto-Bello, Vera-Cruz, and the Havannah, are the moſt conſiderable of all thoſe in the Spaniſh Weſt Indies. The two firſt laſt as long as the flota and galleons continue in thoſe parts; and the laſt is opened as ſoon as the flota, or galleons, arrive there, upon their return for Spain; this being the place where the two fleets join.

The principal fairs in Great Britain are, Stourbridge-fair, near Cambridge; the two fairs of Briſtol; that of Exeter, Weſt Cheſter, Edinburgh, Weyhill, and Burford fairs, for ſheep; Pancraſs fair, in Staffordſhire, for ſaddle-horſes; Barnet fair, near London, for lean and Welſh black cattle; St. Faith's, in Norfolk, for Scots runts; Yarmouth fiſhing fair for herrings; Ipſwich butter fair; that of Woodborough Hill, near Blandford in Dorſetſhire, famous for weſt-country manufactures, Devonſhire kerſeys, Wiltſhire druggets, &c. two cheeſe-fairs at Atherſton and Chipping Norton; beſides many more fairs and weekly markets in different parts of the kingdom. See MARKET.

FAIR, in *Sea Language*, is uſed for the diſpoſition of the wind, when it is favourable to a ſhip's courſe, in oppoſition to that which is contrary or foul. The term fair is more comprehenſive than large, and includes about ſixteen or eighteen points of the compaſs; whereas large is confined to the beam or quarter, that is, to a wind which croſſes the keel at right angles, or obliquely from the ſtern, but never to one right a-ſtern. Falconer's Marine Dict.

FAIR-*Way*, the path or channel of a narrow bay, river, or haven, in which ſhips uſually advance in their paſſage up and down; ſo that if any veſſels are anchored therein, they are ſaid to lie in the fair-way. Falconer.

FAIR-*Curve*, in *Ship Building*, is a winding line, uſed in delineating ſhips, whoſe ſhape is varied, according to the part of the ſhip which it is intended to deſcribe.

FAIR *Maids of Kent*, in *Gardening*, a common name given to a ſpecies of ranunculus. See RANUNCULUS.

FAIR-*Foreland*, or *Vogel-Hook*, in *Geography*, the N.W point of Prince Charles's iſland, in the Northern ocean; N. lat. 78° 52′.

FAIR *Iſland*, or *Fara*, an iſland in the North ſea, lying between Shetland and Orkney, 24 miles from the former, and 30 from the latter. It is more than three miles from north-eaſt to ſouth-weſt, and nearly two miles in breadth, conſiſting of high and barren rocks, which are interſperſed with ſome ſheep paſtures. It has two harbours for ſmall boats, and contains about 160 inhabitants, who chiefly ſubſiſt by fiſhing. On the coaſt of this iſland the duke of Medina Sidonia, commander of the Spaniſh Armada, was ſhipwrecked, A. D. 1588.

FAIR *River*, a river of Canada, which runs from Wapaſſaga to lake St. John.

FAIR *Pleading*, in *Law*. See BEAU-*pleader*.

FAIR *Ape*, in *Zoology*. See SIMIA *Argentata*.

FAIRFAX, ROBERT, doctor in muſic, in *Biography*, an eminent Engliſh compoſer during the reigns of Henry VII. and Henry VIII. He had his doctor's degree at Cambridge, and was incorporated at Oxford in the year 1511. He was of the Yorkſhire family of Fairfax, and a very valuable muſical MS. is preſerved which once appertained to the ſubject of this article, and was afterwards in the poſſeſſion of general Fairfax, upon whoſe demiſe it made a part of the Thoreſby collection, at the ſale of which it was purchaſed by John White, the Quaker, of Newgate ſtreet, who excluſively dealt in ſtraw hats for ladies. He was a great collector of ſcarce and curious things of all kinds, among which the muſic book of Dr. Fairfax was a rarity, with the loan of which we were obligingly indulged, It conſiſts of a collection of the moſt ancient Engliſh ſongs, to which the muſic has been preſerved. The writing is very clear and intelligible for the period when it was tranſcribed, though the time of the muſical characters, from the want of bars, and the uſe of ligatures and prolation, with a mixture of red notes for diminution, is ſometimes difficult to aſcertain. We ſcored the whole of this curious MS. by which we were enabled to judge of the progreſs which had been made in ſecular muſic by our countrymen, at the beginning of the 16th century; which, to ſay the truth, was not very great; the leading and fundamental laws of harmony were not violated; 5ths and 8ths in ſucceſſion were ſedulouſly avoided; but there appear no deſign, no grace, invention, or melody. The compoſers of theſe ſongs are William of Newark, —— Sheryngham, Edmund Turges, Tutor, or Tudor, Gilbert Baneſter, —— Browne, Richard Davy, William Cornyſhe, junior, ſir Thomas Phelyppes, and Robert Fairfax. But little is known now concerning theſe muſicians, except that Turges is a name which occurs among the muſicians of Henry VI. Tudor was author of ſeveral compoſitions in the muſic book of prince Henry, afterwards Henry VIII. Cornyſhe was of Henry VII.'s chapel; and Fairfax was admitted to a doctor's degree in muſic, at Cambridge; but as he is not ſtyled doctor in this MS. we may reaſonably ſuppoſe his compoſitions in it to have been anterior to his receiving that honour in the univerſity.

Moſt of theſe muſicians ſeem to have been merely ſecular compoſers, as we have met with none of their names, except that of Fairfax, among thoſe for the church. The muſic of theſe ditties is ſomewhat uncouth; yet it is ſtill better than the poetry: but this may be accounted for, by the frequent changes of our national language, which was never ſeriouſly cultivated till the reign of queen Elizabeth. The Saxons, who diſpoſſeſſed the Britons of the greateſt part of the iſland, we find, from Bede's account of Cædmon, had poetry, though not rhyme, in the ſeventh century; for he repeatedly calls the compoſitions of Cædmon carmina, poemata, and in one place verſus. No traces, however, of rhyme, or metre, can be found in our language, till ſome years after the conqueſt, at which time French was forced upon us, and till the reign of Edward III. it was the practice in all ſchools to conſtrue Latin into Norman French; a language which was faſhionable at our court, even before the time of William the Conqueror; as Edward the Confeſſor, who had been brought up in the court of Normandy, encouraged many Normans to follow him into England.

In the thirty-ſixth year of Edward III., however, a law was made, "That all pleas in the court of the king, or of any other lord, ſhall be pleaded and adjudged in the Engliſh tongue; and the reaſon recited in the preamble was, that the French tongue was too much unknown." And yet for near ſixty years afterwards the proceedings in parliament appear to have been in French.

The Engliſh of Robert of Glouceſter, who flouriſhed about 1265, during the reigns of Henry III. and Edward I., is more Saxon than Norman; however, it would not be very difficult to read, if the characters in which it is printed had been thoſe in preſent uſe, inſtead of Saxon, with which it abounds. The language of Treviſa, 1385, is not very unintelligible, if the ʒ be regarded as a *g*, for which we believe it was originally meant. About the firſt year of Henry VI., 1422, French and Engliſh ſeem pretty equally balanced, and to have been uſed indifferently; however, very little improvement was made in our language and verſification from the time of Edward IV. to that of Henry VIII. Indeed, few Engliſh ſongs are to be found which were ſet to original muſic during that period; it having been the faſhion for the great to ſing none but French words, as appears by the muſic book of Prince Henry, ſon of Henry VII., in which all the ſongs are in French, Italian, or Latin.

It was ſo much the cuſtom for our old poets to write new words to old tunes, that there was little buſineſs for a compoſer. Theſe tunes, like thoſe of the Improviſatori of Italy at preſent, being very ſimple, and little more airy than the chants of the church, required no teaching, and were an eaſy and ready vehicle for the bard who wiſhed to get at the heart of his audience, or at leaſt to engage its attention by the blandiſhments of his own art, not thoſe of another. For metrical romances, and hiſtorical ballads of great length, this kind of plain and familiar melody was beſt adapted; as it had ſcarce any other effect than juſt to render the tone of the narrator's voice a little longer and louder, and conſequently more articulate and diſtinct than in common ſpeech.

FAIRFAX, EDWARD, an Engliſh poet, was ſon of ſir Thomas Fairfax, of Denton, in Yorkſhire; by ſome writers he has been repreſented as illegitimate, but later biographers, upon apparently good authority, have refuted the aſſertion. His education was liberal, and his literary acquirements very conſiderable. He entered into no profeſſion, but is ſuppoſed to have rendered himſelf uſeful to his brother lord Fairfax, by the education of his children, and in the management of his eſtate. He publiſhed a work on "Demonology," in which he treats on witchcraft, and ſhews that he was not free from the credulity and ſuperſtition of the age in which he lived. He is known as a poet by a tranſlation of "Taſſo's Godfrey of Bouillon," which was dedicated to queen Elizabeth, in the year 1600. The tranſlation is given in ſtanzas of eight lines, and he rendered the original line by line. Mr. Fairfax wrote a hiſtory of Edward the Black Prince, and ſome eclogues; of the firſt, nothing is known, and of the others, only the fourth, which was printed in the "Muſe's Library," 1737. He died about the year 1632, leaving behind him a ſon named William, who tranſlated Diogenes Laertius. Biog. Brit.

Fairfax, Thomas, lord, general of the Parliament's army in the civil wars of Charles I. was eldeſt ſon of Ferdinando lord Fairfax, and born in 1611. He was educated at St. John's college, Cambridge; from thence he went to Holland, and ſerved as a volunteer with the Engliſh troops under Horatio lord Vere, with whom he was at the taking of Bois-le-Duc. On his return he retired to the country, and married the daughter of lord Vere, by whom he was afterwards inſtigated to take a decided part againſt the royaliſts. When actual hoſtilities broke out, he was made general of the horſe under his father. At firſt they ſuſtained ſeveral ſignal defeats. Their valour, enterprize, and zeal were, however, very conſpicuous, and when the army was new-modelled, Fairfax was unanimouſly appointed to ſucceed the earl of Eſſex as general; and in the year 1645, when the two parties met at Naſeby, he gained a complete and moſt deciſive victory over the royal army. It was his character to be animated, during action, with a ſpirit which did not ſeem to belong to his ordinary temper, and which roſe to enthuſiaſm. He purſued his ſucceſs with vigour, and was every where triumphant, and, to his honour it is ſpoken, he uniformly conducted himſelf with humanity, and exhibited a ſtudious concern for the intereſts of literature, ſo that on the ſurrender of Oxford he diligently preſerved the Bodleian library and other places from pillage. It is recorded, that the univerſity ſuffered vaſtly leſs from the rebels, as they were then called, than from the royaliſts.

After this Fairfax joined the army agitators, advanced to London, and joined in the reſtoration of the ſeceding members, which deſtroyed all parliamentary independence. He behaved with reſpect towards the king, and ſeemed deſirous of reſtoring him to the throne; nevertheleſs he concurred in the declaration of the army to ſupport the vote of the commons for no farther addreſſes or application to him. He ſucceeded his father, in March 1648, in his titles, and thus united the hereditary dignity of the peerage with the honours which he had acquired by his bravery. He now reſumed his arms, and acted with his uſual vigour. He was engaged in the ſiege of Colcheſter, which had been occupied by the inſurgents; this place held out eleven weeks, when it ſurrendered without conditions. On this occaſion lord Fairfax, contrary to his general character, ordered two brave men, ſir Charles Lucas and ſir George Liſle, whom he conſidered as ſoldiers of fortune, to be ſhot. Returning to London, he took up his quarters at Whitehall, and prepared the way, by over-awing and purging the parliament, for the king's trial. He was among the firſt of thoſe nominated for the king's judges, but he refuſed to act, and it was expected he would have interfered to prevent the execution, but it was ſaid that he was kept back in prayer and conference at major Harriſon's apartments till the fatal blow was ſtruck. To ſoothe his reſentment he was appointed general in chief of the forces in England and Ireland; and under this commiſſion he ſuppreſſed the levellers, who were become formidable in Oxfordſhire. In 1650 the Scottiſh nation declared for Charles II. when it was determined to make war upon that country, and Fairfax was looked to for this purpoſe, but choſe rather to lay down his arms, and retired into the country with a penſion of 5000*l.* per annum. At the eve of the reſtoration he determined to make his peace with the exiled king, and was at the head of the committee appointed to wait upon him at the Hague, to invite him to return and reſume his office. He was well received, and having performed the commiſſion entruſted to him, he retired into the country, where he died, in 1671, in the ſixtieth year of his age. Lord Fairfax was of a manly aſpect, gloomy but gentle in his diſpoſition, ſincere, open, diſintereſted, liberal in his ſentiments, a lover and patron of learning, but poſſeſſing moderate talents, and unfit for taking a lead in any affairs but thoſe of the army. Biog. Brit.

Fairfax, in *Geography*, a county of Virginia, in America, about 25 miles long, and 18 broad, on the W. bank of Potowmack river. It contains 7239 free inhabitants, and 6078 ſlaves; the chief town is Alexandria. The court-houſe, which has a poſt-office, is 14 miles from Waſhington.—Alſo, a poſt-town in Franklin county, Vermont, E. of Georgia, and on the bank of the river La Moille, containing 786 inhabitants; about nine miles from lake Champlain.

FAIRFIELD, the ſouth-weſternmoſt county of Connecticut, bounded W. by the ſtate of New York, E. by New Haven county, N. by Litchfield, and S. by Long Iſland ſound. It is divided into 13 townſhips, of which Fairfield and Danbury are the chief; and contains 38,208 inhabitants, including 276 ſlaves. It is ſeparated from New Haven county and part of Litchfield county by Stratford river The other parts of the county are watered by ſeveral ſmall ſtreams. Several harbours and ſmall iſles lie along the ſound, in the towns of Greenwich, Stamford, Norwalk, Fairfield, and Stratford. The face of the county is rough, and the ſoil is good.—Alſo, a poſt-town and port of entry of Connecticut, and capital of the above county, the "Unquowa" of the Indians, pleaſantly ſituated on Mill run, a little above its entrance into Long Iſland ſound, 22 miles S.W. by W. of New Haven, and 64 from New York. It contains about 200 houſes, and 3730 inhabitants, a neat congregational church, and a court-houſe. About 4 miles N.W of the centre of the town is the beautiful pariſh of Greenwich, in which is a flouriſhing academy. This town was ſettled from Weathersfield in 1639. It carries on a conſiderable trade to the Weſt Indies.—Alſo, a county in the ſtate of Ohio.—Alſo, a townſhip in Kennebeck county, Maine, on the S.E. bank of Kennebeck river, S. of Canaan and oppoſite to Hancock, 7 miles from fort Halifax, and 225 miles N.E. of Boſton. It contains 852 inhabitants.—Alſo, a new townſhip in Herkemer county, New York; containing 2065 inhabitants.—Alſo, a poſt-town in Franklin county, Vermont, E. of St. Albans; containing 911 inhabitants. It is 13 miles S. of the Canada line, and as far from the neareſt part of lake Champlain.—Alſo, a townſhip in Waſhington county, New York, containing 591 inhabitants.—Alſo, a townſhip in Cumberland county, New Jerſey, on Cohanzy creek, and at the head of Black creek; 25 miles E. by S. of Salem, in Salem county.—Alſo, a townſhip in Weſtmoreland county, Pennſylvania, containing 1363 inhabitants.—Alſo, a diſtrict of South Carolina, between Wateree river, which ſeparates it from Lancaſter county, and Broad river, which divides it from Newbury and Union diſtricts. Its chief town is Winnſborough.

FAIRFORD, a market town in the hundred of Brightwells Barrow, Glouceſterſhire, England, is ſituated on the banks of the river Colne; and derives its name from an old ford over that river near its confluence with the Thames. The celebrity of this town has ariſen more from the beauty of its church, and the very fine painted glaſs of which that is the repoſitory, than from any other circumſtance. The church, dedicated to the Virgin Mary, is a fine ſpecimen of the ſtyle of architecture that prevailed about the cloſe of the fifteenth century. It conſiſts of a lofty nave, a chancel, and ſide aiſles, with a tower riſing from the centre. The internal architecture is extremely fine and highly embelliſhed: the aiſles are divided from the nave by light fluted pillars, ſuſtaining four arches on each ſide, with a range of windows above them in the upper part of the nave. The aiſles are continued parallel with the chancel, with which is a communication by two arches of equal height. A beautiful oak ſcreen ſurrounds the chancel, ornamented with finely carved tabernacle-work, and having ſtalls in the ſame ſtyle. On the north ſide of the altar are three niches, or ſubſellia, uſed in the Catholic times by the officiating prieſts. This elegant church, 120 feet in length, and 55 in breadth, owes its erection to John Tame, an opulent merchant of London; who, about the year 1492, is recorded to have captured a veſſel bound from a Flemiſh port to Italy and laden with painted glaſs, which, agreeably to the expenſive piety of the times, he determined to put up in a large edifice expreſsly built for its reception. The glaſs was diſpoſed in twenty-eight windows, with four or more compartments in each: but in ſeveral of them the figures are now mutilated or diſplaced. The principal ſubjects are ſcriptural, and diſplay the moſt important events in the life of our Saviour, with a few of the more remarkable tranſactions recorded in the Old Teſtament. The church contains a variety of monuments and ſepulchral inſcriptions. In the north aiſle is a table tomb of Italian marble to the memory of John Tame, the beneficent founder of this edifice, and Alice his wife.

The town conſiſts of two ſtreets; the buildings in general are neat and regular: here are three bridges over the river Colne. Among many charitable inſtitutions is a free-ſchool, eſtabliſhed by the produce of money expended in the purchaſe of lands, and bringing in about ſixty pounds annually, purſuant to the bequeſts of the Hon. Elizabeth Fermor, and Mary Barker, ſpinſter. Two fairs are held annually, and a weekly market on Thurſdays; originally granted by Henry III. in 1263, and renewed and confirmed by a charter procured in 1688, through the intereſt of Andrew Barker, eſq. Fairford is 79 miles diſtant from London: the population of the pariſh in 1801 was returned at 1326; and the number of houſes at 273.

Near the church was anciently a manorial reſidence, erected by the earls of Warwick, and called Beauchamp and Warwick court. This appears to have been rebuilt by the Tames, as Leland mentions "a fayr manſion-place of the Tames, hard by the chirche-yarde, builded thoroughly by John Tame and Edmund Tame: the back thereof goithe to the very bridge of Fairford." This edifice was pulled down by Andrew Barker, eſq. who, with the materials, erected at a few furlongs diſtance, the preſent manor houſe, which is a ſpacious and convenient building, ſituated in a pleaſant park, and now inhabited by John Raymond Barker, eſq. who has conſiderably improved it.

Two miles north from Fairford is Quenington, or Queenington, a ſmall village, remarkable for the architecture of its church, which is a ſmall low building, diſplaying veſtiges of great antiquity; though it has apparently undergone conſiderable alterations during the two laſt centuries.

About three miles from Fairford is the grand canal which unites the rivers Severn and Thames. Rudge's Hiſtory of Glouceſterſhire, 2 vols. 8vo. Bigland's ditto fol.

FAIRHAVEN, a town of America, in Briſtol county, Maſſachuſetts, lying on the N.W. ſide of Buzzard's bay, and on the eaſtern ſide of Accuſhnet river, oppoſite to Bedford. N. lat. 41° 34'. W. long. 70° 50'.—Alſo, a conſiderable port-town in Rutland county, Vermont, N.W. of Poultney, containing 411 inhabitants; and 51 miles N. of Bennington.—Alſo, a bay on the N.W. coaſt of Spitzbergen. N. lat. 79° 50'. E. long. 60°.

FAIRHEAD, a cape of Ireland, on the northern coaſt of the county of Antrim, oppoſite to the iſland of Raghery. It forms part of that intereſting baſaltic region, ſo frequently referred to in geological controverſies. It is ſuppoſed to be the Robogdium Promontorium of Ptolemy, and its Iriſh name is Ben-more, or the great promontory, a name to which it ſeems well entitled. It and the promontory of Bengore ſtand at the diſtance of eight miles from each other: both formed on a great and extenſive ſcale, both abrupt to the ſea, and abundantly expoſed to obſervation; and each in its kind exhibiting noble arrangements of the different ſpecies of columnar baſaltes. Fairhead raiſes its lofty ſummit more than five hundred feet above the ſea, forming the eaſtern termination of Ballycaſtle bay. It preſents to view a vaſt maſs of rude columnar ſtones, the forms of which are extremely groſs, many of them exceeding two hundred feet in length, and the texture ſo coarſe as to reſemble an imperfect compact granite, rather than the uniform fine grain of the Giant's cauſeway baſaltes. At the baſe of theſe gigantic columns lies a wild waſte of natural ruins, of an enormous ſize, which, in the courſe of ſucceſſive ages, have been tumbled down from their foundation by ſtorms, or ſome more powerful operations of nature. Theſe maſſive bodies have ſometimes withſtood the ſhock of their fall, and often lie in groups and clumps of pillars, reſembling many of the varieties of artificial ruins, and forming a very novel and ſtriking landſcape. A ſavage wildneſs characterizes this great promontory, at the foot of which the ocean rages with uncommon fury. Scarce a ſingle mark of vegetation has yet crept over the hard rock to diverſify its colouring, but one uniform greyneſs clothes the ſcene all around. Upon the whole it makes a fine contraſt with the beautiful capes of Bengore, where the varied brown ſhades of the pillars, enlivened by the red and green tints of ochre and graſs, caſt a degree of life and cheerfulneſs over the different objects. Dr. Hamilton ſays that, from attentive obſervation, there is reaſon to imagine that this enormous pile reſts on the foſſils uſually attendant on beds of ſea-coal; and that the ſtrata of the Ballycaſtle coal pits extend entirely under the promontory of Fairhead. This cape is in long. 6° 2'. W. from Greenwich, lat. 55° 44' N. Hamilton's Antrim.

FAIRLEE, a townſhip of America, in Orange county, Vermont, on the W. bank of Connecticut river, 16 miles N. of Dartmouth college. This townſhip, which is hilly but having a good ſoil, is divided into E. Fairlee, containing 435 inhabitants, and W. Fairlee, including 371.

FAIRLEY, a town of Scotland, in the county of Ayr; 11 miles N.W. of Irvine.

FAIRLEY *Road*, a narrow ſtrait of Scotland, in the frith of Clyde, between the iſlands of Cumora and the county of Ayr.

FAIRNESS SOUND, a harbour on the W. coaſt of Eday, one of the Orkney iſlands.

FAIRUYOSAND, a town of Perſia, in Segeſtan, on the Heermund; 20 miles S.W. of Boſt.

FAIRWEATHER, CAPE, a cape on the N.W. coaſt of America, in N. lat. 58° 36'. W. long. 138°.—Alſo, a cape on the E. coaſt of Patagonia. S. lat. 51° 34'. W. long. 68° 25'.—Alſo, a mountain on the W. coaſt of North America; 100 miles S.E. of Admiralty bay. N. lat. 59°. W. long. 137°.

FAIRY, a term frequently occurring in ancient traditions and romances, denoting a kind of genii, or imaginary deities, converſant on earth, and diſtinguiſhed by abundance of fantaſtical actions and offices, either good or evil.

The fairies, according to theſe traditions, are peculiar ſpecies of divinities, that have but little relation to any of thoſe of the ancient Greeks and Romans, unleſs, perhaps, to the larvæ; though others will not have them ranked among deities, but ſuppoſe them an intermediate kind of beings, neither gods, nor angels, nor men, nor devils.

They are of oriental extraction, and ſeem to have been invented by the Perſians and Arabs, whoſe hiſtory and religion abound with tales of fairies and dragons. The Perſians call them Peri, and the Arabs Ginn; having a peculiar country which they ſuppoſe them to inhabit, called Ginniſtian, and, by us, Fairy Land. Our famous countryman Spenſer's maſter-work, the Fairy Queen, is an epic poem under the perſons and characters of fairies.

FAIRY *Circles*, or *Rings*, an expreſſion by which certain ſpots, frequently to be obſerved upon the graſs in the fields, are commonly denoted. The ſpots conſiſt of graſs more green and more luxuriant than the reſt of the field. The figure of the ſpot is ſometimes circular; *viz.* an area either circular, or nearly circular, is peculiarly luxuriant throughout its whole ſurface; but it more commonly conſiſts of a circular or nearly circular zone of luxuriant graſs, including a ſpace of the ſame kind of coloured graſs as that which ſurrounds the zone. In this latter, and by far more frequent caſe, the circular zone is ſeldom complete, generally conſiſting of an arch or ſegment, part of which often bends its direction in an irregular manner.

The ſize of theſe ſpots varies conſiderably. When the ſpot is luxuriant throughout, its diameter generally is very ſmall; but the circular zones, which are from two inches to a foot or more in breadth, are the arches of very different circles, the radius of their curvature varying from a few inches to ten feet and upwards.

Theſe ſingular appearances have been long noticed, not only by ſhepherds and labourers in the field, but likewiſe by philoſophers and naturaliſts, who have endeavoured to examine all their peculiarities, for the purpoſe of inveſtigating their nature and origin.

With reſpect to the old vulgar opinion relative to the origin of theſe ſpots, we need not ſay any thing, the abſurdity of it being pretty well manifeſted by their denomination; but of the ſcientific opinions it is incumbent upon us to give a diſtinct and ſatisfactory account.

Two different opinions have been principally advanced by philoſophers with reſpect to the origin of theſe ſpots, and both opinions are grounded upon experiments and obſervations. The fairy circles were for a long time ſuppoſed to be the effects of lightning; but they were afterwards attributed to the growth of fungi: and this latter opinion ſeems upon the whole to be the moſt probable, eſpecially in the manner in which it has been lately illuſtrated by Dr. Wollaſton.

One of the early volumes of the Philoſophical Tranſactions contains the following obſervations of Mr. Jeſſop.

“I have,” he ſays, “often been puzzled to give an account of thoſe phenomena which are commonly called fairy circles. I have ſeen many of them, and thoſe of two ſorts: one ſort bare, of ſeven or eight yards in diameter, making a round path, ſomething more than a foot broad, with green graſs in the middle; the others like them, but of ſeveral bigneſſes, and encompaſſed with a circumference of graſs, about the ſame breadth, much freſher and greener than that in the middle. But my worthy friend Mr. Walker gave me full ſatisfaction from his own experience: it was his chance one day to walk out among ſome mowing graſs (in which he had been but a little while before) after a great ſtorm of thunder and lightning, which ſeemed by the noiſe and flaſhes to have been very near him; he preſently obſerved a round circle, of about four or five yards diameter, the rim whereof was about a foot broad, newly burnt bare, as the colour and brittleneſs of the graſs roots did plainly teſtify. He knew not what to aſcribe it unto but to the lightning, which, beſides the odd capricios remarkable in that fire in particular, might, without any wonder, like all other fires, move round and burn more in the extremities than the middle. After the graſs was mowed, the next year it came up more freſh and green in the place burnt than in the middle, and at mowing-time was much taller and ranker.”

Dr. Prieſtley, at the end of his Hiſtory of Electricity, where he relates his original electrical experiments, deſcribes, amongſt others, the effects which were produced by the diſcharges of a battery upon ſeveral ſubſtances, eſpecially upon metallic ſurfaces, which he ſometimes covered with water. The experiment which principally relates to our preſent ſubject is as follows.

“I then laid,” the doctor ſays, “more water upon the copper, but ſo as only to moiſten it; for the ſurface, being convex, would not allow it to be in any great quantity; and upon taking the exploſion, I found no circle, but ſeveral beautiful circular ſpots melted very deep, one of which was much larger than the reſt. Theſe experiments ſeem to ſhew that the electric matter meets with a conſiderable reſiſtance in paſſing through water, which confines its excurſion more than the air; and that, by ſuch a condenſation, its force is greatly increaſed, ſo as to leave deeper impreſſions upon the metal than when it had paſſed only through the air. In like manner, if two pieces of metal be placed nearly in contact, or if they be light, and one of them lie upon the other, the impreſſion made upon both of them by the diſcharge of the battery paſſing through them will be conſiderably deeper than it would have been if the electric matter had not been confined to ſo ſmall a compaſs as the points in contact.

“To account for the formation of theſe concentric circles nothing ſeems to be neceſſary but the ſuppoſition of the elaſticity of the electric fluid, whereby its particles repel one another. For then, ſuppoſing a quantity of electric matter to iſſue from one piece of metal to another through the air, it will endeavour to ſpread, but will be confined in its paſſage by the ſurrounding electric medium and the ſtrong attraction of the oppoſite metal. If this piece of metal have a flat ſurface, or one that is nearly ſo, the fluid will be attracted by it pretty equally, within a certain ſpace, ſo that the mutual repulſion of its particles will have room to exert itſelf, and produce a diviſion of the whole quantity: and as this repulſion is the ſame in all directions, the effect muſt be its throwing itſelf into a circle, or ſeveral concentric circles, on its entering the oppoſite piece of metal, and conſequently melting it in that form. For the ſame reaſon, the circles themſelves will conſiſt of ſeparate dots, each of which might have been cauſed by the fluid in another hollow circle, but being ſo ſmall the fuſion of the metal could not ſhew that circumſtance.”

And a little farther on the doctor ſays, “communicating this experiment to Dr. Price, he ſuggeſted to me, that the circles, called *fairy rings*, which conſiſt of graſs of deeper green in paſture fields, and which have by ſome been imagined to be occaſioned by lightning, might be analogous to the circles above-mentioned, but that they want a central ſpot. I have ſince examined one of theſe rings. It was about a yard in diameter, the ring itſelf about a quarter of a yard broad, and equally ſo in the whole circumference; but there was no appearance of any thing to correſpond to the central ſpot.”

Notwithſtanding theſe experiments and theſe conjectures, it was not long after the publication of Dr. Prieſtley's Hiſtory of Electricity, that the fairy circles began to be attributed to the growth of fungi; for Mr. Cavallo, in the firſt edition of his Treatiſe on Electricity, which was publiſhed in the year 1777, deſcribes the method of forming, by means of the electrical apparatus, ſuch rings as were diſcovered by Dr. Prieſtley, and which have been already deſcribed; after which he ſays,

“ I have given theſe ſpots the appellation of *fairy circles*, on account that they bear ſome reſemblance to the ſpots ſo called, which are often obſerved upon the graſs in the fields. Theſe, which we may call natural fairy circles in the fields, it has been thought to be effected by lightning, on account of their bearing ſome reſemblance to the above-mentioned circles produced by electricity; the ſuppoſition, however, ſeems not very probable; for the ſpots in the fields, called *fairy circles*, have no central ſpot, no concentric circles, neither are they always of a circular figure; and, as I am informed, they ſeem to be rather beds of muſhrooms, than the effects of lightning.”

In the year 1807 Dr. Wollaſton preſented a paper to the Royal Society, containing various valuable obſervations relative to the fairy circles, and from this paper, which is contained in the volume of the Philoſophical Tranſactions for the above-mentioned year, we ſhall now tranſcribe ſuch paſſages as ſeem abſolutely neceſſary to illuſtrate the ſubject of this article.

“ That,” he ſays, “ which firſt attracted my notice, was the poſition of certain fungi, which are always to be found growing upon theſe circles, if examined in a proper ſeaſon. In the caſe of muſhrooms, I found them to be ſolely at the exterior margin of the dark ring of graſs. The breadth of the ring in that inſtance, meaſured from them towards the centre, was about twelve or fourteen inches, while the muſhrooms themſelves covered an exterior ring about four or five inches broad.

“ The poſition of theſe muſhrooms led me to conjecture that progreſſive increaſe, from a central point, was the probable mode of formation of the ring. I was the more inclined to this hypotheſis, when I found that a ſecond ſpecies of fungus preſented a ſimilar arrangement, with reſpect to the relative poſition of the ring and fungi; for I obſerved, that in all inſtances the preſent appearance of fungi was upon the exterior border of a dark ring of graſs. I thought it not improbable that the ſoil, which had once contributed to the ſupport of fungi, might be ſo exhauſted of ſome peculiar *pabulum* neceſſary for their production, as to be rendered incapable of producing a ſecond crop of that ſingular claſs of vegetables. The ſecond year's crop would conſequently appear in a ſmall ring ſurrounding the original centre of vegetation, and at every ſucceeding year the defect of nutriment on one ſide would neceſſarily cauſe the new roots to extend themſelves ſolely in the oppoſite direction, and would occaſion the circle of fungi continually to proceed by annual enlargement from the centre outwards. An appearance of luxuriance of the graſs would follow as a natural conſequence, as the ſoil of an interior circle would always be enriched by the decayed roots of fungi of the preceding year's growth.”

In the ſequel Dr. Wollaſton relates ſome obſervations of Dr. Withering, who had already attributed theſe ſpots to the growth of fungi, but he confined his conjecture to one ſpecies only of agaric; (*viz.* the Ag. orcades of his arrangement.) “ I am ſatisfied,” Dr. Withering ſays, “ that the bare and brown, or highly clothed and verdant circles in paſture fields called fairy-rings, are cauſed by the growth of this agaric.”—“ Where the ring is brown and almoſt bare, by digging up the ſoil to the depth of about two inches, the ſpawn of the fungus will be found of a greyiſh white colour; but where the graſs has again grown green and rank, I have never found any of the ſpawn exiſting.” Dr. Wollaſton then continues in the following manner. “ Had,” he ſays, “ Dr. Withering frequently repeated this examination of the ſoil, he would have corrected the laſt remark, which is not univerſally true, as the graſs may at ſome period be found luxuriant even over the undecayed ſpawn. During the growth of the fungi, they ſo entirely abſorb all nutriment from the ſoil beneath, that the herbage is for a while deſtroyed, and a ring appears bare of graſs, ſurrounding the dark ring. If a tranſverſe ſection be made of the ſoil beneath the ring at this time, the part beneath the fungi appears paler than the ſoil on either ſide of it, but that which is beneath the interior circle of dark graſs is found, on the contrary, to be conſiderably darker than the general ſurrounding ſoil. But in the courſe of a few weeks after the fungi have ceaſed to appear, the ſoil where they ſtood grows darker, and the graſs ſoon vegetates again with peculiar vigour; ſo that I have ſeen the ſurface covered with dark graſs, although the darkened ſoil has not exceeded half an inch in thickneſs, while that beneath has continued white with ſpawn for about two inches in depth.

“ For the purpoſe of obſerving the progreſs of various circles, I marked them three or four years in ſucceſſion, by inciſions of different kinds, by which I could diſtinguiſh clearly the ſucceſſive annual increaſe, and I found it to vary in different circles from eight inches to as much as two feet. The broadeſt rings that I have ſeen were thoſe of the common muſhroom (Ag. campeſtris); the narroweſt are the moſt frequent, and are thoſe of the champignon (Ag. orcades of Dr. Withering.) The muſhroom accordingly makes circles of largeſt diameter, but thoſe of the champignon are moſt regular. There are, however, as many as three other fungi that exhibit the ſame mode of extenſion, and produce the ſame effect upon the herbage. Theſe are the Ag. terreus, Ag. procerus, and the Lycoperdon boviſta, the laſt of which is far more common than the two laſt mentioned agarics.

“ There is one circumſtance that may frequently be obſerved reſpecting theſe circles, which can ſatisfactorily be accounted for, according to the preceding hypotheſis of the cauſe of their increaſe, and may be conſidered as a confirmation of its truth. Whenever two adjacent circles are found to interfere, they not only do not croſs each other, but both circles are invariably obliterated between the points of contact; at leaſt in more than twenty caſes; I have ſeen no one inſtance to the contrary. The exhauſtion occaſioned by each obſtructs the progreſs of the other, and both are ſtarved.”

FAIRY-*Stones*, or *Fairy Night-caps*, in *Natural Hiſtory*, are the vulgar names, in ſome parts of England, for the impreſſions of *Echini* which are found plentifully imbedded in the chalk ſtrata, and are often ploughed up on the ſurface of ſuch ſtrata. See Dr. Woodward's “ Method of Foſſils,” p. 11, or Parkinſon's “ Organic Remains,” vol. i. p. 4. See alſo W. Martin's “ Outlines of the Knowledge of Extraneous Foſils,” p. 93.

FAISAN *of Buffon*, in *Ornithology*. See PHASIANUS.

FAISANS, ISLE DE, *Iſle of Pheaſants*, or *Iſle of Conference*, in *Geography*, a ſmall iſland in the river Bidaſſoa, celebrated for being the place where the peace of the Pyrenées was concluded in 1669, between France and Spain, and for the interview between the kings of France and Spain, on the marriage of Louis XIV., the firſt name it received from the number of pheaſants found there, and the laſt from the circumſtance of the interview. It is two miles diſtant from Fontarabia.

FAISTENBERGER, Anthony and Joseph, in *Biography*, two brothers, landſcape painters; they both imitated Gaſper Pouſſin with conſiderable ſucceſs, and their works are ſo much alike, that with difficulty the difference is diſcernible. They wrought together at the court of Vienna in ſeveral large works, and were likewiſe employed by many of the princes of the empire. Anthony died in 1722, aged 44.

FAIT, Factum, in *Law*, is uſed for a writing lawfully executed to bind the parties thereto. See Deed.

FAITH, Fides, in *Antiquity*, as denoting honeſty or fidelity, was deified by the Romans, and repreſented with an erect open air, and dreſſed in a thin robe, ſo fine, that one might ſee through it. This deity is alſo repreſented as very old and grey-headed; and ſhe appears on medals as giving her hand, and ſometimes only by two hands joined together. The oath made in the name of this deity, or "Jupiter Fidius," who was the ſame, was of all oaths the moſt inviolable. The temple of Faith erected by Calatius was in the capitol, near that of Jupiter; and if we admit the teſtimony of Dionyſius Halicarnaſſenſis, and that of Plutarch, the firſt who erected a temple to this deity was Numa Pompilius. He likewiſe ordered the prieſts, whom he ſet over the worſhip of this deity, to wear white veſtments when they offered ſacrifices. Dionyſius Halicarnaſſenſis, (l. ii. c. 5.) has ſtated the reaſons why Numa Pompilius gave Faith a place among the venerable Roman divinities. This was done in order to engage the people to obſerve mutual fidelity and truth in their contracts with one another. With this view he deified Faith, and conſecrated a temple to this divinity. Hence Faith came to be ſo revered, and held in ſuch awe, as to have greater influence with the Romans than witneſſes and oaths. Hercules was repreſented as preſiding over Faith pledged in contracts: and the oath taken on ſuch occaſions was thus conceived, "Medius Fidius," *i. e.* "Ita me Deus Fidius adjuvet," So help me Medius Fidius, or Hercules. "Swear to me," ſays Plautus in one of his comedies, by Medius Fidius.

Faith, in *Philoſophy and Theology*, that aſſent which we give to a propoſition advanced by another, the truth of which we do not immediately perceive from our own reaſon or experience; or, it is a judgment, or aſſent of the mind, the motive whereof is not any intrinſic evidence, but the authority, or teſtimony, of ſome other, who reveals or relates it.

Hence, as there are two kinds of authorities and teſtimonies, the one of God, and the other of man, faith becomes diſtinguiſhed into *divine* and *human*.

Faith, *Divine*, is that founded on the authority of God; or, it is that aſſent we give to what is revealed by God.

The objects of this faith, therefore, are matters of *revelation*, which ſee.

Faith, *Human*, is that whereby we believe what is told us by men. The object of this faith is matter of human teſtimony and evidence. See Evidence and Testimony.

Faith, again, may be diſtinguiſhed into *implicit*, and *ſcientific*.

Faith, *Implicit*, or *Blind*, is that whereby we give our aſſent to a propoſition advanced by another, of whoſe knowledge and veracity we have no certain and evident reaſon, or proof. This is only opinion, under another name.

We may obſerve here, that the terms implicit faith are uſed in two different ſenſes. With us Proteſtants, at leaſt in this country, no more is commonly meant by them than the belief of a doctrine, into the truth of which we have made no inquiry, on the bare authority of ſome perſon or ſociety declaring it to be true. But this pre-ſuppoſes ſome knowledge, or ſome conception of the doctrine itſelf. In this acceptation of the term *implicit*, it merely denotes that, in lieu of evidence, one reſts on the judgment of him or them by whom the tenet is affirmed: and no other ignorance is implied but that of the proofs. But the implicit faith, recommended by the ſchoolmen, is a very different thing, and is conſtituted thus: if you believe that all the religious principles, whatever they be, which are believed by ſuch particular perſons, are true, thoſe perſons who hold the principles are explicit believers, but you are an implicit believer of all their principles. Nor is your belief the leſs efficacious, becauſe you are ignorant of the principles themſelves. The tranſcendent excellency of implicit faith conſiſts in this: that you have it then in the higheſt perfection, when, in regard to its object, you know nothing, and have heard nothing at all. This is as if we ſhould call one an implicit mathematician, who knows not a tittle of mathematics, nor even the definitions and axioms; but is convinced of the knowledge of ſome other perſon, who is really, or whom he ſuppoſes to be an adept in that ſcience. "To believe implicitly," ſays Bona, "is to believe in general univerſally all that holy mother church believes; ſo as to diſſent from her in nothing, nor diſbelieve any of her articles." It is of no conſequence, according to the ſcholaſtic doctors, what a man's explicit faith may be; he may be an Arian, a Socinian, an Anthropomorphite, a Polytheiſt, in ſhort, any thing; he cannot err, whilſt he has an implicit faith in the church. Implicit faith has been ſometimes ludicrouſly ſtyled "fides carbonaria," from the noted ſtory of one who, examining an ignorant collier on his religious principles, aſked him what it was that be believed. He anſwered, "I believe what the church believes." "What then," rejoins the other, "does the church believe?" He readily replied, "the church believes what I believe." The other deſirous, if poſſible, of bringing him to particulars, reſumes his inquiry: "Tell me then, I pray you, what it is which you and the church both believe?" The only anſwer the collier could give was, "Why truly, ſir, the church and I both believe the ſame thing:" this is implicit faith in perfection, and, in the eſtimation of ſome celebrated doctors, the ſum of neceſſary and ſaving knowledge in a Chriſtian. Campbell's Lectures on E. H. Lect. xxiii.

Faith, *Scientifical*, or *ſeeing*, is that by which we give our aſſent to a propoſition advanced by one who can neither deceive, nor be deceived; which may be properly referred to ſcience and knowledge.

Divine faith, *cæteris paribus*, is ſtronger than human. When we are fully convinced, that any propoſition comes from God, faith becomes aſſurance, or ſcience; it being an ingredient in our idea of God, that he can neither deceive, nor be deceived; but when there is any doubt, whether the propoſition is declared by God, the faith can be no ſtronger, or weaker, than the reaſons on which it is founded; divine faith, therefore, may either be ſtrong, weak, or none at all. Again, the reaſons or motives of believing men may be of ſuch weight and force, that being perfectly underſtood, they may equal a mathematical evidence; and then the human faith is ſcarce inferior to the divine; there being, as it were, an equal neceſſity of giving our aſſent on each ſide.

Hence, it is eaſily obſerved, that all our faith or belief has its foundation on reaſon, which cannot deceive us, if we make a due uſe of our liberty, and do not acquieſce, till that neceſſarily compels us.

All our preſent religious faith is really human, as depending on the ſecondary teſtimony of men; of whoſe veracity, however, we have the ſtrongeſt proofs. The prophets, or thoſe to whom God immediately revealed his will, believed him, becauſe they knew he could not deceive. We at this day believe them, or rather their writings, for other reaſons; *viz.* the ſame which oblige us to believe all well-atteſted hiſtories. (See EVIDENCE.) Beſides the two ſpecies of faith, human and divine, the Romaniſts make a third, or intermediate kind, called

FAITH, *Eccleſiaſtical,* which is the aſſent orthodox perſons give to certain events decided by the church, and enjoined to be believed by all. As, when the church declares that ſuch a book contains heretical doctrine, &c.

This term, eccleſiaſtical faith, was firſt introduced by Mr. Perefixe, to diſtinguiſh the faith whereby we believe matters of divine revelation, from that whereby we believe matters of eccleſiaſtical determination.

FAITH, in *Practical Theology,* makes the firſt of the theological virtues, or graces.

Faith in God, in this ſenſe, denotes ſuch a conviction of his being, perfections, character, and government, as produces love, truſt, worſhip, obedience, and reſignation. Faith in Chriſt, as it has been defined by ſome, is a mere aſſent to the Goſpel as true; according to others, it ſignifies ſuch a perſuaſion that he is the Meſſiah, and ſuch a deſire and expectation of the bleſſings which he has promiſed in his Goſpel to his ſincere diſciples, as engage the mind to fix its dependence upon him, and ſubject itſelf to him in all the ways of holy obedience; and thus defined it is a very extenſive principle, and includes in its nature and inſeparable effects the whole of moral virtue. In this ſenſe it has been ſaid, that under the Goſpel a man is juſtified by faith. Faith, likewiſe, in reſpect to futurity, is a moral principle, implying ſuch a conviction of the reality and importance of a future ſtate, as is ſufficient to regulate the temper and conduct.

A theological writer of conſiderable reputation, who is of opinion that the New Teſtament teaches, with the cleareſt evidence, a double *juſtification,* (which ſee,) or ſalvation, maintains a diſtinction of faith, correſponding to his ideas of juſtification. Accordingly he ſays, that the faith which gave a right to the firſt juſtification, or an admittance into the kingdom of God in this world, was conſiſtent with a man's periſhing eternally: becauſe he might be admitted into the church upon a profeſſion of *that* faith, and yet remain a wicked perſon, and be loſt for ever. This was evidently the caſe with Simon the ſorcerer, (Acts, viii. 21.) of whom it is ſaid, though "his heart was not right in the ſight of God," and he was in the "gall of bitterneſs, and bond of iniquity," (v. 23.) that "he *believed* and was baptized," (v. 13.) Conſequently, *that* faith muſt be the *general faith,* which is common to all *Chriſtians,* good and bad; or faith conſidered ſimply and ſeparately from the fruits and effects of it. It was that general profeſſion of faith in Chriſt Jeſus, as the Meſſiah and Saviour of the world, (which included a profeſſion of repentance, and which indeed ought to have been ſincere,) upon which the apoſtles baptized the firſt converts. In this ſenſe, "we are all the children of God by faith in Jeſus Chriſt," (Gal. iii. 26.) This faith may be called the *firſt* faith. (See 1 Tim. v. 12.) And it is the continued profeſſion of this faith in Chriſt, which gives us a continued right to a place in the church. For, if we caſt off this *firſt* faith, we renounce our profeſſion, we ceaſe to be Chriſtians; or, we no longer belong to the peculiar family of God. Of this *firſt* faith St. James ſpeaks, (chap. ii. 14—26.) and he very juſtly pronounces it inſufficient, being *alone,* for our final ſalvation or juſtification. In order to *that,* this general and profeſſed faith muſt grow into a principle in the heart, working by love, overcoming the world, and bringing forth all the fruits of righteouſneſs in this life; otherwiſe the *firſt* faith, and *firſt* juſtification, will come to nothing. This is the *working* faith, (Gal. v. 6); faith perfected by works, (Jam. ii. 23.); the *continued* faith (Col. i. 23.); the *growing* faith (2 Theſſ. i. 3. 2 Pet. i. 5. 2 Cor. x. 15.); the *ſtedfaſt,* or eſtabliſhed faith (Col. ii. 5.); *unfeigned* faith (1 Tim. i. 5.) The *firſt* faith is the common faith of all *Chriſtians;* this *latter* faith is peculiar to *real* Chriſtians. The *firſt* may be a dead, inactive faith, (Jam. ii. 17. 20. 26.) The *other* is living and active. The *firſt* is a profeſſion; the *other,* an operative principle. A man may have the *firſt* faith, and periſh; by the *other,* we "believe to the ſaving of the ſoul." (Heb. x. 39.) The *firſt* faith may be a foundation without a ſuper-ſtructure; the *other* is faith *built upon* and improved. (2 Pet. i. 5—8. Jude, 20.) This diſtinction of faith ſeems to be agreeable to the following texts. Rom. i. 17. 1 John, v. 13; in the latter of which the *firſt* and *ſecond* faith appears to be diſtinguiſhed. Taylor's Introduction to his Paraphraſe, &c. on the Romans.

The diſtinction above ſtated will ſerve to reconcile the declarations of St. Paul and St. James concerning faith and works, which ſome have pretended are contradictory; or, they may be otherwiſe reconciled by conſidering that St. Paul puts faith for the whole of Chriſtianity, in contradiſtinction to the law of Moſes, and the works which he declares to be unneceſſary for juſtification, are the rites and ceremonies of that law. On the other hand, by faith, St. James means a bare aſſent to the truth of the goſpel; and the works which he declares to be neceſſary for juſtification are the moral duties enjoined by the goſpel, and which are produced by faith. St. Paul, therefore, ſays, the religion of Chriſt, if believed and obeyed, is ſufficient to juſtify. St. James ſays, the bare belief of the religion of Chriſt, without conformity to its precepts, is not ſufficient to juſtify. Theſe two propoſitions are perfectly conſiſtent with each other; and the ſeeming contradiction in the paſſages themſelves ariſes from the circumſtance juſt mentioned, namely, that the two apoſtles, in reaſoning againſt different errors, uſe the ſame words in different ſenſes. See Biſhop Tomlin's Elements of Chriſtian Theology, vol. ii. p. 262.

FAITH, *Articles of.* See ARTICLES.

FAITH, *Confeſſion of.* See CONFESSION.

FAITH *and Homage,* in the *Feudal Law.* See FEALTY.

FAITHFUL, an application which the Mahometans aſſume to themſelves. See MUSSULMAN.

FAITHFULNESS, in *Ethics,* is an agreement between a man's promiſes and his actions.

FAITIERE, in *Natural Hiſtory,* the name of a ſpecies of ſhell-fiſh, called by many authors, by a much leſs determinate name, concha imbricata. The French have thus called it, from the word *faitage,* which, in the ſame language, ſignifies the roof of a houſe. The ſhell is of the bucardium, or ox heart-kind, and has ſeven longitudinal ribs, and a great many laminæ running tranſverſely acroſs them, ſo that it greatly reſembles the roof of a houſe, where the rafters and croſs-beams are ſeen while it is not covered with tiles.

FAITOURS is uſed in ſtat. 7 Ric. II. cap. 5. for evildoers; and may be interpreted idle livers, from (ſays the author of the Terms de Ley) *faitardiſe*, which ſignifies a kind of ſleepy diſeaſe, proceeding from too much ſluggiſhneſs. In the fore-mentioned ſtatute it ſeems ſynonymous with vagabond.

FAKAUL, in *Geography*, a town of Aſiatic Turkey, in Caramania; 4 miles N. of Cogni.

FAKE, or FACK, in the *Sea Language*, one round or circle of a cable; otherwiſe called a coil.

FAKENHAM, in *Geography*, a ſmall market town in the hundred of Gallow, Norfolk, England, is ſituated on the ſlope of a hill near the river Yar. The buildings are neat and compact. The church, dedicated to St. Peter, is a large, commodious ſtructure, conſiſting of a nave, two aiſles, chancel, porch, and lofty ſtone tower: the latter has a fine weſtern door-way with a large window divided into ſix lights, and ſubdivided by a horizontal mullion and tracery mouldings. In the church is an octangular font, richly ornamented on every ſide with religious emblems. The quarter-ſeſſions for this part of the county were formerly held alternately here and at Walſingham; but ſince the turn has been removed hence to Holt, the ſeſſions-houſe has been uſed as a ſchool. The ſheriffs' open court for the whole county is ſtill kept on an adjoining hill. Fakenham is 108 miles diſtant from London; contains 237 houſes, and 1236 inhabitants; has two annual fairs, and a weekly market on Thurſdays, which is eſteemed the beſt for corn in the county, and is regularly attended by the merchants from Wells and other contiguous ports. Blomefield's Topographical Hiſtory of Norfolk.

FAKIR, or FAQUIR, a kind of derviſe, or Mahometan religious, who travels the country, and lives on alms.

The word *fakar* is Arabic, and ſignifies a *poor* or *needy perſon*. It is formed of the word פקר, *fakara, to be in need*.

D'Herbelot makes fakir and derviſe the ſame thing. The Turks and Perſians uſe the name derviſe for any poor perſon, whether he be ſo out of neceſſity or choice; and the Arabs apply fakir in the ſame ſenſe. Whence, in ſome Mahometan countries, the religious are called derviſes; and in others, particularly throughout the ſtates of the Great Mogul, fakirs.

The fakirs ſometimes travel ſingle, and ſometimes in companies of two or three hundred. When they go in companies, they have a ſuperior, who is diſtinguiſhed by his habit. Each fakir bears a horn, which he blows at his arrival in any place, as alſo at his departure; and a kind of ſcraper or trowel, to ſcrape the earth in the place where he ſits, or lies down. When they go together, they divide their alms equally amongſt them; give what is left every night to the poor: and never reſerve any thing for the morrow.

There is alſo a kind of idolatrous fakirs, who follow much the ſame practice. D'Herbelot reckons in the Indies eight hundred thouſand Mahometan fakirs, and twelve hundred thouſand idolatrous ones; to ſay nothing of divers extraordinary ſpecies of fakirs, particularly penitents, whoſe mortification and penance conſiſt in very odd obſervances. Some, *e. gr.* remain night and day, for many years, in certain uneaſy poſtures. Others never ſit or lie down to ſleep, but ſuſtain themſelves by a rope, hung down for that purpoſe. Others bury themſelves in a ditch, or pit, for nine or ten days, without eating or drinking. Others keep their arms lifted up to heaven ſo long till they cannot let them down again if they would. Others lay fire on their heads, and burn the ſcalp to the very bone. Others roll themſelves naked on thorns. Tavernier, &c.

In Bengal, where they are very numerous, they are the refuſe of ſociety, and live altogether on the alms beſtowed upon them by the ſuperſtition of the people. They go, ſays Stavorinus, entirely naked, and are wholly devoid of ſhame. On their ſhoulders they carry a thick club, the end of which is wound round with rags of cloth, of different colours. It is dangerous to meet them in ſolitary places, or in the woods; for they make no ſcruple of knocking down, and murdering any one that has any thing of value about him. They ſtrew their hair, which hangs down their backs, with aſhes, and ſometimes wallow in aſhes. They generally take up their abode in ſhady places, either in the open air, or in old and ruinous buildings, without any thing to repoſe upon, or to cover themſelves. The genuine fakirs make vows of penance; and Stavorinus ſays, that he ſaw one of them, who had impoſed upon himſelf a ſilence of 12 years.

Another claſs of fakirs retire into moſques, live on alms, and devote themſelves to the ſtudy of the law, the reading of the Alcoran, &c. to fit themſelves for moulas, or doctors. People of quality ſometimes aſſume the character of fakirs. The famous Aurengzebe himſelf, before he aſcended the throne, gave out, that he intended to commence fakir.

FAKIRA, in *Geography*, a town of Japan, in the iſland of Ximo; 15 miles S. of Nagaſaki.

FAKOENI, a town of Walachia, on the Danube; 21 miles N.N.E. of Raſſovat.

FALACA, a kind of baſtinado inflicted on the Chriſtian captives in Algiers. The falaca is properly a piece of wood, about five feet long, bored with two holes, through which the feet of the patient are put, who is laid on his back on the ground, with his arms tied. Two men are employed to give him fifty or an hundred ſtrokes with a cudgel, or bull's pizzle, on the ſoles of his feet. A very trifling fault often incurs this ſevere puniſhment.

FALACER, in *Mythology*, the name of a Roman deity recorded by Varro.

FALAISE, in *Geography*, a town of France, and principal place of a diſtrict, in the department of Calvados, ſituated on the Ante. The town is divided into two parts, one containing 8000 inhabitants in 10 communes, and the other 6000 in 30 communes; on a territorial extent of 237½ kiliometres. It has manufactures of ſerges, linens, and lace. This was the native place of William the Conqueror. It lies 18 miles S. of Caen. N. lat. 48° 55'. W. long. 0° 7'. —Alſo, a ſmall town in the department of the Dyle; 16 miles S.E. of Tirlemont.

FALARI, a town of Italy, in the Patrimonio; 10 miles N.E. of Sutri.

FALARICA, in *Antiquity*, a kind of dart or miſſive weapon, of ſingular ſervice to the Saguntines in their conteſt with the Carthaginians. This dart was diſcharged by the parties poſted in wooden towers, upon the enemy. Theſe wooden towers were called "falæ," from which was derived the name of the weapon. Towards the end it had a ſquare piece of iron, bound about with tow, beſmeared with pitch. The iron head, reſembling that of the Roman pilum or javelin, was three feet long, that it might be capable of penetrating the ſtrongeſt armour, and, through it, of doing execution. As the combuſtible part of it was ſet on fire before it was diſcharged upon the enemy, and this fire muſt have been greatly encreaſed by the air fanning it in its motion, it could not fail to do miſchief, and to excite terror. This dart was ſometimes diſcharged out of the baliſta with an inconceivable force, and did not only deſtroy men, but likewiſe frequently conſumed the wooden towers of the enemy, at which it was levelled. Liv. lib. xxi. Enn. apud Feſt. in voc. *Falarica*.

FALARII, FALARI, in *Ancient Geography*, a town of

Italy, in Etruria, E. of Tarquinii, and very near the Tiber. The ancients repreſent it as a well fortified city. The inhabitants often took up arms againſt the Romans, but when it was ſubdued by them, they eſtabliſhed a colony in it.

FALASJAM, a country of Africa, W. of Abyſſinia.

FALCADE, in the *Manege*. A horſe makes falcades, when he throws himſelf upon his haunches two or three times, as in very quick curvets, which is done in forming a ſtop, and half-ſtop. A falcade, therefore, is the action of the haunches, and of the legs, which bend very low, as in curvettes, when you make a ſtop or half-ſtop.

They ſay, this horſe ſtops well, for he makes two or three falcades, and finiſhes his ſtop with a peſate. This horſe has no haunches, he will make no falcades. The falcades are ſo much the prettier, as in making them his haunches are low. Stop your horſe upon the haunches, in making him ply them well, ſo that after forming his falcades, he may reſume his gallop without making a peſate, that is, without ſtopping or making one time. And thus he will make an half ſtop. See Haunches and Time.

FALCANDUS, Hugh, in *Biography*, a Sicilian hiſtorian of the 12th century, was ſuppoſed to have been a Norman by birth. He publiſhed his hiſtory about 1190, of which the ſubject is the exploits of the Normans in Sicily, and the calamities which it underwent from 1154 to 1169, under the two kings William I. and II. This work has been ſeveral times printed. Moreri.

FALCATA, in our *Old Writers*, was uſed for the graſs freſh mowed, and laid in ſwathes.

FALCATED, one of the phaſes of the planets, popularly called horned.

The aſtronomers ſay, the moon or any planet is falcated, when the enlightened part appears in form of a ſickle, or reaping-hook, by the Latins called *falx*.

The moon is falcated whilſt ſhe moves from the third quarter to the conjunction, and from the conjunction, or from new moon, to the firſt quarter; from hence to oppoſition or full, and from full to the third quarter the enlightened part appears gibbous, and the dark falcated. See Moon.

FALCATOR, in our *Old Writers*, the ſervile tenant who performed ſervice of falcature.

FALCATURE, Falcatura, ſignifies one day's mowing of graſs; a cuſtomary ſervice to the lord by his inferior tenants. Kennet's Gloſſ. in voc.

FALCKENBERG, in *Geography*, a town of the duchy of Holſtein; ſeven miles W.S.W. of Nordtorp.

FALCKENBURG, a town of France, in the department of Mont Tonnerre; 20 miles E.S.E. of Deux Ponts.

FALCO, in *Ornithology*, a genus of *Accipitres*, the bill of which is hooked, and furniſhed at the baſe with a cere; head cloſely covered with feathers; tongue bifid at the end.

The falcons are diſtinguiſhed from the vultures in ſeveral eſſential reſpects, notwithſtanding the ſimilarity in their general appearance and manners of life. The bill in the vulture is of a more lengthened form, or ſtraight, being only hooked at the apex; in the falcon the curvature of the bill commences nearly at the baſe; the head of the vulture is alſo bare of feathers, and the neck retractile; they differ beſides in other particulars, but the two tribes may be clearly aſcertained by the above characters. The falcons are very generally diſperſed throughout the globe, being inhabitants of almoſt every climate, while the vulture is confined to the warmer regions. Both prey on ſmaller birds, quadrupeds, reptiles, and ſome ſpecies on fiſh: theſe the vulture ſeems to prefer in a putrid ſtate, as it is rarely known to attack living animals unleſs urgently preſſed by hunger; but the falcon, on the contrary, rejects its food in this ſtate, delighting to ſeize its prey alive, and devour it recent. The falcon, like the vulture, is capable of enduring abſtinence for a conſiderable period without experiencing any material inconvenience. It has been obſerved of the falcon tribe that they aſſociate only in the breeding ſeaſon, and then only in pairs for the purpoſe of perpetuating their offspring; their neſt is ſometimes formed of a few ſticks and herbage on the bare ground; moſt commonly, however, they ſeek ſome convenient ſpot on the ſummits of rocks or hills, and the larger kinds the loftier pinnacles of mountains.

A conſiderable variation prevails with regard to the colours as well as markings of the plumage in the falcon tribe at different periods of their growth, and hence writers who have treated on this family have been occaſionally miſled, and induced to deſcribe as diſtinct ſpecies what are in reality no other than the ſame bird in different tranſitions of plumage. Some material errors of this kind have already been detected, and others of a ſimilar nature will, no doubt, be diſcovered likewiſe, as we become better acquainted with the hiſtory of this tribe than we are at preſent. The falco genus, in point of ſpecies, is very numerous.

Species.

Harpyja. Head creſted with long feathers; body variegated beneath. Gmel. *Vultur harpyia*, Linn. *Aquila braſilienſis criſtata*, Briſſ. *Aquilæ criſtatæ genus*, Raj. *Yzquauhtli*, Hernand. *Creſted eagle*, Will. *Oronooko eagle*, Brown. *Creſted vulture*, Lath.

Size rather exceeding that of the turkey; the plumage above mixed with black; the head is covered with feathers, and adorned with a creſt of four feathers, two placed on each ſide; the middle ones are two inches long; thoſe at the ſides rather ſhorter, and the whole are moveable at the will of the bird. The hind part of the neck is fulvous; body beneath white; tail faſciated with brown and black; vent and thighs with black and white; the legs are covered with white feathers, and ſpotted with black. Linnæus deſcribes the legs in his ſpecies harpyja as being naked. This creature inhabits South America, and is ſaid to poſſeſs ſuch amazing ſtrengh that it is able to cleave a man's ſkull at one ſtroke of the bill.

Jacquini. Feathers of the head long and numerous; feet naked; body ſnowy white. Gmel. *Vultur coronatus*, Jacquin Beytr. *Crowned vulture*, Lath.

Native of the mountains of New Granada; in ſize nearly reſembling the former. The back, wings, greater part of the neck, and bill, black; head reddiſh aſh, with a creſted tuft of long feathers, which ſtand erect when the bird is irritated; tail long, whitiſh, with tranſverſe black bands; feet and toes yellow; claws black.

Albicilla. Cere and legs yellow; quill-feathers white, the middle ones tipped with black. Linn. *Aquila albicilla*, Briſſ. *Grand pygargue*, Buff. *Cinereous eagle*.

Found in Europe and the ſouthern parts of Ruſſia; the ſize is equal to that of the turkey, and its food conſiſts chiefly of fiſh and ſmall birds.

Coronatus. Cere ferruginous; feet white, ſpotted with black, downy; breaſt rufous; ſides banded with black. Gmel. *Aquila africana criſtata*, Briſſ. *Crowned eagle*, Edwards.

Inhabits Guinea. The body is brown above, with the edge of each feather pale brown; beneath white, with round black ſpots; breaſt rufous; the ſides faſciated with black; tail deep grey, tranſverſely banded with black; toes bright orange. The feathers on the top of the head, and forming a creſt.

CHRYSAETOS. Cere yellow; legs downy, yellowiſh ruſty; body variegated brown, and ruſty; tail black, waved at the baſe with cinereous. Linn. *Le grand aigle*, Buff. *Gold adler wirſing*, *Golden eagle*, Lath.

The length of this bird is three feet; breadth, when the wings are expanded, ſeven feet; the bill is blue; the cere and legs yellow; the head and neck bright ruſt colour; body and tail dark brown. It delights in mountainous ſituations, and occurs throughout Europe and Siberia. The golden eagle is a bird of prodigious ſtrength and courage, and preys on all the ſmaller tribes of animals and birds, and is ſometimes known to carry off the lambs from the flocks of ſheep in the mountain paſtures; it flies to an amazing height in ſerene weather.

OSSIFRAGUS. Cere and legs yellow; legs ſomewhat downy; body ferruginous; tail-feathers white on the inner ſide. Linn. *Aquila oſſifraga*, Briſſ. *Sea eagle*, Will.

Size of a large turkey, and inhabits Europe and North America; this bird lives chiefly on fiſh.

LEUCOGASTER. White; back, wings, and tail dull brown; tip of the tail white; bill and legs yellow. Gmel. *White bellied eagle*, Lath.

Inhabits North America. The length is two feet nine inches; the bill browniſh yellow, large, and much hooked; the head, neck, breaſt, belly, thighs, and vent white; back, wings, and tail dark brown; legs yellow, and very ſtout; claws black. Deſcribed from a ſpecimen formerly in the Leverian muſeum. Native place ſuppoſed to be the iſlands in the South ſeas.

JAPONENSIS. Cere duſky; legs yellow; body brown. Gmel. *Japoneſe hawk*, Lath.

Deſcribed from a ſpecimen in the Bankſian collection, meaſuring one foot eleven inches; the bill is narrow, at the baſe blue, tip black, and beneath yellowiſh; the forehead buff colour; the reſt of the head and body brown, with the tips ruſty; throat white, ſtreaked with black, and ſurrounded with a black ring; feathers of the breaſt and belly yellowiſh-white at the edges; quills dark, and on the inner web of each ſeveral ferruginous ſpots placed tranſverſely; tail deep brown, and all the feathers ſpotted each ſide of the webs with ferruginous, except the two outermoſt, which are plain on the outer web; claws rather large, hooked, and black.

FEROX. Cere green; body above brown; back, belly, and tail-coverts ſnowy, variegated with cheſnut ſpots; tail-feathers equal, brown, with four paler bands. Gmel. Nov. Comm. Petr. *Fierce eagle*, Lath.

Was found abundant, according to Gmelin, near the city of Aſtrachan, in the winter of 1769. The length is about two feet, and its diſpoſition highly fierce and rapacious, as it would not feed on the carcaſes of dead animals. The bill is lead colour; eye-lids blue; the head and neck ferruginous mixed with whitiſh; quill-feathers twenty-ſix in number, black, beneath white; tail-feathers twelve, equal, and beneath white; legs white, thick, and rough, and claws crooked.

SINENSIS. Cere and legs yellow; body above red-brown, beneath yellowiſh. Gmel. *Chineſe eagle*, Lath.

Native of China, and other parts of Aſia. In ſize correſponding nearly with the common eagle; acroſs the wing a duſky band; two bands and tip of the tail duſky.

AMERICANUS. Cere, and woolly legs pale yellow; head, neck, and breaſt duſky-cinereous; tranſverſe band on the cheeks, back, belly, wings, and tail black. Gmel. *Black cheeked eagle*, Arct. Zool.

Size of the common eagle; inhabits North America.

CHEELA. Somewhat creſted, and fuſcous; body brown; wing-coverts ſpotted with white; rump white; tail with a broad white band. Lath. *Cheela falcon*.

Length exceeding two feet; the ſpecies inhabits India, where it is not uncommon, and is known by the name of Cheela.

ASIATICUS. Legs yellow, half downy; body brown above, white beneath; breaſt ſtreaked; tail-feathers ſilver grey; external ones with five pale bands. Lath. *Aſiatic falcon*.

Native of China; ſize that of the honey-buzzard. The bill is black; quill-feathers grey with black bands; upper tail-coverts white; legs downy on the fore part.

NOVÆ HOLLANDIÆ. White; cere, orbits, and legs pale yellow; hind claw twice as long as either of the reſt. *Falco Novæ Hollandiæ*, Gmel. *New Holland white eagle*, Lath.

Deſcribed on the authority of Dr. G. R. Forſter. The ſpecies inhabits New Holland, is twenty inches in length, and has the bill and claws black.

AUSTRALIS. Deep brown; cere yellow; tail black with the tip yellowiſh. Gmel. *Staatenland eagle*, Lath.

Length twenty-five inches; the ſpecies inhabits Staten Land, and has a peculiar note, reſembling the cry of the common hen.

GLAUCOPIS. Cere and legs citron yellow; legs ſomewhat downy; back and breaſt brown; head and crown yellowiſh-white with brown ſtripes; quill-feathers black. Gmel.

Found among the mountains of Germany; its length one foot nine inches. The bill is glaucous; noſtrils large, oval, and beſet with briſtles; front with brown lunate marks; legs ſhort, and covered with ſoft feathers.

MELANONOTUS. Cere, and woolly legs pale yellow; head, hind part of the neck, belly, and wing-coverts ferruginous; throat, breaſt, back, and quill-feathers black. Lath. Ind. Orn. *Falco niger*, Gmel. *Black backed eagle*, Brown.

Size of the golden eagle; bill and claws black; baſe of the tail to the middle white; the extreme part black; claws black. Native place unknown.

LEUCORYPHOS. Cere livid cinereous; legs pale whitiſh, ſlightly downy; body clouded brown; crown with a triangular white ſpot; throat white. Gmel. *Aquila leucorypha*, Pallas. *White crowned eagle*, Lath.

Frequents the ſouthern parts of Siberia. This bird is larger than the oſprey, and in ſeveral reſpects reſembles it; the wings are duſky black, within white; tail long, ſtiff, equal; claws very large and black.

THARUS. Cere and legs pale yellow; body of the male whitiſh with black ſpots; female grey; crown creſted. *Falco tharus*, Gmel. *Chileſe eagle*.

Deſcribed by Molina as an extremely common ſpecies in Chili, where it builds in the higheſt trees, forming its neſt of twigs, wool, hair, and feathers; and lays five eggs. This bird feeds on carrion, poultry, &c. The female is rather ſmaller than the male.

MOGILNIK. Cere pale yellow; legs woolly, and with the reſt of the body duſky ferruginous; back mixed with white. *Aquila mogilnik*, Gmel. Nov. Comm. Petrop. *Ruſſian eagle*.

Inhabits the deſarts near Tanais; the bill, pupil, claws, and quill-feathers black; tail equal; tail-feathers black, with duſky grey bands; tawny at the tips.

CRISTATUS. Head creſted; back, throat, and wings black; belly white; tail with four parallel cinereous bands. Gmel. *Creſted falcon*, Dillon. *Caracca falcon*, Lath.

Size of a turkey; upper mandible much hooked, lower ſtraight.

Haliætus. Cere and legs blue; body above fuſcous, beneath white; head whitiſh. Gmel.

Leverianus. Legs yellow; head fuſcous and white in alternate ſtriæ; body above fuſcous, beneath white; wings dull brown. Gmel. *Leverian falcon*, Arct. Zool.

Native of Carolina; ſize of the buzzard.

Lagopus. Cere and downy legs yellow; body black, ſpotted with white; tail-feathers white, towards the tip black. Gmel. *Graa-falk*, Act. Nidroſ. *Rough-legged falcon.*

This rare ſpecies inhabits Europe, and has been obſerved in Britain; a ſpecimen ſhot near London occurs in the collection of Mr. Donovan.

Groenlandica. Cere and legs lead-colour; body above browniſh, beneath whitiſh with longitudinal brown ſtreaks. Gmel. *Greenland falcon*, Arct. Zool. *Falco fuſcus β*, Faun. Grœn. *Falco lagopus β*, Lath.

By ſome writers this bird is conſidered as a variety of the former; the crown is brown with irregular oblong ſpots of white; front whitiſh; cheeks blackiſh; tail above duſky, croſſed with paler bars, beneath whitiſh.

Antillarum. Body entirely brown. Briſſ. *Mansfeny*, Hiſt. Antilles.

Native of the Weſt Indies. The ſpecies feeds on ſmaller birds, ſnakes, and other reptiles; and is about eighteen inches in length.

Pennatus. Cere and legs yellow; body above variegated with blackiſh brown and dirty grey, beneath brown yellow, with longitudinal blackiſh lines; feet feathered to the toes. Gmel. *Falco pedibus pennatis*, Briſſ. *Booted falcon.*

Length about twenty inches; the bill blackiſh; head and neck yellow-grey with blackiſh lines; tail brown, towards the tip blackiſh, with the apex grey; claws black. Deſcribed by Briſſon from a ſpecimen in the muſeum of Madame de Bandeville; its native place unknown.

Maritimus. Cere and legs yellow; body and tip of the tail white; ſhanks reddiſh mixed with white. Gmel. *Javan eagle.*

A large ſpecies, meaſuring in length near four feet; it lives on the ſea coaſt of Java, and feeds on fiſh and carrion.

Ægyptius. Cere yellow; legs half downy and yellow; body above cinereous, beneath ferruginous; wings above brown; tail forked, as long as the body, and barred with brown. Gmel. *Falco cinereo-ferrugineus*, Forſkal. *Arabian kite*, Lath.

Frequent in Egypt. Length eighteen inches; bill yellow; tail-feathers black towards the tip; wings beneath grey-brown; tail cinereous; claws black.

Niloticus. Cere and legs yellow; body above reddiſh brown with tranſverſe black rays; tail forked, as long as the body; wings variegated with brown, grey, white and reddiſh. Sonnini. *Nilotic falcon.*

Length twelve inches; the bill black, at the baſe grey; feathers of the head black in the middle, of the ſides of the head varied with black, grey, and red; throat grey; upper part of the breaſt reddiſh with black longitudinal ſpots; reſt of the body beneath grey, tinged with red; legs ſpotted with black.

Milvus. Cere yellow; tail forked; body ferruginous; head whitiſh. Linn. *Milvus regalis*, Briſſ. *Milan royal*, Buff. *Hüner-geyer*, Licht. *Weiſſer Milan*, Gunth. *Kite*, Will. Donov. Brit. Birds, &c.

The kite is common in moſt of the hilly parts of Britain, and is found in Sweden, Germany, and other parts of Europe, and alſo in Aſia and Africa, but upon the beſt authorities appears to be unknown as an inhabitant of the American continent. In England it remains throughout the year; as it approaches the more northern climates it becomes migratory, paſſing the winter in milder climates. The kite is a bird of large dimenſions, in length exceeding two feet. The ſmaller kinds of birds, and other animals of inferior ſize, are its uſual prey; and poultry eſpecially, in queſt of which it is often ſeen hovering on the wing over farm-yards in the country ready to dart down upon the ſtraggling young and carry them away. The egg of the kite is blueiſh white, inclining to red at one end.

In the laſt edition of the Syſtema Naturæ three ſuppoſed varieties of this ſpecies are enumerated, as β milvus vertice et gula caſtaneis, Gmel. having the head and throat cheſnut; γ accipiter korſchun, S. G. Gmel. found in the deſerts at Tanain in the Ruſſian dominions; the bill of which is blueiſh black; cere greeniſh; area of the eyes white; ſides of the head pale brown; head and throat cheſnut; δ milvus jaicenſis, Lepechin, with the coverts of the back violet; feathers marked at the top with a white ſpot.

Ater. Cere and legs yellow; above fuſcous black; head and beneath whitiſh; tail forked. Gmel. *Milvus niger*, Briſſ. *Milan noir*, Buff. *Black geld*, Sibbald. *Braunermald geyer*, Kram.

Smaller than the common kite, and inhabits Europe.

Austriacus. Cere and legs yellow; legs ſomewhat downy; body above cheſnut, beneath brickduſt colour ſpotted with brown; tail forked. Gmel. *Brauner-geyer*, Kram. *Auſtrian kite.*

Inhabits the woods of Auſtria, and feeds on ſmall birds and dormice; in point of ſize reſembles the common kite.

Brasiliensis. Legs yellow; body rufous with white and yellow dots; tail variegated with white and brown. Gmel. *Circus braſilienſis*, Briſſ. *Milvus braſilienſis*, *Caracara*, Ray. *Braſilian kite*, Will.

Native of Braſil; its ſize is that of the common kite, and it is exceedingly deſtructive to poultry. Length nine inches.

Furcatus. Cere obſcure; legs yellowiſh; body above fuſcous, beneath white, tail forked and very long. Gmel. *Milvus carolinenſis*, Briſſ. *Falco peruvianus, cauda furcata*, Klein. *Milan de la Caroline*, Buff. *Swallow-tailed hawk*, Cateſby. *Swallow-tailed falcon*, Arct. Zool.

An elegant ſpecies, and of larger ſize than the common European kite; it inhabits Carolina in the ſummer months, where it is called the ſnake hawk. The principal food of this bird conſiſts of inſects.

Urubitinga. Cere and legs yellow; body fuſcous and ferruginous varied; wings black mixed with cinereous; tail white, the tip black ſpeckled with white. Gmel. *Urubitinga*, Ray. *Braſilian eagle.*

Briſſon deſcribes this as being about the ſize of a half grown duck, and as a native of Braſil.

Æquinoctialis. Legs pale yellow; head, neck, and back black-brown; breaſt reddiſh; wing-coverts and ſhoulders chocolate; tail black; the feathers, except the two middle ones, marked with the letter V in white. Gmel. *Equinoctial eagle.*

Native of Cayenne; length twenty-one inches; bill pale; claws pale, with the tip black.

Orientalis. Legs lead-colour; body fuſcous; eyebrows ferruginous; wings and tail ſpotted with white. Gmel. *Oriental hawk*, Lath.

Length ſeventeen inches; the bill is black, beneath yellow; body beneath ſub-ferruginous; the ſpecies inhabits Japan.

Indicus. Cere and legs yellow; body reddiſh fuſcous; front and rump white; belly ſtreaked with whitiſh; tail brown, with five black bands. *Falco indicus*, Gmel. *Javan hawk.*

Size of the laſt; bill black, baſe yellow; hind head whitiſh.

Ponticerianus. Cere blueiſh; body cheſnut; head, neck, and breaſt white, with a longitudinal brown line in the middle of all the feathers. *Aquila ponticeriana*, Briſſ. *Aigle de Pondichery*, Buff. *Pondicherry eagle.*

About the ſize of the jer-falcon, the length one foot ſeven inches. The ſpecies is held ſacred among the natives on the coaſt of Malabar, where it inhabits.

Buteo. Cere and legs yellow; body fuſcous; abdomen pale with fuſcous ſpots; tail fuſcous and banded. Linn. *La buſe*, Buff. *Maaſſe geyer*, Gunth. *Pojana ſecunda*, Zinnan. *Buzzard*, Will.

The buzzard is a native of Europe and preys on ſmall birds, reptiles, the inferior tribes of quadrupeds, and inſects; its length is twenty inches. Not uncommon in Britain.

Apivorus. Cere black; legs half naked and yellow; head cinereous; tail with a cinereous band, and white tip. Linn. *La bondrée*, Buff. *Pojana*, Zinnan. *Honey buzzard*, Lath. Donov. Brit. Birds.

Inhabits Europe, and preys on mice, lizards, frogs, ſmall birds, and inſects, eſpecially bees, whence its name; the male birds are very uncommon, the female extremely rare. The length of this ſpecies is one foot eleven inches.

Variegatus. Legs yellow, body fuſcous, beneath white with fuſcous ſpots; head and neck whitiſh with ferruginous-brown ſtriæ; tail pale brown, with paler bands croſſing each other. *Falco variegatus*, Gmel. *Buzzardet*, Arct. Zool. *Speckled buzzard*, Lath.

Length twelve inches; the bill duſky with black claws. This ſpecies inhabits North America.

Jamaicensis. Cere and legs pale yellow; body above browniſh yellow varied with fuſcous. Gmel. *Jamaica buzzard*, Lath.

Inhabits Jamaica; the ſize of the common buzzard, and rare.

Borealis. Cere and legs pale yellow; body above brown, beneath white; tail pale ruſty, with a tranſverſe ruſty band near the tip. Gmel. *Red tailed falcon*, Arct. Zool.

Size of the laſt, and inhabits North America.

Rufus. Legs yellow; body rufous, above inclining to brown; tail cinereous. Gmel. *Circus rufus*, Briſſ. *Fiſchgeyer*, Friſch. *La harpaye*, Buffon. *Harpy falcon.*

Native of France and Germany.

Æruginosus. Cere greeniſh; body grey; crown, chin, arm-pits, and legs yellow. Linn. *Falco bæticus*, Gerin. *Circus paluſtris*, Briſſ. *Buſard*, Buff. *Fauxperdrieux*, Belon. *Il nibbio*, Zinnan. *Moor-buzzard*, Will.

Length twenty-one inches; the ſpecies inhabits Europe, where it frequents marſhy places, and ſubſiſts principally on fiſh, aquatic birds, and rabbits. Some variation is obſervable in the plumage of different individuals of this ſpecies.

Sclavonicus. Cere yellow; legs downy; body brick-duſt colour, ſpotted with black; head and neck whitiſh. Kram. *Sclavonian buzzard.*

Native of Sclavonia; its ſize that of the common cock.

Marginatus. Cere blueiſh; body above variegated brown and ruſty, beneath ruſty, with irregular oval brown ſpots; tail-feathers barred with blackiſh, edged with white. *Falco marginatus*, It. Poſegan. *Croatian buzzard.*

Rather leſs than the former, and alſo inhabits Sclavonia and Croatia.

Rubiginosus. Fuſcous; beneath whitiſh-yellow; breaſt with a yellow ſpot; tail-feathers with four dull red bars. It. Poſegan.

Bill black; head whitiſh yellow; wing-coverts white at the tip; legs pale yellow. The ſpecies inhabits Sclavonia.

Javanicus. Cere black, in the middle yellow; legs yellow; head, neck, and breaſt cheſnut; back brown. Wurmb.

Inhabits the maritime parts of Java, and feeds on fiſh.

Spadiceus. Cere yellow; body chocolate mixed with ruſty; beneath white at the ſides; legs feathered to the toes. *Falco ſpadiceus*, Phil. Tranſ. *Bay falcon*, Lath.

This and the Placentia falcon (Lath.) are ſuppoſed to be varieties of the ſame ſpecies. The firſt is from Hudſon's bay, the other from Newfoundland. The Bay falcon preys on ducks, which they ſeize as they riſe out of the water; its length is twenty-two inches.

Obsoletus. Legs yellow, body brown; beneath ſlightly ſpotted with white; tail-feathers in the middle pale brown. Gmel. *Plain falcon.*

Length two feet; bill black, nape ſpotted with white; native of Hudſon's bay.

Novæ Zelandiæ. Cere and legs yellow; body ferruginous brown; beneath ſtriated with rufous; tail faſciated with pale yellow; thighs ferruginous. Lath. *New Zealand falcon.*

The female meaſures twenty three inches in length, the male eighteen. Its bill is blue, as are alſo the naked orbits of the eye; in the female the orbits are blue.

Lineatus. Cere and legs yellow; body ferruginous brown, varied with white and pale ruſty lines; tail-feathers duſky brown, with two tranſverſe dirty white bands and tips. Gmel. *Red ſhouldered falcon*, Arct. Zool. *Barred-breaſted buzzard*, Lath.

Native of North America; ſize that of the common buzzard.

Rusticolus. Cere, eye-lids, and legs yellow; body waved with cinereous and white; collar white. Linn. *Collared falcon.*

Inhabits Sweden, and, according to Linnæus, is the ſize of the common hen.

Macrourus. Cere and legs pale yellow; bill blackiſh; body above cinereous, beneath white; inner parts of the wings cinereous, tips white. Lepechin, &c. *Long-tailed falcon.*

The length of this bird is nineteen inches; tail nearly nine inches; it inhabits Ruſſia, and is known by the name of Lun.

Cayennensis. Legs blue; head and neck blueiſh-white; back and wings duſky aſh, throat, breaſt, and belly whitiſh. Gmel. *Petit autour de Cayenne*, Buff. *Cayenue falcon.*

Native of Cayenne; the bill is blue; irids yellow.

Palumbarius. Cere black, edged with yellow; legs yellow; body brown; tail-feathers with pale bands; eye-brows white. Linn, &c. *Aſtur*, Briſſ. *Groſſer gepfeilter, Falck*, Friſch. *L'aſtore*, Cetti. *Goſhawk.*

Formerly uſed in falconry, and highly eſteemed for that purpoſe; the ſpecies is twenty-two inches in length; the bill blue with the tip black; irids yellow; head brown; body beneath white, waved with black; tail long, cinereous, white at the tip, and claws blueiſh. The goſhawk is ſcarce in England, in Scotland not uncommon, and is there conſidered very deſtructive to game. The ſpecies inhabits various parts of Europe, and extends to Aſia and America.

Gentilis. Cere and legs yellow; body cinereous with brown ſpots; tail with four blackiſh bands. Linn. *Falco montanus*, Ray. *Falcon gentil*, Will. &c.

Inhabits the mountains of Europe and North America, and occurs rarely in England; the ſize excels that of the goſhawk, and the ſpecies preys on partridges. The bill is lead-colour; irids yellow; head reddiſh with oblong black ſpots; tail dotted with white; claws black.

Communis. Body brown; the feathers edged with ruſty; tail with darker tranſverſe bands; bill blueiſh aſh; cere, irids, and legs yellow. Linn. *Accipiter fuſcus*, Friſch. *Faucon*, Buff. *It falcone cetti. Common falcon.*

The common falcon is about the ſize of a moderate fowl, and nearly eighteen inches in length. Whether this be the primitive ſtock from whence the following ſuppoſed varieties, enumerated by falconers, have originated, we cannot pretend to determine; and ſhall only obſerve that it is admitted as ſuch by writers of repute.

Varieties.

Hornotinus β. Inclining to cinereous. Gmel. *Falcon ſors*, Buff. *Yearling falcon*, Lath. *The young of the common falcon.*

Gibboſus γ. Back gibbous. Ray. *Faucon haggard ou boſſu*, Buff. *Haggard falcon*, Will.

So named when grown old, from drawing its head cloſe between the ſhoulders, as though it were hump-backed.

Leucocephalus δ. Head white, with ſmall brown ſpots. Briſſ. *Raub-fuſs-geyer; gelbbrauner geyer*, Friſch. *White headed falcon.*

In this variety the bill is aſh-coloured; cere pale yellow; back and wing-coverts ſpotted with brown, rufous, grey, and whitiſh indiſcriminately; beneath grey with brown ſpots, each ſpot encircled with rufous; feet feathered to the toes; legs yellow; claws black. There is another variety in which the head, neck, and breaſt are white, with minute fuſcous ſpots only.

Albus ε. Entirely white. Ray. *Weiſſer falk, Weiſſer geyer*, Friſch. *White falcon*, Will.

Several varieties of this kind are deſcribed; in ſome the back and wings are marked with a few black ſpots, and the tail barred; others have the white plumage marked with ſcarcely viſible yellow ſpots.

Ater ζ. Uniformly blackiſh brown. Briſſ. *Falco columbarius nebbi dictus*, Ray. *Black hawk*, Edw.

Buffon admits this to be a diſtinct ſpecies, and names it le Faucon Paſſager.

Nævius η. Wings ſpotted. Briſſ.

Fuſcus ϑ. Dark brown. *Braunfahler geyer*, Friſch. *Brown falcon.*

Ruber ι. Spotted with black and red. *Falco rubens*, Ray. *Red falcon*, Will.

Indicus κ. Beneath reddiſh fulvous. *Falco ruber indicus*, Briſſ. *Falcones rubri indici Aldrovandi*, Ray. *Red Indian falcon.*

Italicus λ. Breaſt pale yellow with ferruginous ſpots; wings near the tip ſpotted with white. Briſſ. *Italian falcon.*

Found in the Alps.

The varieties above-mentioned are widely diſperſed throughout Europe, and North America, China, and other parts of Aſia.

Gyrfalco. Cere blue, legs yellow; body fuſcous; beneath faſciated with cinereous; tail at the ſides white. Linn. *Jer-falcon.*

Inhabits Europe.

Islandicus. White, with fuſcous ſpots; tail-feathers white; outer edges ſpotted with brown. Lath.

Native of Iceland.

Peregrinus. Cere and legs pale yellow; body above blue, cinereous, ſtriped with brown; beneath reddiſh-white, with blackiſh ſtripes; tail dotted with white. Gmel. *Peregrine falcon*, Donov. Brit. Birds, &c.

Breeds in the mountainous parts of Britain, and was formerly employed in the ſports of falconry. The ſpecies is found in various parts of Europe, Aſia, and America.

Versicolor. Cere yellow; head and body above white, with pale reddiſh ſpots, beneath white; breaſt a little ſpotted with ferruginous. Gmel. *Spotted falcon.*

Three diſtinct ſpecies of the falco tribe have been deſcribed by different Engliſh writers, under the name of the ſpotted falcon. The firſt bird to which this name was aſſigned is ſmaller than the other two, and differs conſiderably in plumage; the ſecond is the ſpotted falcon of Pennant; and the third the ſpotted falcon of Lewin and Walcot. The errors of the latter-mentioned writers have originated from miſconceiving the ſpecimen firſt deſignated by the title of the ſpotted falcon, and which for this reaſon ought with propriety to be conſidered as the original. Each of the individual ſpecimens deſcribed by thoſe reſpective writers were preſerved in the late Leverian muſeum, and are at preſent in the poſſeſſion of Mr. Donovan.

Barbarus. Cere and legs pale yellow; body blueiſh, with fuſcous ſpots; breaſt immaculate; tail faſciated. Linn. *Falco tunetanus*, Ray. *Barbary falcon*, Will.

Length one foot five inches; the ſpecies inhabits Barbary.

S. Johannis. Cere and feathered legs yellow; body brown; above with black and dirty white oblique lines; beneath with white and yellowiſh ſpots; tail barred, and white at the tip. Gmel. *St. John's falcon*, Arct. Zool.

Native of Newfoundland.

Sacer. Cere and legs blue; back, breaſt, and primary wing-coverts ſpotted with brown; tail with kidney-ſhaped ſpots. Briſſ. *Sacre*, Buff.

A large ſpecies, meaſuring in length two feet; it inhabits Europe, and extends to Tartary. The ſpeckled partridge-hawk of the Arctic Zoology is ſuppoſed to be a variety of this bird.

Novæ Terræ. Cere and legs yellow; body above brown, beneath and hind head ferruginous; tail variegated with paler and darker lines. Gmel. *Newfoundland falcon.*

Length twenty inches; legs half-feathered; the ſpecies inhabits Newfoundland.

Stellaris. Legs blue; body blackiſh, with radiate ſpots; beneath intermixed with black and white. Briſſ. *Falco cyanopus*, Klein. *Blue footed*, Will. *Starry falcon*, Lath.

Native of Europe. Size of the peregrine falcon; wings ſhorter; tail longer; irids golden.

Hyemalis. Cere yellow; head and back black brown; neck ſtreaked with white; breaſt and belly white, with cordated ſpots. Gmel. *Winter falcon*, Arct. Zool. *Northern falcon*, Lath.

Inhabits New York during the winter ſeaſon. Length eighteen inches; in the male the wing-coverts are duſky, edged with dull white, the exterior one orange; tail with brown and black bars, and white at the tip; bill black; feet long and ſlender.

Rhombeus. Legs yellowiſh; body above grey, beneath brown, with rhombic ſpots; tail-feathers with eleven oblique black bands. Lath. *Rhomboidal falcon.*

The length of this bird is nineteen inches; the bill is lead colour; head and neck black; back and wings grey, with black bands; tail grey, and faſciated with black; native of India, about the river Ganges.

NIGRICOLLIS. Legs yellow; body rufous, with black bars; crown and neck ſtreaked with black; tail-feathers blackiſh at the tips. Lath. *Black-necked falcon*, Lath.

Native of Cayenne; its length one foot eleven inches; bill black, and a black ſtreak behind the eyes.

ALBICOLLIS. Legs yellow; head, neck, fore part of the back, breaſt, and belly white; wings black, with white ſpots; feathers between the ſhoulders marked with ſquare black ſpots. Lath. *White-necked falcon.*

Length twenty-two inches; quill-feathers ſpotted with white from the baſe to the middle. Inhabits Cayenne.

MELANOLEUCOS. Legs pale yellow; body white; head, neck, back, ſhoulders, and quill-feathers black; wing-coverts and tail white. Gmel. *Black and white Indian falcon*, Ind. Zool.

Deſcribed by Sonnerat as a native of Ceylon, under the title of faucon á collier des Indes. The length is ſixteen inches; its irids are yellow; orbits ſpotted with white; bill, claws, and middle wing-coverts blackiſh.

CIRRHATUS. Cere and feathered legs pale yellow; bifid creſt on the hind head pendulous; body above black; beneath ſtriated black and white. Lath. *Falco indicus criſtatus*, Briſſ. *Cirrhatus*, Ray. *Faucon hupé des Indes*, Buff. *Creſted Indian falcon*, Will.

Size of the goſhawk; the bill dark blue; irids yellow; neck tawny; tail with cinereous and black bands placed tranſverſely; claws black. A ſuppoſed variety, has a black band acroſs the breaſt, and another on the wing.

MERIDIONALIS. Cere and chin yellow; head and neck rufous, with dark ſtreaks; belly whitiſh, with narrow black bars; four middle tail-feathers with one, the outer with ſix pale bars. Lath. *Rufous-headed falcon.*

Length nineteen inches; the ſpecies inhabits Cayenne.

MELANOPS. Cere and legs pale yellow; body black, with white ſpots; beneath white; head and neck white, with black ſtriæ; orbits black; quill-feathers black, with a white band in the middle. Lath. *Streaked falcon.*

Size of a rook, and inhabits Cayenne.

CACHINNANS. Cere and legs pale yellow; eye-brows white; body varied with brown and whitiſh; crown white, with a black ring. Linn. *Laughing falcon*, Lath.

Inhabits South America, and emits a laughing ſound when obſerved. The back, wings, and rump are brown; neck, chin, breaſt, and belly, with the under parts of the wings white; tail with yellow and black bands.

SUFFLATOR. Cere and legs pale yellow; body whitiſh-brown; eye-lids bony. Linn. *Surinam falcon*, Lath.

Native of Surinam.

BIDENTATUS. Bill bidentated and fuſcous; body lead colour; breaſt and abdomen rufous; vent white; quill-feathers with many, tail with three bars of white. Lath. *Notched falcon.*

Native of Cayenne; length fourteen inches.

FORMOSUS. Cere and legs pale yellow; throat and neck purple; body above blue, tinged with red; abdomen fleſh-colour. *Falco formoſus*, Lath. *Falco aquilinus*, Gmel. *Petit aigle d'Amerique*, Buff. *Red-throated falcon.*

The length of this beautiful ſpecies is eighteen inches. The bill is blue and ſtraight at the baſe; irids orange; legs yellow; claws black. Inhabits Cayenne and South America. The female is five inches longer than the male, the body blacker, purple on the neck more obſcure, and the poſterior part of the thighs with the vent white.

ALBICANS. Cere and legs pale yellow; body browniſh, beneath whitiſh; quill and tail-feathers blackiſh. Gmel. *White lanner.*

Inhabits Europe, and is by ſome believed to be the ſame with the common lanner.

LANARIUS. Cere pale yellow; legs and bill blue; body beneath marked with black longitudinal ſpots. Linn. *Le lanier*, Buff. *Lanneret*, Alb. *Lanner*, Arct. Zool. *Brown lanner.*

Rather leſs than the buzzard, and inhabits Europe; very rare in Britain.

CYANEUS. Cere white; legs fulvous; body blue-grey; a white arch over the eyes, and ſurrounding the chin (male). *Falco cyaneus*, Linn. *Falco torquatus* (maſ.), Briſſ. *Falco accipiter* (maſ.), Ray. *Falco albanella*, Gerin. *Falco cinereus*, Friſch. *Oiſeau St. Martin*, Buff. *Hen Harrier*, Lath. Donov. Br. Birds, &c.

Cere and legs yellow; body cinereous; abdomen pale, with oblong rufous ſpots; orbits of the eyes white (female). *Falco pygargus*, Linn. *Falco torquatus* (fem.). *La ſoubuſe*, Buff. *Ring tail*, Lath. Donov. Br. Birds, &c.

The above are the two ſexes of the ſame ſpecies; the male is ſeventeen inches in length, the female nineteen inches and a half; the ſpecies is found in Europe and Siberia.

HUDSONIUS. Cere and legs yellow; back brown; eye-brows white; ſpeculum on the wing blueiſh. Linn. *Ring-tailed hawk*, Edwards. *White-rumped bay falcon*, Lath.

Length one foot nine inches and a half; the bill black; body beneath white, with rufous-brown ſpots. The Hudſon's bay ring-tail of Latham is ſuppoſed by that writer, in Ind. Orn. to be the ſame with the above, and both, together with the following, are imagined to be varieties of cyaneus.

BUFFONI. Cere blue; legs yellow; body blackiſh cheſnut; beneath reddiſh buff; eye-brows yellow; tail with pale and duſky brown ſpots. Gmel. *Cayenne ringtail*, Lath.

Inhabits Cayenne.

ULIGINOSUS. Cere and legs orange, body above brown, beneath ſhining ruſty; tail with four black bands. Gmel. *Marſh hawk.*

Briſſon conſiders this as a variety of falco cyaneus, and in this opinion he is countenanced by ſome other writers; it differs principally in being larger, and in having a black ſtreak through the eye, independently of the above-mentioned characters. The Marſh hawk is repreſented as a fierce bird, and inhabits Jamaica.

CALIDUS. Legs yellow; body brown-black, beneath white, with black lunules; tail with obſolete bars. Lath. *Behree falcon.*

This ſpecies inhabits India, and is called Behree; its length is nineteen inches.

NITIDUS. Lead colour; beneath white, with cinereous bands; tail-feathers blackiſh, with two narrow tranſverſe white lines. Gmel. *Plumbeus falcon.*

Native of Cayenne; length thirteen inches and a half; legs yellow.

TINNUNCULUS. Cere and legs yellow; back rufous with black dots; breaſt ſtriated with fuſcous; tail rounded. Linn. *Cenchris*, Klein. *La Creſſerelle*, Buff. *Keſtril*, *ſtannel*, or *windhover*, Will. Lath. Donov. Brit. Birds, &c.

The male is fourteen inches in length, the female much larger; the former has the head and tail grey, and the back and wings purpliſh red, with black ſpots; in the female the head is reddiſh with black ſtreaks; back, tail, and wing-coverts ruſty with black lines. The ſpecies was formerly employed in the ſports of falconry for young partridges, and ſmall birds. The hawk, called l'epervier des alouettes by Briſſon is ſuppoſed to be a variety of the female keſtril.

Sparverius. Cere and legs pale yellow ; head fuſcous ; crown and abdomen red ; wings blueiſh. Linn. *Æſalon carolinenſis*, Briſſ. *Eſmerillon de Cayenne*, Buff. *Little falcon*, Cateſby.

Native of Carolina, Virginia, and St. Domingo ; the length eleven inches, bill and irids yellowiſh ; head blueiſh aſh ; crown, body above, and wing-coverts brown-orange, with black tranſverſe lines; tail red-brown, with dots of black ; legs yellow ; head of the ſuppoſed female ſurrounded with ſeven blackiſh ſpots.

Dominicensis. Cere and legs pale yellow ; head cinereous ; body above red-brown, beneath dirty white, and both ſpotted with black ; eight middle tail-feathers cheſnut, towards the tips black, and at the extremity white. Gmel. *Æſalon dominicenſis*, Briſſ. *Emerillon de St. Domingue*, Buff. *New York merlin*, Lath. and *St. Domingo falcon*, Lath.

Inhabits St. Domingo. The bill is yellow, with the tip black ; irids yellow ; outer tail-feathers of the male white on the outſide and tips; inſide cheſnut, with a tranſverſe black ſpot towards the tips ; of the female the outſide white, with five black ſpots ; claws black. The male alſo differs in having the upper part leſs numerouſly ſpotted than in the female, and the throat and fore part of the neck more inclining to red-brown. In the Ind. Orn. of Latham ſparverius and dominicenſis are admitted to be of the ſame ſpecies, the firſt as male, the other female.

Nisus. Cere green ; legs yellow ; abdomen undulated with grey ; tail with blackiſh bands. Linn. *Accipiter*, Briſſ. *Niſus ſtriatus ſagittatus*, Friſch. *Le ſparviere*, Cetti. *Epervier*, Buff. *Sparrow hawk*, Will. Donov.

The two ſexes of this hawk are exceedingly diſſimilar ; the male is twelve inches in length, and the female fifteen. In the male the plumage verges to dove colour, like the female it is marked on the breaſt with tranſverſe lines, but which are leſs abrupt, and numerous than in the other ſex ; and the under parts are alſo darker. Both ſexes are pale above the eyes, and the bill and legs blue. The ſparrow hawk commits vaſt havoc among the young of poultry and game, as well as pigeons, and all the ſmaller tribes of birds. The ſpotted ſparrow hawk of Latham, l'epervier tacheté of Briſſon, is a variety of this ſpecies. The ſparrow hawk with the plumage perfectly white, or milky white, occurs occaſionally. Gmelin deſcribes one of this kind as a diſtinct variety "accipiter corpore toto lacteo unicolore." The ſame circumſtance is however obſervable in birds of every deſcription.

Bohemicus. Legs yellowiſh; body above cinereous ; beneath white ; orbits white ; five exterior quill-feathers black. Gmel. *Mæuſe-habicht, miſſilauce*, Mayer. *Bohemian falcon*.

Inhabits the mountains of Bohemia, and preys in the evening on mice. Length about one foot.

Fuscus. Cere cinereous ; legs yellow ; body black, waved; above cinereous-brown, beneath whitiſh. Gmel. *American brown hawk*.

Size of the ſparrow hawk ; bill lead colour ; tail cinereous with three tranſverſe pale brown bands ; tip paler ; claws black.

Piscator. Somewhat creſted ; head ferruginous ; body cinereous ; margin of the feathers fuſcous ; beneath yellowiſh, with longitudinal fuſcous ſpots. Lath. *Faucon pecheur*, Damp. *Fiſhing falcon*.

Native of Senegal, and ſubſiſts on fiſh ; the bill and irids are yellow ; legs fuſcous.

Badius. Legs pale, head and body above brown, beneath white, with yellow lunar ſpots ; tail pale brown, with four duſky lines. *Falco badius*, Gmel. *Brown hawk*, Brown Illuſtr.

Inhabits Ceylon ; length thirteen inches ; bill blue, irids yellow.

Dubius. Cere, irids, and legs yellow ; body fuſcous, beneath white, ſtriated with fuſcous ; tail-feathers cinereous, with four black bands. Gmel. *Dubious falcon*, Lath

Length ten inches, and inhabits Carolina.

Obscurus. Cere and legs yellow ; hind head and neck ſpotted with white ; body above fuſcous ; beneath whitiſh lineated with black ; tail with fuſcous bands. *Falco obſcurus*, Gmel. *Duſky falcon*, Arct. Zool.

Smaller than the laſt, and inhabits New York. The bill is blueiſh ; head dull fuſcous ; tail ſhort ; legs with the tip white.

Columbarius. Cere, irids, and legs pale yellow ; body fuſcous ; beneath whitiſh, ſtriated with fuſcous ; tail with four narrow black bands. Linn, &c. *Accipiter carolinenſis*, Briſſ. *Epervier des pigeons*, Buff. *Pigeon hawk*, Cateſby.

Length ten inches, the bill whitiſh, with black tip ; legs yellow, and claws black ; the ſpecies is a native of Carolina, and other parts of North America, and is called the ſmall bird hawk by the inhabitants of Hudſon's bay. It feeds on ſmall birds, and ſhrieks hideouſly.

Vociferus. Legs yellow ; body cinereous grey, beneath white ; larger and leſſer wing-coverts black. Gmel. *Petite buſe criarde*, Son. *Criard falcon*.

Frequent among the rice plantations on the coaſt of Coromandel, where it is ſuppoſed to prey on the frogs which abound in thoſe places ; when diſturbed, it utters a loud cry, and has hence obtained the name of criard. Its ſize is that of a pigeon ; the irids are yellow, and the orbits red and naked.

Superciliosus. Cere and eye-lids pale yellow ; body fuſcous, with whitiſh waves ; quill-feathers ruſty, with black bands. Linn. *Guiana falcon*, Lath.

Size of the magpie, and inhabits Surinam and Guiana. The ſecondary tail-feathers are whitiſh at the outer edge ; the tail black, with two broad bands, and cinereous tip ; vent white, with a few black ſtreaks; bill and claws black.

Vespertinus. Cere, legs, and eye lids pale yellow ; vent and thighs ferruginous. Linn. *Kober*, Decouv. *Ingrian falcon*.

Native of Ingria, Ruſſia, and Siberia ; on the banks of the Baikal very common, and known by the names of kober and derbnitſchoek; it flies chiefly in the evening or night time, and feeds on quails, ſmall birds, reptiles, &c. The ſize is that of the pigeon ; the body blueiſh, fuſcous ; belly blueiſh white ; head fuſcous ; bill yellow ; legs naked. The neſt is built on the tops of high trees, and not unfrequently it takes poſſeſſion of the magpie's neſt inſtead of conſtructing one for itſelf.

Vespertinoides. Cere, legs, and eye-brows pale yellow ; thighs black ; neck, breaſt, and belly browniſh, with white ſpots, *Falck*, &c. *Permian falcon*.

Inhabits Permia and Baſchkiria, in Siberia ; ſize half that of veſpertinus.

Magnirostris. Cere and legs yellow ; body fuſcous ; abdomen white, with ferruginous ſtriæ ; quill-feathers black and white banded. Gmel. *Epervier à gros bec de Cayenne*, Buff. *Great-billed falcon*.

Larger than the ſparrow hawk, and inhabits Cayenne.

Johannensis. Legs pale yellow ; body ferruginous, with linear black dots ; throat pale yellow ; quill-feathers blackiſh fuſcous ; tail cuneiform and white. Lath. *Johanna falcon.*

Inhabits the iſland of Johanna, in India ; its ſize uncertain, the ſpecies being deſcribed from a manuſcript in the poſſeſſion of the late Dr. Fothergill.

Subbuteo. Cere and legs yellow ; back fuſcous ; nape white ; abdomen pale, with oblong fuſcous ſpots ; vent and thighs rufous. Linn. *Falco barletta*, Ger. *Hobreau*, Briſſ. *Baum falck*, Gunth. *Hobby*, Will. Lath. Donov. Br. Birds, &c.

Native of Europe, and extending as far as Siberia. Length twelve inches ; the bill blue ; orbits yellow ; lateral tail-feathers with blackiſh bars ; claws black. Preys on larks, and other ſmall birds. A variety of this bird has the body above blueiſh black ; cheeks white with a black line reaching through them from the crown.

Lithofalco. Cere yellow ; body cinereous fuſcous ; beneath reddiſh with longitudinal fuſcous ſtreaks ; tail-feathers blackiſh toward the tips, and at the extremity white. *Falco lithoſalco*, Ray. *Le rochier*, Buff. *Stone falcon*, Will.

Size of the keſtril, and inhabits Europe ; bill lead-colour, irids yellow.

Montanus. Legs pale yellow ; body cinereous brown, beneath whitiſh ; head black ; throat ſpotted ; tail at the baſe cinereous, in the middle blackiſh, at the tip white. Gmel. *Falco montanus*, Ray. *Mountain falcon*, Will.

Briſſon deſcribes this bird as being leſs than the peregrine falcon, and as a probable variety of the ſtone falcon ; the "faucon de montagne cendrée" of the ſame writer is conceived to be another variety ; the latter is twenty-one inches in length ; the bill is black ; iris yellow ; general colour cinereous ; paleſt on the wing-coverts ; beneath white ; legs luteous.

Aurantius. Bill and legs lead colour ; body blackiſh ; back, baſe, and tail with white interrupted bands ; breaſt fulvous ; thighs ferruginous. Lath. *Orange-breaſted hobby.*

Native of Surinam, and in length fifteen inches. The bill is whitiſh at the baſe ; throat with round white ſpots ; lower tail-coverts ruſty ; legs long and ſlender ; claws black. There is a variety in which the body is more duſky ; the chin white, and throat orange ; this is two-thirds the ſize of the former. Another of the ſame magnitude as the latter ſmall variety has the legs tawny ; body above blueiſh-black with blueiſh ſtreaks, and ſtreaked beneath with white.

Plumbeus. Cere duſky ; legs yellow ; body cinereous ; upper part of the back black-lead colour ; tail feathers underneath with three white ſpots. Lath. *Spotted-tail hobby.*

Size of the ſparrow hawk ; bill and claws black ; head and neck cinereous ; legs ſhort. Native of Cayenne.

Æsalon. Cere and legs yellow ; head ferruginous ; body above blueiſh-aſh with ruſty ſpots and ſtripes ; beneath yellowiſh white with oblong ſpots. Gmel, &c. *Cenchris*, Friſch. *Accipiter ſmerillus*, Ger. *Merlin*, Will. Donov. Br. Birds, &c.

The merlin inhabits various countries in Europe, and the ſouthern part of Aſia, but appears to be every where rather uncommon. The ſpecies is of a ſmall ſize, being ſcarcely larger than a blackbird : it was nevertheleſs formerly employed in the ſports of falconry, and was not conſidered inferior in point of ſpirit to any of the hawk tribe. Merlins have been known to breed, though very rarely, in North Britain ; in leſs temperate regions they migrate ſoutherly at the approach of winter. The bill is blueiſh ; tail marked with alternate duſky and reddiſh ſtreaks ; claws black.

There are ſeveral varieties of this ſpecies : one kind has the front cinereous ; crown, back, and wing-coverts cheſnut ; temples with a triangular ſpot of white, edged with black ; tail cheſnut with black ſtripes, beneath varied with black and white. The Caribbee variety is rather larger than a thruſh ; it is rufous above with black ſpots, beneath white with longitudinal ſpots of black. Briſſon conſiders this as a variety of the merlin, and names it l'emerillon des Antilles. The natives of the Antilles call it *gry gry*. The true falconer's merlin, according to Buffon, reſembles the hobby in figure, except that the wings are ſhorter, and in colour and other reſpects accords with the ſtone falcon. This, however, ſeems very doubtful, as Salerne obſerves, for ſportſmen have commonly confounded all birds of the hawk tribe inferior in ſize to the buzzard, under the name of merlin, and there are, for this reaſon, ſeveral birds which have an equal claim to the ſame title, as well as the ambiguous variety mentioned by Buffon.

Minutus. Cere brown ; legs yellow ; body beneath white ; tail-feathers brown, banded with black. Linn. *Accipiter minor*, Briſſ. *Minute falcon.*

Inhabits the iſland of Malta ; length eleven inches ; the bill and claws are black ; body above brown, varied with rufous ; beneath with tranſverſe browniſh red ſtreaks ; belly with lanceolate ſpots.

Cærulescens. Cere, eye-lids, legs, and body beneath pale yellow ; back blueiſh black ; temples ſurrounded by a white line. Linn. *Falco bengalenſis*, Briſſ. *Little black and orange Indian hawk*, Edw. *Bengal falcon.* Length ſix inches and a half ; inhabits Bengal.

Regulus. Cere greeniſh ; legs obſcure yellow ; ruff ferruginous ; body above lead colour, beneath whitiſh with ruſty ſpots. Pallas. *Siberian falcon.*

A rare ſpecies diſcovered by Pallas in Siberia ; the irids are brown ; crown brown with black lines ; wings white at the edges, varying beneath ; tail feathers lead-colour towards the tip, beneath with pale bands, edges black, tips white. Leſs than ſix inches in length ; and preys on larks.

Tinus. Legs yellow ; body cinereous fuſcous ; beneath whitiſh with blackiſh bands ; crown whitiſh. Lath. *Tiny falcon.*

This minute ſpecies, formerly in the Leverian muſeum, is ſix inches in length, or rather leſs ; the bill duſky ; legs yellow. The tail in this ſpecimen wanting.

The jer-falcon, the gentil falcon, the common falcon, the peregrine, and the goſhawk, were the principal ſpecies uſed in the diverſion of *Falconry*, which ſee.

Falcon, in *Gunnery*. See Faucon.

Falcon *Iſlands*, in *Geography*, two or three ſmall iſlands near the coaſt of Connecticut, in Long Iſland ſound. N. lat. 41° 10′. W. long. 72° 40′.

Falcon, in *Ornithology*. See Falco.

FALCONARA, in *Geography*, a town of Naples, in Calabria Citra ; nine miles W. of Coſenza.

FALCONE, Da Benevento, in *Biography*, an ancient chronicler, filled an high office under pope Innocent II. about the middle of the 12th century. He was afterwards chief magiſtrate of Benevento. He wrote a chronicle of the affairs of the kingdom of Naples from 1102 to 1140, which is eſteemed a faithful and very uſeful record. It is found in Muratori's and other hiſtorical collections. Moreri.

FALCONER, a perſon who brings up, tames, and makes, that is, tutors and manages birds of prey; as falcons, hawks, &c. The grand ſeignior uſually keeps ſix thouſand falconers in his ſervice. The French king had a grand falconer, which was an office diſmembered from that of great hunt, grand veneur. The duke of St. Alban's is hereditary grand falconer of England.

Hiſtorians take notice of this poſt as early as the year 1250. One great buſineſs of the falconer is to conſider the quality and mettle of the birds, to know which to fly early, and which late. He muſt alſo be buſy and cleanly in freeing them of lice, nits, and vermin. Every night after flying he ſhould give his bird caſting; nor muſt he forget to water her unleſs ſhe have been bathed. After this, ſhe muſt be put in a warm room, having a perch, with a candle burning by her; where ſhe is to ſit unhooded, that ſhe may prune and pick herſelf. Next morning ſhe ſhould be weathered, &c.

Falconer, William, in *Biography*, was born in a village in Fifeſhire, Scotland, and left, at an early age, an orphan. He was brought up a ſailor, and in that capacity he ſpent the greater part of his life, in a very low ſtation. We do not know how he acquired a taſte for literature, but while ſerving on board a man of war he attracted the notice of Campbell, author of Lexiphanes, who took him for his ſervant, and became his literary inſtructor. He publiſhed, in 1751, a poem on the death of Frederic, prince of Wales, which was but little noticed, and he was left to ſtruggle with the hardſhips of his profeſſion. Like many other poets, he ſeems to have been the ſport of ill fortune, for he calls himſelf "a hapleſs youth, whoſe vital page was one ſad lengthened tale of woe." He ſuffered ſhipwreck in a voyage from Alexandria to Venice, a circumſtance that produced a poem to which he is indebted for celebrity: it is entitled "The Shipwreck." He dedicated this little work to Edward, duke of York, by whoſe intereſt he obtained the lucrative employment of purſer to the Royal George. This poem conſiſts of three cantos: the ſcene of the firſt is near the city of Candia, and the time about four days and a half; the ſcene of the ſecond lies in the ſea between Cape Freſchia in Candia, and the iſland of Falconera; the time from nine in the morning till one the following morning; the ſcene of the third ſtretches from that part of the Archipelago which lies ten miles to the northward of Falconera to Cape Colonna, in Attica; the time from one till eight in the morning. The verſification of this poem is varied and melodious; its deſcription, being drawn from reality, is ſtrong, glowing, and often original. It is, nevertheleſs, ſo technical, as ſometimes to be too obſcure for common readers; but it has the advantage of communicating new ideas, which is no common quality in cultivated verſe. After Mr. Falconer's promotion in the ſea-ſervice, he enliſted in the field of ſatyrical controverſy, as one of the king's friends, and wrote a ſatyrical poem, entitled, "The Demagogue," in which Mr. Pitt, Wilkes, Churchill, and the oppoſition in general, were treated with virulence. In 1769 he publiſhed "The Marine Dictionary," a work of conſiderable merit, and to which many modern Cyclopædias have been indebted. This was his laſt performance, for in the ſame year he embarked on board the Aurora, bound to the Eaſt Indies, where Falconer propoſed to ſettle. The veſſel was never heard of after ſhe left the Cape of Good Hope, and it is ſuppoſed ſhe periſhed with all her crew. Lives of the Poets.

FALCONERA, in *Geography*, a town of Italy, in the duchy of Mirandola; four miles N.E. of Mirandola. N. lat. 36° 57′. E. long. 24° 1′.—Alſo, a town of Italy, in the department of the Panaro; four miles N. of Mirandola.

FALCONET, in *Gunnery*. See Fauconet.

FALCONIERI, in *Geography*, a ſmall iſland in the Mediterranean, near the coaſt of Sicily.

FALCONRY, or Fauconry, the art of taming, managing, and tutoring, birds of prey, particularly falcons and hawks; and employing them with advantage in the purſuit of game; called alſo hawking. This art is now in a great degree ſuperſeded through moſt parts of Europe by the more certain and ready ſervices of the gun.

The word is formed of *falco*, *falcon*, or *faucon*, the bird of moſt uſe and eſteem in this kind of ſport.

Falconry, though the principal amuſement of our anceſtors, was either wholly unknown, or very little practiſed, among the Greeks and Romans. All their writings do not furniſh ſo much as a proper name to call it by; ſo far are they from teaching us the terms. Ariſtotle (Hiſt. Anim. l. ix. c. 6.) merely mentions ſome rude practice of this art in Thrace; and Ælian (Hiſt. Anim. l. iv. c. 26.) ſpeaks of hawks and crows among the Indians (ſee alſo Pliny H. N. l. ii. c. 8.); but little or no mention of true falconry occurs before Julius Firmicus, in the days of Conſtantius, ſon to Conſtantine the Great. If the Romans, ſays the learned Rigaltius, had well underſtood their airy chace, they would have abandoned or leſs regarded their Circenſian recreations. In the European world the Germans and the French ſeem to have been the firſt who devoted themſelves to the ſcience of falconry.

It is the French language alone that has particular words for all the parts of falconry and hunting; and from them moſt of our terms, as well as what we know of the art itſelf, are borrowed.

The art of falconry, ſays Beckmann, who maintains that it was known to both the Greeks and Romans, ſeems to have been in the greateſt perfection, and to have been much in vogue with the principal courts of Europe, in the 12th century. Hence ſome have, therefore, aſcribed the invention of it to the emperor Frederic I., and others to Frederic II. But when the invention of gun-powder was introduced, hawks were diſcarded, and the diverſion of fowling was very much reſtricted to ſhooting.

"In our own country," ſays Mr. Pennant, "I cannot trace the certainty of falconry till the reign of king Ethelbert, the Saxon monarch, in the year 760, when he wrote to Germany for a brace of falcons, which would fly at cranes and bring them to the ground, as there were very few ſuch in Kent. It ſeems highly probable, that falconry had its riſe in Scythia, and paſſed from thence to the northern parts of Europe. Tartary is even at preſent celebrated for its fine breed of falcons; and the ſport is in ſuch general eſteem, that, according to Olearius, (tom. i. p. 217, 218.) there was no hut but what had its eagle or falcon. The boundleſs plains of that country are as finely adapted to the diverſion, as the wooded or mountainous nature of moſt part of Europe is ill calculated for that rapid amuſement."

In England falconry ſeems to have continued in high repute till about the time of the Uſurpation, after which it appears to have gradually declined. This diverſion was purſued with ſuch ardour ſo late as the reign of James I. that ſir James Monſon is ſaid to have given a thouſand pounds for a caſt of hawks; and the laws were very rigorous that tended to preſerve this pleaſure. In the 34th of Edw. III. it was made felony to ſteal a hawk; and to take its eggs, even in a perſon's own ground, was puniſhable with impriſonment for a year and a day, beſides a fine at the king's pleaſure; and in the reign of queen Elizabeth the impriſonment was reduced to three months; but the offender was to find ſecurity for his good behaviour for ſeven years, or to remain in priſon till he did. We may here obſerve, that almoſt every kind of falcon, from the largeſt to the ſmalleſt, may be trained to falconry; even eagles themſelves have here been uſed for the chace of the roebuck, the antelope, the wolf, fox, &c. Falcons of the larger kind, as the jer-falcon, the peregrine, and the goſhawk, were uſed for the flight after the heron, the wild gooſe, the crane, the hare, &c.; and the common falcon for game in general; while thoſe of the ſmaller kind were often inſtructed to fly at the partridge and the quail. The Iceland falcon is, according to Mr. Pennant, in the higheſt eſteem, and will laſt ten or twelve years (ſome falcons are ſaid to continue in full vigour for twenty years); whereas thoſe of Norway, and other countries, are ſeldom fit for the ſports of the field after two or three years' uſe. The feats performed by the jer-falcon may be numbered among the nobleſt in the practice of falconry. Scaliger aſſerts, that he ſaw ſome which belonged to Henry, king of Navarre, ſtrike down a buzzard, two wild geeſe, divers kites, a crane, and a ſwan. Among the beſt of hawks for falconry is alſo the goſhawk; theſe were uſed by the emperor of China in his ſporting progreſſes attended by his grand falconer, and a thouſand ſubordinate perſons in his train. The emperor often carried a hawk on his hand, to let fly at any game which might preſent itſelf, and which were uſually pheaſants, partridges, cranes, or quails. This diverſion was witneſſed by Marco Polo in the year 1269. The flight of a ſtrong falcon is wonderfully ſwift. To this purpoſe it is recorded that a falcon, belonging to a duke of Cleve, flew out of Weſtphalia into Pruſſia in one day; and in the county of Norfolk a hawk has made a flight at a woodcock near thirty miles in an hour.

Hawks in general prove courageous or cowardly all their lives, as they are firſt quarried; and if they are taken out of the eyrie before they are fully ſummed and well penned, their wings will never grow to perfection. Their legs alſo will grow crooked, and their train will be full of taints. Falcons of one and the ſame kind are called by the ſportſmen by very different names, and eſteemed of ſeveral different kinds, according to the places and time of their reclaiming, and the countries from whence they came. Thus the names mewed-hawk, ramaged-hawk, ſoar-hawk, and eyeſſe, firſt commenced; and theſe are again divided into large hawks, wean hawks, and ſlender hawks. All theſe have different mails and plumes, according to the country from whence they come; ſome are black, ſome brown; they have alſo each its different diſpoſition, ſome being beſt for the field, and others for the brook or river. Different names are alſo given to falcons according to their different age and time of taking. The falcon is called an eyeſſe, as long as ſhe remains in the eyrie; theſe are always troubleſome in their feeding; they cry very much, and they are not entered without great difficulty; but being once well entered, they prove excellent hawks for the heron and all the large fowl, and are very hardy and full of courage. The ſecond name given this bird is the ramage-falcon. This name ſhe retains from the time of her leaving the eyrie, during the months of June, July, and Auguſt. Theſe are always hard to be manned; but being reclaimed, they are not inferior to any hawk. The third is the ſoar-hawk, ſo called in September, October, and November. Theſe birds keep for a whole twelvemonth the firſt feathers, which they have on when they leave the eyrie, and do not molt them. Theſe are therefore called the ſoar-feathers. The fourth is termed the murzarolt or carviſt, quaſi carry-fiſt; for they may at this time be almoſt continually carried on the fiſt. They are thus called from January to the middle of May. Theſe are uſually great baters, and very little eaters; they are ſubject to ſeveral troubleſome diſorders, particularly to the filanders, more than any other hawk, and they are very ſeldom brought to be good for any thing. The fifth name is the entermew. They are called by this name from May till December, becauſe all that time they are caſting their coats. Theſe would be excellent hawks if they could be truſted; but they are unſteady. They muſt be kept hard under, and the falconer muſt make his fiſt their perch. The hawk newly taken muſt be ſeeled, have all new furniture, and muſt be often ſtroked with a ſtick to accuſtom her to be gentle. She muſt alſo have two good bells, that ſhe may be well heard when ſhe ſtirs or ſcratches; and her beak and talons muſt be cut a little, but not ſo near as to make them bleed. If there be a ſoar-falcon taken that has already croſſed the ſeas, ſhe is uſually very hard to be broken; but that being well done, ſhe is the beſt of all hawks. Her food muſt be good and warm, and it muſt be given her at leaſt three times a day. It ſhould be pigeons, larks, or other live birds; for ſhe muſt be broke by degrees from her accuſtomed manner of feeding. The hawk muſt always be fed with hoop and lure, that ſhe may always know when you will give her meat. She muſt then be gently unhooded, and two or three bits being given her, ſhe muſt be hooded again; and in the night let her rooſt on a perch near ſome perſon's bed, that ſhe may be often waked in the night. When by theſe means ſhe becomes tame and gentle, her uſual food may be changed, and a ſheep's heart given her. After this ſhe may be unhooded in the day time, but not in company, and after giving her a bit or two, ſhe muſt be hooded again, and then a little more given her. After this, by degrees, ſhe will be taught to eat before company, and then the buſineſs of taming her will ſoon be accompliſhed. Till ſhe is thoroughly manned, ſhe muſt be borne continually on the fiſt, and fed in company, giving her in the morning about ſun-riſe the wing of a pullet, and every morning the foot of a hare or rabbit cut off above the joint, flead, and laid in water, which having ſqueezed give it her with the pinion of a hen's wing. It is beſt to give the hawk waſhed meat, and after this plumage, according as ſhe ſeems to be foul within. She is then to be hooded, and nothing more ſhould be given her till ſhe gleams after caſting; but when ſhe has gleamed and caſt, ſhe ſhould then have ſome hot meat given her, toward evening eſpecially, and be made to eat in company. When ſhe is well reclaimed, manned, and ſharp-ſet, ſhe may be fed on the lure.

But three things are to be conſidered before your lure be ſhewed her. 1. That ſhe be bold and familiar in company, and not afraid of dogs and horſes. 2. Sharp-ſet and hungry, having regard to the hour of morning and evening when you would lure her. 3. Clean within, and the lure well garniſhed with meat on both ſides. When you intend to give her the length of a leaſh, you muſt abſcond yourſelf; ſhe muſt alſo be unhooded, and have a bit or two given her on the lure, as ſhe ſits on your fiſt. That done, take the lure from her, and ſo hide it that ſhe may not ſee it; when ſhe is unſeeled, caſt the lure ſo near her, that ſhe may catch it within the length of her leaſh; and as ſoon as ſhe has ſeized it, uſe your voice as falconers do, feeding her upon the lure on the ground.

After having lured your falcon, in the evening give her but little meat, and let this luring be ſo timely, that you may give her plumage, &c. next morning on your fiſt; when ſhe has caſt and gleamed, give her a little beaching of warm meat about noon, tie a creance to her leaſh, go into the field, there give her a bit or two upon the lure, and unſeel her. If you find ſhe is ſharp-ſet, and has eagerly ſeized on the lure, let a man hold her, to let her off to the lure; then unwind the creance, and draw it after you a good way, and let him who has the bird hold his right hand on the taſſel of her hood, ready to unhood her as ſoon as you begin to lure; to which if ſhe come well, ſtoop roundly upon it, and haſtily ſeize it; let her caſt two or three bits thereon; that done, take her off the lure and deliver her again to the perſon that held her; and, going farther off the lure, feed her as before; and ſo daily farther and farther off the lure. Afterwards you may lure her in company, but do not fright her: and having uſed her to lure on the foot, do it alſo on horſeback; which may be ſooner accompliſhed, by cauſing horſemen to be about you, when you lure her on foot: it is alſo ſooner done, by rewarding her upon the lure on horſeback among horſemen. And when ſhe is grown familiar this way, let ſomebody a-foot hold her, and he that is on horſeback muſt call, and caſt the lure about his head, while the holder takes off the hood by the taſſel; and if ſhe ſeize eagerly on the lure without fear of man or horſe, then take off the creance, and lure at a greater diſtance. Laſtly, if you would have her love dogs as well as the lure, call dogs when you give her plumage. See HAWKING.

The Abbé le Pluche, in his deſcription of falconry, repreſents it as one of the nobleſt, and alſo the moſt profitable of pleaſures. For the various kinds of this diverſion, the falcon, the jer-falcon, the lanner, the ſaker, the goſhawk, the merlin, and the ſparrow-hawk are uſed; but in general the falcon and hawk are more frequently uſed than the reſt. The falcon, jer-falcon, and goſhawk are in great repute; and are trained up to various flights, ſome of which are pointed againſt the heron, others againſt the kite, the curlew, or the owl. The hawk is uſed in low flights, and is ſagacious and ſucceſsful in attacking the partridge. The manner of training up hawks, and employing them in the field, is very agreeable. Such as are taken in the neſt are called “Rias,” and ſuch as are taken when full-grown, and at full liberty, are called “Haggards,” or old birds. When hawks are too wild, they are neither fed, nor ſuffered to ſleep for three or four days and nights, and are never left alone; by which means they come familiarized to the falconer, and obedient to all his commands. An unquiet hawk has been ſometimes placed in a ſmith's ſhop, where, by the continued noiſe of the hammering, he has been made gentle and tractable. The principal care of the falconer is to accuſtom theſe birds to ſettle in his fiſt, to ſpring when he throws them off; to know his voice, his ſinging, his whiſtle, or any other ſignal he gives them, and to return to order on his fiſt. At firſt they are tied with a ſtring about 30 fathoms in length, to prevent them from flying away; from which they are not releaſed till they are completely diſciplined, and return at the proper call or ſignal. For this purpoſe they muſt be lured. The lure is a piece of red ſtuff or wool, on which are fixed a bill, talons, and wings. To this is likewiſe faſtened a piece of that fleſh on which the bird feeds, and the lure is thrown out to him. When they intend to reclaim or recall him, the ſight of food brings him back; and in time the voice will be ſufficient. The various plumage with which the lure is ſet off is called a “Drawer.” When they accuſtom the hawk to fly at a kite, a heron, or a partridge, they change the drawer according to the kind of game to which he is to be devoted. When this is a kite, they fix the bill and feathers of that bird to the lure; and ſo of the reſt: and in order to entice the bird to his object, they faſten beneath the drawer or plumage the fleſh of a chicken, or other fowl, occaſionally ſeaſoned with ſugar and ſpices, together with marrow and other delicacies. Thus he is prepared for ſpringing at real game, which he does with ſurpriſing precipitation. Having been accuſtomed to a month's exerciſe in a chamber or garden, the bird is tried in the open fields, when little bells are faſtened to his feet, in order to be informed of his motions. He is always capped or hooded, that he may ſee no object but his game; and as ſoon as the dogs either ſtop or ſpring it, the falconer unhoods the bird, and toſſes him into the air after his prey. His various motions in the air furniſh much diverſion; at length he deſcends and launches upon his prey with the rapidity of an arrow, and bears it to his maſter, who recalls him. By theſe firſt eſſays, he is preſented with the neck and entrails of the prey which he has brought. Theſe gratuities, and the careſſes of the falconer, animate the bird to the performance of his duty, and prevent him from “bearing away his bells;” that is, from flying off, and not returning, which, however, is ſometimes the caſe.

When falcons are taught to fly at rabbits, hares, &c. it is called “flying at the fur;” and ſome are inſtructed to fly at the fur and the plume, or to the purſuit of hares and rabbits, as well as of pheaſants and partridges, &c. For this purpoſe, when the falcon is very tame, they either take a live hare, and break one of its legs, or elſe a hare's ſkin ſtuffed with ſtraw; and having fixed to it a piece of chicken's fleſh, or ſuch food as the falcon is moſt fond of, they tie this ſkin, with a long cord, to the girth of a horſe, and as the ſkin is thus dragged along, the bird imagines it to be a hare in flight, and is allowed to dart upon it; and is thus taught to diſtinguiſh the animal. Falcons of the larger kind have been taught to fly at the roebuck, and even at the wild boar, and the wolf. With this view they ſhould be accuſtomed to feed, when young, from out of the ſockets of the eyes of a wolf's or boar's head; the whole ſkin of the animal being ſtuffed, ſo as to make it appear alive. While the bird is feeding, the falconer begins to move the figure gradually; in conſequence of which the bird learns to faſten itſelf ſo as to ſtand firm, notwithſtanding the precipitate motions which are gradually given to the ſtuffed animal. He would loſe his meal if he quitted his hold, and therefore he takes care to ſecure himſelf. When theſe firſt exerciſes are finiſhed, the ſkin is placed on a cart, drawn by a horſe at full ſpeed; the bird follows it, and is particularly feeding; and then, when they come to fly him in the field, he never fails to dart on the head of the firſt beaſt of the kind he diſcovers, and begins to ſcoop out the eyes. This puts the animals into ſuch diſtreſs, that the hunters have time to approach, and diſpatch it with their ſpears.

In order to obtain birds fit for inſtruction, they ſhould, if poſſible, be taken from the neſt; but as this is not always practicable, the wild and full-grown bird muſt undergo the troubleſome proceſs of education. Falcons, like all other birds, may be taken by means of nets, ſuch as are uſed in catching larks; but the main difficulty is that of inſtructing the bird. If a falcon is purſuing his prey in the air, he will not deſcend to an immoveable and lifeleſs bait on the ground.

As this is the caſe, the experienced falconer fixes in the centre of his net a pulley, or a ſtrong iron wire bent into a ring, through which he paſſes a ſtring, 30 or 40 fathoms long, and at its extremity ties by its legs a live pigeon, which he carries with him into his hut or cover; and as the falcon ſometimes flies ſo high as not to be ſeen, the falconer is informed of his motions by means of a butcher-bird, which is faſtened by a ſtring tied to a ſtick fixed near the net. This bird by its movements indicates the kind of hawk which is hovering above; if it be a buzzard, or any kind of ſluggiſh hawk, the butcher-bird's motions are but ſlight;

but if it ſuddenly flies down and hides itſelf, it is a ſign that ſome large kind of falcon is above. The falconer, therefore, lets out the pigeon, whoſe apparent ſtate of liberty attracts the ſight of the falcon. If it approach readily, the man withdraws the pigeon, and, after a very ſhort interval, lets it out again. This ſecond appearance of the pigeon never fails to invite the falcon, which darts upon it as his prey, and is conſequently caught in the net, which the man inſtantly draws over it. The above-deſcribed method of taking falcons, and, indeed, the art of falconry in general, ſeems to have been held in no high eſtimation by Linnæus, ſince, by way of note to his ſpecific character of "falco gentilis," he adds "ars capiendi falcones columba et lanio, inſtituendi, venandi gazellas, ardeas, aviculas, &c. propriis artificibus commiſſa, in luxuriam magnatum, ridenda etiam á ſtulto."

Among the oldeſt writers on falconry we may reckon Demetrius, who, about the year 1270, was phyſician to the emperor Michael Paleologus. His book, written in Greek, was firſt printed at Paris in 1612, by Nicholas Rigaltius, from a MS. in the king's library, and with the Latin tranſlation of Peter Gyllius. (See Fabr. Bibl. Græc. l. i. c. 25. vol. i. 155.) A curious precept occurs in the book of Demetrius, which requires ſportſmen to ſay their prayers before they go out to the field. Some other works, of unknown antiquity, were printed at the ſame time.

The writers of reputation on falconry are Deſparon, Franchiere, Tardiffe, Artelouche, Dalagona, Latham, &c. M. de S. Martha has put the principles of the art into fine Latin verſes, in his Hieraſcoſophion, ſive De Re Accipitraria, libri tres.

There is alſo a treatiſe on hunting, hawking, and heraldry, printed at St. Alban's by Caxton, and attributed to dame Julian Barnes. Beckmann's Hiſt. of Inventions, &c. vol. i. Shaw's Zoology, vol. vii. part. i.

FALCZI, or Faltschi, in *Geography*, a town of Moldavia, on the Pruth; 32 miles E. N. E of Birlat.

FALDAGE, a term which was formerly employed to ſignify an old privilege reſerved by different lords of manors to themſelves, for ſetting up ſheep-folds or pens in any fields within their manors, for the purpoſe of having them better manured, not only with their own, but likewiſe with their tenants' ſheep. It was alſo frequently termed *ſecta faldae*, and in ſome particular old charters *fold-ſoca*, which in ſome places implied a fold courſe, or free-fold.

FALDE'LLA, in *Surgery*, rolled or twiſted lint, uſed for compreſſes.

FALD-FEE, or Fey, in *Rural Economy*, is a term which was formerly uſed to denote a rent or fee paid by certain cuſtomary tenants for the liberty of folding their ſheep upon their own lands.

FALDUSTOR was anciently uſed to ſignify the higheſt ſeat of a biſhop, incloſed round with a lattice.

FALDWORTH, among the *Old Writers*, was uſed to ſignify a perſon of age, ſufficient to be reckoned of ſome decennary.

FALE, in *Geography*, a river of England, in the county of Cornwall, which riſes about five miles S. E. from St. Columb Major, and runs into the ſea at Falmouth.

FALEMI, a river of Africa, which runs into the Senegal; 20 miles W. of Gallam.

FALERA, a town of Switzerland, in the Griſons; four miles N. N. E. of Ilantz.

FALIGE, a town of Germany, in the principality of Culmbach; five miles S. S. E. of Hof.

FALIN, a river of Chineſe Tartary, which runs into the ſea of Japan. N. lat. 43° 5'. E. long. 133° 16'.

FALIOS, a town of Aſiatic Turkey, on the Black ſea; 24 miles W. of Amaſrek.

FALKANAU, a town of Sileſia, in the principality of Neiſſe; four miles S. of Grotkau.—Alſo, a town of Bohemia, in the circle of Saatz, on the Egra, in which are manufactures of alum, ſulphur, and vitriol; 12 miles N. E. of Egra. N. lat. 50° 9'. E. long. 12° 37'.

FALKENAW, a town of Pruſſia, in Oberland, 22 miles S. E. of Marienwerder.—Alſo, a town of Pruſſia, in Ermeland; nine miles S. W. of Marienburg.

FALKENBERG, a town of the duchy of Stiria; 10 miles N. of Oberwoltz.—Alſo, a ſea-port town of Sweden, in the province of Holland, ſituated at the mouth of the Athron, on the Scaggerac. The chief employment of the inhabitants is fiſhing, 52 miles N. of Helſingborg. N. lat. 56° 56'. E. long. 12° 19'.—Alſo, a town of Germany, in the county of Lippe; two miles S. of Horn.—Alſo, a town of Saxony; five miles N. W. of Leibenwerda.—Alſo, a town of the Middle Mark of Brandenburg; ſeven miles E. N. E. of Farſtenwald.—Alſo, a town of Sileſia, called *Niomodlin*, in the principality of Oppeln; 14 miles W. of Oppeln. N. lat. 50° 35'. E. long. 17° 22'.

FALKENBURG, a town of Brandenburg, in the New Mark, on the Drage; 124 miles N. E. of Berlin. N. lat. 53° 28'. E. long. 16°. See alſo Fauquemont.

FALKENHAGEN, a town of the duchy of Pomerania; five miles S. of Ramelſburg.—Alſo, a town of the Middle Mark of Brandenburg; 40 miles E. of Berlin. N. lat. 52° 25'. E. long. 14° 30'.

FALKENSTEIN, John Henry, in *Biography*, was born in 1682. He received his education at ſome of the Dutch or German univerſities, and was, in the year 1714, appointed director of the academy of Erlangen. After this he entered into the ſervice of John Anthony, biſhop of Eichſtadt, by whom he was employed to write a hiſtory of the biſhopric. By the death of his patron he loſt his employment in the year 1730, and was taken into the ſervice of the margrave of Anſpach. In this ſituation he remained till the time of his death in Feb. 1760. He was buried in a tomb, which he cauſed to be built in his life time, and which he often viſited. Falkenſtein wrote much, but his works contain a deal of matter collected without taſte and judgment, but which will be found uſeful to the future hiſtorian. His principal performances are, "Antiquitates Nordgavienſes," or reſearches reſpecting the antiquities and every thing remarkable in regard to the town of Nordgau; in three vols. fol.; "Deliciæ topographicæ Norimbergenſes," or a geographical deſcription of the imperial city of Nuremberg, &c.; "Antiquitates Sudgavienſes," or an hiſtorical deſcription of thoſe diſtricts which in the ſeventh and eighth centuries were known under the general name of Sudgau, &c. Gen. Biog.

Falkenstein, in *Geography*, a town of Auſtria, with a caſtle, the proprietor of which has a right to coin money; 10 miles N. W. of Ziſterſdorff.—Alſo, a town of Auſtria, 10 miles S. of Aigen.—Alſo, a town of Upper Bavaria, on the Inn; 24 miles S. W. of Traunſtein.—Alſo, a ſmall county of Germany, ceded to France by the treaty of Campo Formio, and confirmed by the peace of Luneville. It contains the town of Winweiler, a town of its own name, and about 15 villages. The inhabitants are partly Roman Catholics, but chiefly Lutherans.—Alſo, a town of Germany, in Lower Bavaria, 13 miles N. of Straubing.—Alſo, a town of Germany, in the Vogtland, called *Elleford*; two miles S. of Aarbach.—Alſo, a town of France, in the department of Mont Tonnerre, but in the county of Falkenſtein;

kenſtein ; 24 miles W. of Worms, and 27 N. E. of Deux Ponts.

FALKIA, in *Botany*, ſo named by Thunberg in commemoration of John Peter Falk, profeſſor at Peterſburgh, whom he celebrates as a highly meritorious and very ſound botaniſt. Linnæus in his *Supplementum* ſays profeſſor Falk was a Swede, and famous for his botanical tour in the eaſtern parts of Ruſſia. Thunb. Nov. Gen. 17. Linn. Suppl. 30. Schreb. 237. Willd. Sp. Pl. v. 2. 248. Mart. Mill. Dict. v. 2. Juſſ. 132. Claſs and order, *Pentandria Digynia.* Nat. Ord. *Borragineis affine*, Juſſ.

Gen. Ch. *Cal.* Perianth of one leaf, bell-ſhaped, with five angles, in five ovate, bluntiſh, equal ſegments. *Cor.* of one petal, twice as long as the calyx, funnel-ſhaped, ſpreading, plaited, its margin in ten regular ſegments. *Stam.* Filaments five, thread-ſhaped, erect, rather ſhorter than the corolla and inſerted into its tube ; anthers ovate, compreſſed. *Piſt.* Germens four, ſuperior, ſmooth ; ſtyles two, capillary, divaricated, the length of the corolla ; ſtigmas capitate, obtuſe. *Peric.* none. *Seeds* four, globoſe, in the bottom of the calyx.

Eſſ. Ch. Calyx of one leaf, inferior. Corolla of one petal, plaited, funnel-ſhaped, with ten ſegments. Seeds four, naked.

1. F. *repens*. Linn. Suppl. 211. Ait. Hort. Kew. v. 1. 325. (Convolvulus Falckia ; Thunb. Prod. Cap. 35.) Native of watery places at the Cape of Good Hope. *Stems* perennial, woody, creeping, branched, leafy. *Leaves* on long ſtalks, cluſtered, heart-ſhaped, obtuſe, entire, rather fleſhy, ſlightly downy. *Flowers* on ſimple, ſolitary, axillary ſtalks, white or pale fleſh-coloured, exactly like thoſe of a *Convolvulus*, to which genus profeſſor Thunberg has now reduced this plant. Conſequently his own deſcription of the fruit, as given above, muſt be exceſſively erroneous. The learned editors of the *Hortus Kewenſis* had long ago corrected another miſtake in the number of the ſtamens, which they found to be five only, as analogy would lead us to expect ; not ſix, except from occaſional luxuriance.

FALKIRK, in *Geography*, a conſiderable town in the ſhire of Stirling, Scotland, is ſituated on an eminence near the river Carron on the high road from Edinburgh to Glaſgow, and commands an extenſive proſpect of the adjacent country. It was formerly a royal borough ; but is now governed by a baron-bailie, appointed by the lord of the manor. This town is noted for ſeveral fairs, and three celebrated tryſts, at which are ſold on an average 60,000 head of black cattle, and a great number of ſheep and horſes. Falkirk is 12 miles diſtant from Stirling, and 24 from Edinburgh ; the whole pariſh, which includes ſeveral villages, was returned, in 1801, as containing 1767 houſes, and 8838 inhabitants. The great canal, which forms a communication between the Britiſh ocean and the north channel, interſects this pariſh. A degree of celebrity attaches to Falkirk from a battle fought in its vicinity July 22, 1298, when the Scots, under ſir William Wallace, were defeated by the Engliſh under Edward I. ; and the town was again diſtinguiſhed by an engagement between the royal and rebel forces January 18, 1746.

FALKLAND, a town in the ſhire of Fife, Scotland, was erected into a royal borough in 1458. The government is veſted in three bailies, 14 counſellers, a treaſurer, and town clerk. The town is neatly built, and plentifully ſupplied with water by leaden pipes : and carries on a conſiderable manufacture of coarſe linens and Oſnaburghs. The vicinity abounds with coal and lead-ore. Falkland is 15 miles diſtant from Edinburgh, and about the ſame diſtance from Perth ; the population of the pariſh was returned in 1801 as 2211, inhabiting 460 houſes. This town was formerly the reſidence of the kings of Scotland, and the remains of the palace, though in ruins, evince its former magnificence.

FALKLAND's *Iſlands*, a group of iſlands, ſituated in the ſouthern Atlantic ocean, eaſtward of the ſtraits of Magellan. The firſt diſcoverer of theſe iſlands is ſaid to be Captain Davies, the aſſociate of Cavendiſh, in 1592. In 1594 ſir Richard Hawkins ſaw land, ſuppoſed to be the ſame, and from obſerving fires he concluded that it was inhabited. In honour of his miſtreſs, queen Elizabeth, he called it "Hawkins's Maiden-land." Long afterwards theſe iſlands were ſeen by ſome French ſhips, from St. Maloes, and Frezier, probably for that reaſon, called them the "Malouins," and by the Spaniards they are denominated "Maluinos." The two principal iſlands of this group, each of which is about 40 miles ſquare, were probably diſtinguiſhed by the name of Falkland's iſlands by captain Strong, or Strahan, in the year 1639, in honour of viſcount Falkland ; and this name has been continued ever ſince. Roggewein, who paſſed by theſe iſlands in the year 1721, called them "South Behira," and they have likewiſe been called "Iſlands of St. Lewis," "Pepys's iſlands," and "Sebald de Wert's iſlands." The name of "Pepys's" iſland was given to this land by Cowley, who had only a diſtant view of it in January 1683, who erroneouſly makes its latitude to be 47°. But the true poſition and extent of theſe iſlands, and every circumſtance which could render their exiſtence of any conſequence, remained abſolutely undecided till commodore Byron viſited them in 1765. Lord Anſon conſidered Pepys's iſland and Falkland's iſles as diſtinct places, diſtant from each other about 5 degrees of latitude. But Byron's reſearches have rectified this capital error ; and it is now decided, beyond all contradiction, that as captain Cook obſerves, "future navigators will miſpend their time, if they look for Pepys's iſland in latitude 47° ; it being now certain that Pepys's iſland is no other than theſe iſlands of Falkland." Byron took poſſeſſion of Port Egmont, (which ſee,) and all the neighbouring iſlands, January 1765, for his majeſty king George III., by the name of Falkland's iſlands ; and captain Macbride, who followed him thither two years after, having circumnavigated their coaſts, and taken a compleat ſurvey, a chart of Falkland's iſlands has been conſtructed, with ſo much accuracy, that the coaſts of Great Britain itſelf are not more authentically laid down upon our maps. "We found," ſays captain Macbride, "a maſs of iſlands and of broken lands, of which the ſoil was nothing but a bog, with no better proſpect than that of barren mountains, beaten by ſtorms almoſt perpetual. Yet this is ſummer ; and if the winds of winter hold their natural proportion, thoſe who lie but two cables' length from the ſhore muſt paſs weeks without having any communication at all." In 1763, the French having loſt Canada, turned their attention towards theſe iſlands, with a view to an American ſettlement ; and the account of Bougainville's voyage for that purpoſe, publiſhed by Pernetty, contains ample details concerning theſe iſlands. From theſe we learn, that there is little herbage except on the N.E. and E., the ſouthern antarctic winds being extremely cold. The rocks are of quartz, with ſome pyrites and traces of copper. Grey and reddiſh ſlate is common, with red and yellow ochre. In theſe iſlands, the ſoil and climate of which are unfavourable, there is a conſiderable variety of fowls and fiſh ; and the plants ſeem ſomewhat to reſemble thoſe of Canada. The walruſs, and other animals of the ſeal kind, frequent the ſhores. Although Byron made a ſmall eſtabliſhment at Port Egmont, it was found to be of little or no value, and in the year 1774 it was ceded to Spain. Theſe iſlands, which ſeem to be unfit for the habitation even of ſavages, occaſioned ſome ridiculous diſputes; and this circumſtance is the more extraordinary, as they are covered with reeds and moſs, and are ſubject to perpetual fogs, and furious tempeſts from the antarctic pole. The extreme cold cannot be relieved by fire, as there is no material for fuel, though Cowley ſays, that it abounded with woods; and even a ſhip in the port is covered with perpetual ſnow. The penguins ſupply a ſcanty and miſerable food. S. lat. 51° 6′ to 52° 30′. W. long. 56° 30′ to 62° 16′.

FALKLAND's *Sound*, a ſtrait or bay, ſeparating the two largeſt of the Falkland iſlands.

FALKOPING, a town of Sweden, in Weſt Gothland; 56 miles E. of Uddevalla. N. lat. 58° 12′. E. long. 13° 16′.

FALL, a river of Scotland, which riſes in the S.W. part of Perthſhire, and runs into Loch Lomond.

FALL *Indians*, Indians of North America, who occupy a territory, through which runs Red Deer river in N. lat. between 51° and 52°, and between 110° and 115° W. longitude. Theſe Indians, called alſo "Big-bellied Indians," amount to about 600 warriors. They ſeem to have migrated from the ſouth-eaſtward, and belong to a people who inhabit the plains from the north bend of the Miſſiſoury river, N. lat. 47° 32′. W. long. 101° 25′, to the ſouth bend of the Aſſiniboin river, to the number of 700 men. Some of them occaſionally come to the latter river to exchange dreſſed buffalo robes, and bad wolf-ſkins for articles of no great value. Theſe Fall Indians, intermixed with the Aſſiniboins, reſigning the territory next lake Winipic, and about its ſource, to the Algonquins and Kniſteneaux, occupy the more central parts of the country. They do not exceed 500 families. They are not beaver-hunters, like thoſe laſt mentioned, but confine themſelves to the hunting of the buffalo, and trapping wolves, which cover the country. What they do not want of the former for raiment and food, they ſometimes make into "pemmiean," or pounded meat, while they melt the fat, and prepare the ſkins in their hair, for winter. The wolves they never eat, but produce a tallow from their fat, and prepare their ſkins; all which they bring to exchange for arms and ammunition, rum, tobacco, knives, and various baubles, with thoſe who go to traffic in their country. Mackenzie's Voyage, &c. Introd.

FALL *River*, a town of America, in Briſtol county, Maſſachuſetts, lately the ſoutherly part of Freetown, incorporated in 1803; 50 miles S. of Boſton.

FALLS, a townſhip of Bucks county, in Pennſylvania; containing 1680 inhabitants.

FALL, *Deſcent*, in *Phyſics*, the tendency of any heavy body towards the centre of the earth.

Galileo firſt diſcovered the ratio of the acceleration of falling bodies; *viz.* that dividing the whole time of falling into equal parts, the body will fall thrice as far in the ſecond moment as in the firſt; five times as far in the third; ſeven times in the fourth, &c. and ſo on in the order of the uneven numbers. See ACCELERATION.

FALL *of bodies, for the cauſe of the.* See GRAVITY.

FALL *of bodies, for the laws of.* See ACCELERATION, DESCENT, and FORCE.

FALL, *Water.* See CATARACT.

FALL is alſo uſed in a moral ſenſe: as the fall of Adam, See ORIGINAL SIN; the fall of the Roman empire, &c. Authors contend, that Plato had a notion of Adam's fall, which he had learnt from Moſes. Euſebius, De Præparat. Evangel. lib. xii. cap. 11. quotes a fable from Plato's Sympoſ. wherein he thinks he finds the whole hiſtory allegorically related.

FALL, in *Muſic* and *Poetry*. See CADENCE.

FALL, in *Agriculture*, a meaſure of length, which in ſome places ſignifies the ſame as the rod; but in others, as the northern parts of the kingdom of Scotland, it denotes a meaſure which contains ſix of the ells of that country, each of which is equivalent to thirty-ſeven two tenths Engliſh inches. See MEASURE, and WEIGHTS and MEASURES.

It is a meaſure alſo frequently made uſe of in the application of marle, and other ſimilar earthy ſubſtances to land, eſpecially in the northern counties, in which caſes, from two to four or five falls are conſidered a proper ſet. See MARLE.

FALL, a ſuperficial meaſure, is the Scotch pole of land = 36 Scotch ells, = 342.25 Scotch feet, = 38.027 Scotch yards, = 345.96 ſquare Engliſh feet, = 38.44 ſquare Engliſh yards, = 1.27 Engliſh perches.

FALL, a ſolid meaſure, is uſed in Lancaſhire in meaſuring marle, and is a cube, whoſe ſide is four yards, = 64 cubic yards,

FALL, among *Seamen*, denotes the rope that connects the blocks of a tackle; and ſometimes it ſignifies that part of the rope of a tackle which is haled upon. They ſay alſo that a ſhip hath falls when ſhe is not fluſh, but hath riſings of ſome parts of her decks more than others. Alſo, a ſhip is ſaid to fall off, when, being under ſail, ſhe keeps not ſo near the wind as ſhe ſhould do.

FALL *not off*, at ſea, a word of command from him that conducts the ſhip, ſignifying as much as keep the ſhip near the wind.

To FALL *aboard of*, is to ſtrike or encounter another ſhip, when one or both are in motion; or to be driven upon a ſhip by the force of the wind or current.

To FALL *a-ſtern*, is to be driven backwards, or to retreat with the ſtern foremoſt; and is expreſſed of the motion of a ſhip, either under ſail or at anchor.

To FALL *calm*, expreſſes a total ceſſation of the wind.

To FALL *down*, is to ſail or be conducted from any part of a river, towards ſome other part nearer its mouth or opening.

FALL, *Cat.* See CAT-*heads*.

FALL *of the Leaf*, in *Vegetable Phyſiology*, is that ſpontaneous ſeparation of the leaves of trees and ſhrubs from their branches, which regularly takes place every autumn in ſuch ſpecies as are, for that reaſon, termed deciduous, and which happens, ſooner or later, to all leaves whatever (See DECIDUOUS.) Leaves commonly undergo conſiderable changes before they fall, ceaſing to grow for a long time previous to their decay, they become gradually more rigid and leſs juicy, often parting with their pubeſcence, and always changing their healthy green colour to more or leſs of a yellow, ſometimes a reddiſh hue. American trees and ſhrubs in general, and ſuch European ones as are botanically related to them, are remarkable for the rich tints of red, purple, or even blue, which their leaves aſſume before they fall. Hence the autumnal foliage of the woods of North America is, beyond all imagination, rich and ſplendid. In tropical countries, though many trees loſe all their leaves regularly in the rainy ſeaſon, or winter, the generality are evergreen, parting with them in ſucceſſion only, ſo as never to be naked. Even theſe trees, however, if injured by tranſplantation, or any other cauſe not abſolutely fatal, caſt their leaves prematurely, by an effort of the vital energy, which is thus able to withdraw itſelf with more vigour into the moſt important organs. On this principle we have, under the head above cited, explained the fall of leaves as a ſloughing, or caſting off diſeaſed or exhauſted parts. S.

FALLACY, Fallacia, a deception, or falſe appearance, or report.

The Epicureans deny that there is any ſuch thing as a fallacy of the ſenſes. According to them, all our ſenſations, and all our perceptions both of ſenſe and phantaſy, are true; they add, that ſenſe itſelf is the firſt grand criterion of truth. That the ſenſes are never deceived, they argue from their being incapable of all ratiocination and remembrance: hence they can neither add, take away, couple, nor disjoin; they cannot, therefore, infer, conclude, or invent; and conſequently they cannot deceive by any inference or invention. This the mind may do, but not the ſenſe, whoſe buſineſs is only to apprehend what is preſent, *e. gr.* colours; not to diſcern or diſtinguiſh between this body and that. But a thing that barely apprehends, without pronouncing any thing, cannot deceive; add, that there is nothing to convict our ſenſes of falſehood. The right eye, *e. gr.* cannot convict the left; nor Plato's eyes thoſe of Socrates; ſince the reaſons or pretenſions of each are equal; and the purblind perſon ſees what he ſees as much as the lynceus. Nor can a ſenſe of one kind convict another; as the ſight the ſmell; becauſe their objects are different, and conſequently their reports or judgments are not of the ſame things. Thus, again, if I ſee a ſtick ſtraight when out of the water, but when in it, crooked, my perception is altogether as true in the latter as in the former caſe; *i. e.* it is as true that I have the perception or idea of the crooked ſtick as of the ſtraight one; and this idea is all that the ſenſe ſuggeſts, ſo that it does not deceive. Laſtly, reaſon cannot ſhew our ſenſes miſtaken, ſince all reaſoning depends on previous ſenſations, and the ſenſes muſt firſt be true, before any reaſoning, founded thereon, can be ſo. Thus the Epicureans, whoſe ſyſtem is ſtrongly confirmed by what we have already laid down from Dr. Berkeley, concerning exiſtence.

The Carteſians, on the other hand, are continually exclaiming againſt the ſenſes, as the great ſources of all deception. Every thing with which our external ſenſes preſent us, they ſay, ſhould be ſuſpected as falſe, or, at beſt, dubious, till our reaſon has confirmed the report. They add, that our ſenſes, as being fallacious, were never given us by nature for the diſcovery of the truth, but only to point out what things are convenient or hurtful to our bodies.

The Peripatetics keep a middle courſe: they hold, that if a ſenſible object be taken in its common and generical view, the ſenſe cannot be deceived about it; for the ſight can ſee nothing but what is viſible, nor can it err in perceiving what is viſible, *quatenus* ſuch. But they add, that if the object be taken under its ſpecific view, the ſenſe may be miſtaken about it; *viz.* from a want of the diſpoſitions neceſſary to a juſt ſenſation; as a diſorder in the eye, or ſomething uncommon in the medium, &c.

Fallacy, in *Logic*, or *ſyllogiſtic fallacy*, is a captious argument, called alſo a ſophiſm.

Fallacies either ariſe from words or things: the foundation of an illuſion and fallacy in words is ambiguity, which is of two kinds; *viz.* ſimple homonymia, and amphibology.

The kinds of fallacy in things are very numerous; but they may be reduced to ſeven general heads; *viz.* ignoratio elenchi, petitio principii, falſa cauſa, interrogatio multiplex, limitatio vitioſa, accidens, et conſequens.

FALLAFAJEEA, in *Geography*, one of the Friendly iſlands, in the Southern Pacific ocean. S. lat. 20° 30′. E. long. 185° 16′.

FALLATTY, a town of Abyſſinia; 56 miles W.N.W. of Gondar.

FALLEN, a ſmall river of the county of Longford, Ireland, which runs into the Shannon, a few miles north of Laneſborough.

Fallen *City*, or *Old Jeruſalem*, a range of rocks among the Virgin iſles, in the Weſt Indies; S.W. of Virgin Gorda. N. lat. 18° 13′. W. long. 62° 53′.

FALLERN, a town of Sweden, in the province of Smaland, noted for its mineral ſprings; 3 miles from Wexio.

FALLERONE, a town of Italy, in the marquiſate of Ancona; 14 miles W. of Fermo.

FALLERSLEBEN, a town of Germany, in the principality of Luneburg, on the Aller; 27 miles S. E. of Zella.

FALLET, a town of Sweden, in Helſingland; 15 miles N.W. of Hernoſand.

FALLING-Sluices, in *Engineery*, are gates contrived to fall down of themſelves, and enlarge the water-way on the increaſe of a flood, in a mill-dam, or the pound of a river navigation; ſluices of this ſort were ſome years ago to be ſeen on the Ouſe river, below Redford. See Canal.

Falling-*in of ſtrata*, in *Geology*, is a term uſed by Dr. Townſon (Philoſophy of Mineralogy, p. 81.) to denote thoſe ſinkings of particular and ſmall tracts of ſtrata which are in ſome places obſervable, particularly where caverns abound in the ſtrata beneath, as Mr. Mawe has obſerved (Mineral. of Derby, p. 126.), in accounting for Elden hole, and other openings or ſwallow-holes in the peat limeſtone diſtrict of Derbyſhire. (See Depression and Absorption.) A very remarkable inſtance of ſtrata which have fallen in, that has not, we believe, been noticed by any writer, is to be ſeen at Dowall, or Dower, a hamlet of Hartington pariſh, Derbyſhire, ſituate by the ſide of the Dove rivulet, which there ſeparates the counties of Derby and Stafford. Dowall is remarkable for the very diſlocated ſtate of its ſtrata, and for the very ſingular conical and wedge-like hills which it contains. It is ſituate upon or very near to the great fault which almoſt ſurrounds the Derbyſhire and Staffordſhire mineral limeſtone diſtrict, and the ſame ſeems to have occaſioned the falling-in or abſorption of larger pieces of ſtrata in this place than are uſually to be met with. Dove pit, one of the chaſms here, occaſioned by a ſunken piece of the fourth lime-rock, is little if at all inferior to Elden hole in curioſity, although hitherto overlooked by touriſts. Near to this cavern a ſunken piece of ſtrata, about a mile in length and 300 yards or more in width, is ſeen ſo much depreſſed, that the limeſtone-ſtrata remain upon it in the hollow, ſurrounded on all ſides by high and precipitous hills of the fourth limeſtone (ſee the ſection and thickneſſes of the ſtrata here mentioned in Philoſophical Magazine, vol. xxxi. plate 2.) This ſunk or fallen piece of ſtrata is ſurrounded by a line of ſhake-holes, or ſwallows, into which the water which collects on the ſurface drops and diſappears. Croom hill, near this place, ſeems to owe its very ſingular wedge-like form to one half of it having ſlipped off or ſunk down, with the ſuperincumbent ſtrata on it, and which now occupy the adjoining vale or bay between the hills. The eaſy diſtance of this very ſingular place from Buxton, will, we hope, occaſion its being frequently viſited and examined in future by thoſe who travel to view nature in theſe her grandeſt ſcenes.

FALLING *Spring*, in *Geography*, a branch of James river, in Virginia, where it is called *Jackſon*'s river, which ſee.

FALLING-*off*, in *Sea Language*, denotes the movement or direction of the ſhip's head to leeward of the point whither it was lately directed, particularly when ſhe ſails near the wind, or lies by. See FALL *not off*.

FALLING-*off* is alſo the angle contained between her neareſt approach towards the ſource of the wind, and her fartheſt declination from it when trying.

FALLING-*evil*, in *Veterinary Science*, is a diſeaſe to which horſes are ſubject, proceeding from ill blood and cold thin phlegm collected in the fore part of the head, between the pinnacle and the brain, which, being diſperſed over the whole brain, cauſes the horſe ſuddenly to fall, and bereaves him for a time of all ſenſe. Spaniſh, Italian, and French horſes are more ſubject to this diſeaſe than the Engliſh.

For the cure of this diſorder, bleed the horſe in the neck, and again in the temple-veins and eye-veins, four or five days after; anoint his body all over with a comfortable friction, and bathe his head and ears with oil of bay, liquid pitch and tar mixed together, and keep his head warm, by covering it with a canvas cap, quilted with wool, and give him a purging or ſcouring.

FALLING-*ſickneſs*, in *Medicine*. See EPILEPSY.

FALLING *Stones*. Of theſe bodies, the moſt general opinion now is, that they are really of celeſtial origin. But a few years ago nothing could have appeared more out of the reach of human inveſtigation than the analyſis of any part of the ſolar ſyſtem beyond the planet we inhabit. The heavenly bodies, revolving at a diſtance ſo inconceivably remote, ſeemed relatively to us to be rather inacceſſible viſions than objects of chemical examination; the only medium that appeared to connect them with us was that of ſight: to be able to ſee them, and be conſcious of their exiſtence, was the utmoſt boundary of human expectation. How little was it to be expected that beyond this we ſhould ever be able to examine the moſt minute fragment of the ſideral ſyſtem; and it muſt no doubt be reckoned among the wonders of the age in which we live, that conſiderable portions of theſe heavenly bodies are now known to have deſcended to the earth. So wonderful and unexpected an event was at firſt received with incredulity and ridicule, but we may now venture to conſider the fact as well eſtabliſhed as any other hypotheſis of natural philoſophy, which does not actually admit of mathematical demonſtration.

The attention of the philoſophers of this country was firſt called to this ſubject by the falling of one of theſe maſſes of matter near Flamborough Head, in Yorkſhire: it weighed about fifty pounds: and for ſome years after its deſcent was announced did not excite the intereſt it deſerved, nor would perhaps that attention have been paid to it which was required for the inveſtigation of the truth, if a ſimilar and more ſtriking phenomenon had not happened a few years afterwards at Benares, in the Eaſt Indies. Some fragments of the ſtones which fell in India were brought to ſir Joſeph Banks by Major Williams, and ſir Joſeph being deſirous of knowing if there might not be ſome truth in theſe repeated accounts of falling ſtones, propoſed that they ſhould be chemically analyſed, to ſee if any peculiarity could be detected in their compoſition. He therefore gave them to Mr. Howard, a gentleman eminently qualified for this inveſtigation, who found, by a very ſkilful analyſis, publiſhed in the Tranſactions (1802), that the ſtones collected in various countries, and to which a ſimilar hiſtory is attached, contained very peculiar ingredients, and all of the ſame kind. The earthy parts of theſe were all of them ſilex and magneſia, in which were interſperſed ſmall grains of metallic iron. Upon a more minute examination of the metallic particles they were found connected with another metal, nickel. It is a curious circumſtance, and not remarked, we believe, by any writer on this ſubject, that iron and nickel are the only two magnetic metals; but whether this coincidence is accidental, or relates to their mode of formation, we ſhall not preſume to determine.

The peculiarity of this compoſition, which was the ſame as large maſſes of native iron found formerly in Siberia, excited a ſuſpicion that they might all have had one common origin. The great maſs of iron found by Pallas in Siberia, contained within its ſpongy ſubſtance ſmall drops of a tranſparent body, reſembling chryſolite. Mr. Howard was, therefore, deſirous of aſcertaining whether theſe tranſparent particles, though differing in appearance from the ſtones he had already analyſed, might not contain ſimilar ingredients, and on making proper experiments he found they actually contained the two earths above mentioned, ſilex and magneſia. Since theſe inveſtigations of Mr. Howard the ſubject has attracted very general attention, and moſt of the fragments of ſtones ſaid to have fallen from heaven, and which have been preſerved in the cabinets of the curious on account of this tradition, have been analyſed, and found to conſiſt of the ſame ingredients, varying only in their different proportions.

The iron found in theſe maſſes differs from our artificial iron in containing no charcoal, and the proportion of nickel preſerves it from ruſt. The mixture with nickel is not uniform in the ſame ſpecimen, but it is unequally diſtributed, as if it were the effect either of preſſure or imperfect fuſion.

Several writers, particularly Dr. Chladni on the continent, and Mr. King of our own country, have been at great pains to collect the various teſtimonies that are to be found in different authors from the earlieſt times, in favour of the occaſional deſcent of fragments and ſhowers of ſtones.

Pliny relates, that a great ſtone fell near Egos Potamos, in the Thracian Cherſoneſe, in the ſecond year of the 78th Olympiad. Conſidering the immenſe time that theſe maſſes may remain undeſtroyed, it is not abſolutely impoſſible, if ever that country becomes more civilized than at preſent, that ſome intelligent traveller may find veſtiges of it ſtill remaining. Anaxagoras the aſtronomer is ſaid to have predicted this event; a circumſtance that ſhould teach us to receive with great caution the traditionary predictions of eclipſes, ſuch as that of the ſun by Thales, moſt of theſe events, and others of the ſame nature, having been predicted moſt probably long after they happened. This weakneſs was not peculiar to the ancients; this very ſummer (1809) a belief has been very generally prevalent that the late unuſual wet ſeaſon was foretold by Dr. Herſchel.

In the year 1706 another large ſtone is, on the authority of Paul Lucas, then at Lariſſa, ſaid to have fallen in Macedonia: it weighed 72 pounds.

Cardan aſſures us, that a ſhower of at leaſt 1200 ſtones fell in Italy, the largeſt of which weighed 120 pounds; and their fall was accompanied by a great light in the air.

In the Phil. Tranſ. for 1718 is a deſcription of a fiery meteor ſeen at Jamaica, which ſtruck the earth, and made ſeveral holes.

In the Tranſactions for 1725 an account is to be found of a fire-ball which burſt at Mixburg, in Northamptonſhire, and two holes were made, about a yard deep and five inches in diameter, in a gravelly ſoil. An iron ball ſhot perpendicularly from a mortar did not make a greater impreſſion. In ſearching the holes, a very hard glazed ſtone was found, ten inches long, ſix wide, and four thick, cracked into two pieces. A man was killed by what is called the lightning; he was much wounded, with ſome appearance of electric effects.

At Otumpa, in South America, in the Chaco Gualambra, far from any mines or rocks, a maſs of about 300 quintals was found, and which was then ſuppoſed to be of volcanic origin. Phil. Tranſ. 1788.

Mr. Southey, in his Travels through Portugal, mentions the ſtones that fell in Portugal, 1796.

The caaba, or great black ſtone, preſerved by the Mahometans in the temple of Mecca, had probably a celeſtial origin. It is ſaid to have been brought from heaven by the angel Gabriel. Of its chemical nature we have no account, nor would it be very ſafe for a modern chemiſt to attempt to procure a piece to ſatisfy our curioſity.

The following are ſome of the beſt authenticated and moſt intereſting of the accounts lately publiſhed relating to theſe bodies.

Proces verbal of a ſhower of ſtones which fell near Avignon, in the department of Vaucleuſe.

On the 8th of September, 12th year of the republic, about half paſt ten in the morning, there appearing only a few light clouds in the heavens, and the weather being remarkably calm, a noiſe, reſembling that of a cannon fired at the diſtance of a quarter of a league, was heard with the ſame force, and attended with the ſame circumſtances, by a number of individuals in various places, but more particularly in the country, at the diſtance at leaſt of ſeven or eight leagues from Apt, the principal town of the fourth diſtrict of the department of Vaucleuſe. This noiſe, however, could be the effect only of an unuſual exploſion, becauſe it is certain that throughout the whole extent above-mentioned, and at that hour, no cannon was fired, nor was there any exploſion of gun-powder. This circumſtance, which at firſt ſurpriſed all who were witneſſes of it, was accompanied by a phenomenon ſtill more extraordinary. On the ſame day, and at the ſame hour, citizen Joſeph Jully, a farmer in the diſtrict of Apt, and his wife, being about 500 paces from the country-houſe of citizen Bartholomew de Vaux, ſituated north of the town of Apt, at the diſtance of about a quarter of a league, in the limits of Saurette, having heard the noiſe above-mentioned, immediately afterwards heard for the ſpace of ſix or ſeven minutes a whiſtling, which increaſed in ſound as it approached, and announced the fall of ſome ſolid body. Being terrified, and caſting their eyes upwards, the wife of Jully perceived a black ſubſtance, whoſe fall to the ground both ſhe and her huſband heard diſtinctly, after which the whiſtling ceaſed. The wife of Jully ſtates, that this black ſubſtance muſt have fallen in the vineyard of citizen de Vaux: the wife of the latter being then in the fields heard the ſame noiſe and ſubſequent whiſtling, but being alarmed ſhe ran into the houſe, and neither ſaw nor heard the fall of the above ſubſtance. Her ſon, being then at work 3 or 400 paces from the houſe, alſo heard the noiſe, the whiſtling, and the ſound of the fall of a body, which, however, he did not ſee. At the ſame inſtant, Margaret Hugues, widow, and Marie Jean, wife of Jacques Julien, being on the road from Villeurs to Apt, heard the ſame noiſe, the whiſtling, and the fall of ſome ſubſtance in de Vaux's vineyard, which adjoins the ſame road. After the ſound of the fall the whiſtling ceaſed. It appeared to them that the above ſubſtance did not fall at more than 30 paces from them.

As ſoon as the report was ſpread that ſome conſiderable ſubſtance had fallen in the above vineyard, a great eagerneſs was manifeſted to ſearch for it. The attempt was at firſt fruitleſs, but on the 10th De Vaux's ſon, croſſing the vineyard, perceived, at the diſtance of about thirty paces from the houſe, a large hole newly made between two rows of vines, which denoted the place where the ſubſtance muſt have fallen. He was confirmed in this opinion when he perceived that ſome ſmall pebbles near the mouth of the hole had been ground to powder. He then dug and found an extremely hard ſtone, weighing ſeven pounds ſix ounces; and could not doubt that this was the ſubſtance, the fall of which had alarmed the neighbourhood. Phil. Mag. vol. xvii.

Extract of a memoir of M. De Dree, read in the National Inſtitute, 11th April, 1803. M. De Dree, being at Lyons, received the following account from Dr. Petetin.

About four years ago, ſaid he, during the evening twilight, in the month of March, the weather being ſerene, and not at all cloudy, there paſſed over Lyons, nearly in a direction from eaſt to weſt, a luminous ball, which, as it attracted attention by the ſtrong light it emitted in its paſſage, was almoſt generally obſerved. He added, that he learned, a few days after, that this luminous globe had been ſeen by ſome travellers on mount Cenis, and he was informed at the ſame time that it had fallen in the environs of Ville Franche under the form of an incandeſcent ſtone, a ſmall fragment of which was ſent to him.

He aſſured me alſo that a compariſon he then made of the periods at which the meteor had been obſerved at Mount Cenis, at Lyons, and at Ville Franche, poſitively announced that it was the ſame ball which had traverſed that line, and ſhewn itſelf in theſe three points.

I expreſſed to Dr. Petetin a deſire of ſeeing the fragments of this ſtone which he had in his poſſeſſion, and the doctor judging, no doubt, from the anxiety I ſhewed to obtain information reſpecting this phenomenon, how much I was intereſted in it, was ſo kind as to offer me this fragment in caſe he ſhould find it.

I was the more deſirous, indeed, to ſee the ſpecimen of this mineral maſs, as I had it in my power to compare it with analogous ſpecimens, one of which fell near Wold cottage, in Yorkſhire, on the 13th of December, 1795, and another near Benares, in Bengal, on the 19th of December, 1798, a fragment of which I brought with me a few years ago from London, where I received it from count de Bournon, F. R. S. a very celebrated mineralogiſt.

Some time after, Dr. Petetin ſent me the fragment in queſtion, and I was much ſurpriſed to find that it had a perfect ſimilarity to ſpecimens of thoſe which fell at Benares and at Wold cottage, a ſimilarity manifeſt, not only in regard to the genus of the ſtones, but to the mineralogical ſpecies which enter into their compoſition, and alſo in regard to the effects reſulting from their motion in the atmoſpheric fluid.

As I had reaſon to hope I ſhould be able to diſcover the exact ſpot where this globe fell, I made reſearches in the neighbourhood of Ville Franche, and was directed towards the commune of Sales; at about the diſtance of a league and half to the north-weſt of Ville Franche, in the department of the Rhone, where I learned that moſt of the inhabitants had been witneſs of, and frightened by the arrival of this luminous body which had fallen in a vineyard within three hundred paces of the village, and near the houſe of a vintager, called Pierre Crepier.

I proceeded with two of the inhabitants, beſt acquainted with the fact, towards the houſe of Crepier, and on the ſpot where the ſtone buried itſelf received every information reſpecting it, and obtained the laſt ſpecimen which Crepier had remaining.

The following are all the circumſtances I collected in regard to this ſingular phenomenon, omitting the uſeleſs reaſoning in regard to its authenticity.

On the 12th of March, 1798, about ſix in the evening, the weather being calm and ſerene, a luminous globe, of an extraordinary appearance, attracted towards the eaſt the eyes of the inhabitants of the commune of Sales, and of the neighbouring villages, as they were returning from their labour; and by its rapid approach and horrid noiſe, like that produced by an irregular and hollow body traverſing the atmoſphere with rapidity, threw all the inhabitants of that commune into the greateſt terror, eſpecially when they ſaw it paſs over their heads at a very little elevation.

According to their report this ball left behind it a long train of light, and emitted, with an almoſt continual crackling noiſe, ſmall blue ſparks, like ſmall ſtars.

Its fall was obſerved by three workmen, who were not more than fifty paces from it; one of them was ſo much alarmed, that he dropped his coat and a billet of wood, that he might eſcape as faſt as poſſible. The other two fled to Sales, where a general alarm prevailed. Theſe three witneſſes agree that the body moved with aſtoniſhing rapidity, and that after its fall they heard a hiſſing noiſe, proceeding from the ſpot where it buried itſelf.

In regard to Crepier he was at home, where he was ſo much terrified with the hiſſing of the body and noiſe of its fall, that he ſhut himſelf up, and ſpent the night without daring to go out.

Next morning he was called out by the two workmen who had obſerved it, and they went with M. Blondel, adjunct of Sales, and ſeveral other perſons, to the place where the ſubſtance buried itſelf. At the bottom of a hollow, eighteen inches in depth, they found a large, black, irregular ovoid maſs, entirely covered with a blackiſh cruſt; it was no longer warm, and had the ſmell of gunpowder. It was ſplit in ſeveral places, ſo that thruſting a ſtick into one of the fiſſures made it fall to pieces. The weight of this ſtone was about twenty pounds.

M Place, a merchant of Ville Franche, aſſured me he was a witneſs, as well as many other inhabitants, of the paſſage of this luminous globe over the town; that he heard its humming noiſe; that its elevation could not exceed 500 toiſes, and that its direction was from eaſt by ſouth to weſt by north.

It ſince appears that this meteor was ſeen by M. Pictet, and other inhabitants of Geneva, and of the neighbouring towns as far as Berne; they obſerved a luminous body which ſuddenly appeared in the ſouthern regions proceeding rapidly from weſt to eaſt. This phenomenon was then conſidered as a meteor, but M. Pictet is now perſuaded it is the ſame body which fell at Sales.

M. Biot, the celebrated aſtronomer and mathematician, has drawn up a very accurate memoir of the meteoric maſs that fell in the neighbourhood of Laigle; the moſt intereſting particulars of which we have extracted, and are as follow.

July 20, 1803. I went firſt to Alençon, fifteen leagues weſt-ſouth-weſt of Laigle, and in going thither I learned that a globe of fire had been ſeen proceeding towards the north; the appearance of this globe had been followed by a violent exploſion. This took place on the 26th of April, 1802, at one in the afternoon. By the direction of this phenomenon, the day, and particularly the hour, I judged that this had been the commencement of the meteor of Laigle. At Alençon nothing had been heard, in conſequence, no doubt, of the noiſe which uſually prevails in a large town, but I learnt by the mineralogical collections of the country that nothing exiſts in the neighbourhood of Laigle which has any reſemblance to the meteoric ſtones. From Alençon I proceeded to Laigle, traverſing the villages conducted by the accounts given me by the inhabitants. All of them had heard the meteor on the day, and at the hour mentioned. In this manner I reached Laigle, and proceeded to the houſe of our colleague, Le Blond.

The meteor did not burſt at Laigle, but at the diſtance of half a league from it. I ſaw the awful traces of this phenomenon. I traverſed all the places where it had been heard, and collected and compared the accounts of the inhabitants. At laſt I found ſome of the ſtones themſelves on the ſpot, and they exhibited phyſical characters, which admit no doubt of the reality of their fall.

If we firſt conſider the phyſical teſtimonies, no meteoric ſtones had been in the hands of the inhabitants before the exploſion on the 26th of April.

The mineralogical collections formed on the ſpot with the greateſt care, for ſeveral years, contained nothing of the kind.

The founderies, iron-works, and mines in the neighbourhood which I viſited exhibited nothing in their productions, or their ſcoriæ, which had the leaſt affinity to theſe ſubſtances. No traces of a volcano are found in the country.

Suddenly, and only ſince the time of the meteor, theſe ſtones have been found on the ground, and in the poſſeſſion of the inhabitants, who are better acquainted with them than any other perſons.

Theſe ſtones are only found in a certain extent, in ground foreign to the ſubſtance they contain, and in places where, from their ſize and number, it is impoſſible they could have eſcaped notice.

The largeſt of theſe ſtones, when broken, ſtill exhale a ſtrong ſulphureous ſmell from their interior parts. That of their ſurface has vaniſhed, and the ſmalleſt exhale no ſenſible odour, ſo that the odour of the former ſeems likely to be diſſipated in the courſe of time.

Traces, which ſtrongly atteſt the fall of theſe ſtones, never mentioned without terror, are ſtill ſhewn. The inhabitants ſay they ſaw them deſcend along the roofs of the houſes like hail, break the branches of the trees, and rebound on the pavement. The earth ſmoked round the largeſt of them, and they ſtill burnt after they had them in their hands. Theſe accounts are given, and the traces ſhewn only in a certain extent. It is there only that meteoric ſtones are found on the ground: not a fragment is found beyond that diſtrict.

From the aggregate of the teſtimonies, we have deduced the following account of the phenomenon.

On Tueſday, April 26th, 1802, about one in the afternoon, the weather being ſerene, there was obſerved from Caen Pont, Audemer, and the environs of Alençon, Falaiſe, and Verneuil, a fiery globe of a very brilliant ſplendour, which moved in the atmoſphere with great rapidity. Some moments after there was heard at Laigle, and in the environs of that city, to the extent of more than thirty leagues in every direction, a violent exploſion, which laſted five or ſix minutes.

At firſt there were three or four reports like thoſe of a cannon, followed by a kind of diſcharge reſembling a firing of muſketry; after which there was heard a dreadful rumbling, like the beating of a drum. The air was calm, and the ſky ſerene, except a few clouds, ſuch as are frequently obſerved.

This noiſe proceeded from a ſmall cloud which had a rectangular form, the largeſt ſide being in a direction from eaſt to weſt. It appeared motionleſs all the time the phenomenon laſted, but the vapour of which it was compoſed was projected momentarily from the different ſides, by the effect of the different exploſions. This cloud was about half a league to the north-north-eaſt of the town of Laigle; it was at a great elevation in the atmoſphere, for the inhabitants of two hamlets, a league diſtant from each other, ſaw it at the ſame time above their heads. In the whole canton over which this cloud hovered, a hiſſing noiſe, like that of a ſtone diſcharged from a ſling, was heard, and a multitude of mineral maſſes, exactly ſimilar to thoſe diſtinguiſhed by the name of *meteoric ſtones*, were ſeen to fall at the ſame time.

The diſtrict in which theſe ſtones fell forms an elliptical extent of about two leagues and a half in length, and nearly one in breadth; the greateſt dimenſion being in a direction from ſouth-eaſt to north-weſt, forming a declination of about 22°. This direction, which the meteor muſt have followed, is exactly that of the magnetic meridian, which is a remarkable reſult.

The largeſt of theſe ſtones fell at the ſouth-eaſt extremity of the large axis of the ellipſe, the middle ones fell in the centre, and the ſmalleſt at the other extremity. It thereby appears that the largeſt fell firſt, as might naturally be ſuppoſed.

The largeſt of all thoſe which fell weighed 17½ pounds; the ſmalleſt I ſaw weighed two gros, which is the thouſandth part of the former. The number that fell is certainly *above* two or three thouſand.

On the 5th of April, 1804, another ſtone of this kind fell near Glaſgow, the particulars of which were very well aſcertained by ſeveral profeſſional gentlemen belonging to the univerſity of that place. They are related in the 18th volume of the Philoſophical Magazine. On the day above mentioned three men, at work in a field at Poſſil, about three miles north of Glaſgow, were alarmed with a ſingular noiſe, which they think continued about two minutes, ſeeming to proceed from the ſouth-eaſt to the north-weſt. At firſt it ſeemed to reſemble four reports from the firing of cannon; afterwards, the ſound of a bell, or rather gong, with a violently whizzing noiſe; and laſtly, they heard a ſound, as if ſome hard body had ſtruck with great force the ſurface of the earth. On the ſame day, in the forenoon, ſixteen men were at work in the Poſſil quarry, thirty feet below the ſurface of the ground, and there, too, an uncommon noiſe was heard, which, it is ſaid, ſeemed at firſt to proceed from the firing of ſome cannon; but afterwards the ſound of hard ſubſtances hurling downwards over ſtones, and continuing, in the whole, for about the ſpace of a minute.

By others who were at the quarry, *viz.* the overſeer of the quarry, and a man in a tree, to whom he was giving directions, the noiſe is deſcribed as continuing about two minutes, appearing as if it began in the weſt, and paſſed round by the ſouth towards the eaſt; along with theſe people there were two boys of ten and four years old, and a dog; the dog, on hearing the noiſe, ran home in a great fright. The overſeer, during the continuance of the noiſe, looking up at the atmoſphere, obſerved in it a miſty commotion, which alarmed him, and he called to the man in the tree, "Come down, I think there is ſome judgment coming upon us;" and he ſays that the man in the tree had ſcarcely got on the ground, when ſomething ſtruck with great force in a drain made for turning off water, about ninety yards diſtance, ſplaſhing mud and water about twenty feet round. The elder boy, led by the noiſe to look up to the atmoſphere, ſays, that he obſerved the appearance of ſmoke in it, with ſomething of a reddiſh colour moving rapidly through the air from the weſt, till it fell on the ground. The younger boy, at the inſtant before the ſtroke was heard, called out, "Oh, ſuch a reek!" and ſays he ſaw an appearance of ſmoke near the place where the body fell. The overſeer immediately ran up to the place where the ſplaſhing was heard, when he ſaw a hole made at the bottom of the drain. The hole was filling with water from a ſmall ſtream, and about ſix inches of it remained empty: he thruſt his hand into the hole, (which was nearly perpendicular, the bottom a very little inclined to the eaſt, and the upper part to the weſt,) and felt ſomething hard at the bottom, which he could not move. The hole was cleared out, expecting a cannon-ball, but nothing obſerved except the natural ſtratum of ſoil, and the rock on which it lay, and two pieces of ſtone that had penetrated a few inches into the rock; he thought they were whinſtone, and that they were eighteen inches below the bottom of the drain, and the hole fifteen inches diameter; no particular heat was obſerved in the water, nor in the pieces of ſtone, nor any uncommon ſmell in the latter. The one piece of ſtone was about two inches long; the other ſix inches long, four broad, and four thick, blunted at the edges and end; the fractures coincided; he did not know whether the fracture was cauſed by the fall or the mattock; and ſays that he never ſaw any ſuch ſtone about the quarry.

Some days after, when the particulars came to be known, a ſearch was made for theſe ſtones, and the firſt mentioned piece was ſoon found; the other, having fallen among rubbiſh, was miſſing; a few days after a fragment of it was found: the two fragments make the two extremes of the ſtone; on the ſurface they are pretty ſmooth, of a black colour, internally of a greyiſh appearance: the intermediate part ſeems as yet to be loſt. It may be proper to remark, though the overſeer did not obſerve any particular ſmell in the ſtone, that when Mr. Craufurd obtained the firſt piece it had a fiſhy and fœtid ſmell; and the ſecond had the ſame, but in a leſs degree. No warmth, however, was perceived in them at any period.

Account of a ſtone lately fallen in Ruſſia.—On the 13th of March laſt, in the afternoon, the inhabitants of the canton of Juehnow, in the government of Smolenſk, were alarmed by an uncommon loud clap of thunder. At the moment of this exploſion two peaſants, belonging to the village of Peremeſchajeu, in the canton of Werreja, being out in the fields, perceived, at the diſtance of forty paces, a black ſtone of conſiderable magnitude falling to the earth, which it penetrated to a conſiderable depth below the ſnow. It was dug up, and found to be of an oblong ſquare figure, of a black colour, reſembling caſt-iron; its ſurface was very ſmooth, ſhaped like a coffin on one ſide, and it weighed about 160 pounds. Philoſophical Magazine, 1807.

But one of the beſt authenticated accounts we have yet received is from Connecticut, in America; the circumſtances of which were communicated by Charles Greville, eſq. F. R. S. to whom they were originally tranſmitted.

The particulars of this phenomenon were collected with great care by Meſſieurs Silliman and Kingſley, who viſited and carefully examined every ſpot where the ſtones had been aſcertained to have fallen: they converſed with all the principal original witneſſes, and ſpent ſeveral days in the inveſtigation of all the important facts that could be collected on this occaſion. The ſubſtance of the account is as follows. The meteor, which has ſo recently excited alarm in many, and aſtoniſhment in all, firſt made its appearance in Weſton, about a quarter or half paſt ſix o'clock A. M. on Monday the fourteenth inſtant (Dec. 1807.) The morning was ſomewhat cloudy, mingled with ſpots of clear ſky, a ſpace of 15° along the northern horizon perfectly clear ; there was little or no light except from the moon juſt ſetting. Judge Wheeler was paſſing through the encloſure adjoining his houſe, with his face towards the north, and his eyes on the ground, when a ſudden flaſh acroſs the northern ſky made him look up ; he immediately diſcovered a globe of fire, paſſing behind the firſt cloud, which was very dark, and obſcured the meteor. In this ſituation its appearance was diſtinct, like the ſun ſeen through a miſt. It roſe from the north, and proceeded in a direction nearly perpendicular to the horizon, but inclining by a very ſmall angle towards the weſt, deviating from the plane of a great circle, but in large curves, ſometimes on one ſide of the plane, and ſometimes on the other, but never more than four or five degrees ; it appeared about one-half or two-thirds the diameter of the full moon, but it was impoſſible to aſcertain what angle it ſubtended. Its progreſs was not ſo rapid as that of common meteors and ſhooting ſtars ; when it paſſed the clear ſky it flaſhed with a vivid light, not ſo intenſe as lightning in a thunder ſtorm, but like what is called *heat lightning*. Its ſurface was apparently convex. When not too much obſcured by clouds, a conical train of paler light attended it, waving, and in length about 10 or 12 diameters of the body. In the clear ſky there was a briſk ſcintillation about it, like a fire-brand carried againſt the wind. It diſappeared about 15° ſhort of the zenith, and the ſame number weſt of the meridian ; it did not vaniſh inſtantaneouſly, but grew fainter, as a red-hot cannon ball would do, cooling in the dark, only much more rapidly. There was no particular ſmell in the atmoſphere, nor any luminous maſſes ſeen to ſeparate from the body ; the whole period between its appearance and extinction was eſtimated at 30 ſeconds.

About 30 or 40 ſeconds after this, three loud and diſtinct reports, like thoſe of a four pounder, near at hand, were heard ; they ſucceeded each other rapidly, and did not occupy above three ſeconds : then followed a continued rumbling, like a cannon ball rolling over a floor, ſometimes louder and ſometimes fainter ; ſome compared it to a waggon running down a ſtony hill, others to a running fire ; this noiſe continued about as long as the body was in riſing, and died away in the directions from which the meteor came. A Mr. Elihu Staples ſaid, that when the meteor diſappeared, there were three ſucceſſive efforts or leaps of the ball, which grew more dim with every throw, and diſappeared with the laſt.

We now proceed to the fall of a number of maſſes of ſtone, in ſeveral places principally within the town of Weſton. The places which had been well aſcertained at the period of our inveſtigation were ſix, the moſt remote nine or ten miles diſtant from each other, in a line differing little from the courſe of the meteor. It is, therefore, probable, that the ſucceſſive maſſes fell in this order, the moſt northerly firſt, the moſt ſoutherly laſt. We think we can point out the three places where the ſtones fell, correſponding with the three reports and leaps of the meteor. In every inſtance, immediately after the exploſions had ceaſed, there was obſerved a loud whizzing at all the places, and at the moment of the fall ; after this was heard an abrupt noiſe, like a ponderous body ſtriking the ground. Excepting one, the ſtones were more or leſs broken.

The moſt northerly fall was within the limits of Huntingdon, on the borders of Weſton, about 50 rods eaſt of the great road from Bridgeport to Newton, in a croſs road, near the houſe of Mr. Burr ; he was ſtanding in the road when the ſtone fell ; the noiſe produced by its colliſion with a rock of granite, on which it fell, was very loud ; Mr. Burr was within 50 feet, and ſearched for the body ; but it being dark did not find it till an hour after. By the fall ſome was reduced to powder, and the reſt broke in ſmall fragments, thrown round to the diſtance of 30 feet ; the granite was ſtained at the place of contact with a deep lead-colour ; the largeſt fragment did not exceed the ſize of a gooſe egg, and this waſt ſtill warm ; there was reaſon to ſuppoſe the ſtone muſt have weighed 25 pounds.

The maſſes of the ſecond exploſion fell in the vicinity of Mr. Prince's, in Weſton, about five miles ſouth of Mr. Burr's. The family were in bed when "they heard a noiſe of the fall of a heavy body after the exploſion." They would have paid no further attention to the circumſtance, had they not heard that ſtones had fallen in other parts of the town ; this induced them towards evening to ſearch a hole newly made in the yard, where they found a ſtone buried in the looſe earth which had fallen on it ; it was two feet from the ſurface, the hole 12 inches diameter, and as the earth was ſoft the maſs was little injured, only a few ſmall fragments being detached. It weighed 35 pounds.

Six days after another maſs was diſcovered, half a mile north-weſt of Mr. Prince's ; the ſearch was induced by the perſuaſion of the neighbours that they heard it fall near the ſpot where it was found buried. It weighed from ſeven to ten pounds, and was ſplit in fragments, having fallen on a detached maſs of gneiſs rock which it had ſplit in two. We found another maſs, of thirteen pounds weight, half a mile north-eaſt of Mr. Prince's ; it was broken only in two pieces, one of which we purchaſed, for it was now become an article of ſale.

A fifth maſs fell two miles ſouth-eaſt of Mr. Princes' at the foot of Taſhowa hill. Its fall was heard by Mr. Porter and his family. They ſaw a ſmoke riſe, from the ſpot where they found a ſtone, in the road, which had penetrated two feet in the deepeſt place, the hole twenty inches diameter, and the margin coloured blue from the powder of the ſtone, which weighed 25 pounds.

It is probable that the four laſt ſtones were projected at the ſecond exploſion, and one has been ſince found on the neighbouring hill, weighing 35 pounds, which muſt be referred to the ſame.

A maſs of ſtone, far exceeding the united weight of all we have deſcribed, fell in a field belonging to Mr. Seely, within 30 rods of his houſe.

A circumſtance attended the fall of this which ſeems peculiar to it. Mr. Staples lives on the hill, at the bottom of which this body fell. After the laſt exploſion a noiſe like a whirlwind paſſed to the eaſt of his houſe, and over his orchard ; at the ſame inſtant a ſtreak of light paſſed over it in a large curve, and ſeemed to pierce the ground ; a ſhock was felt, and a report heard like that of a heavy body ſtriking the earth.

Three or four hours after this, Mr. Seely went to look after his cattle. Some had leaped into the adjoining incloſure, and appeared frightened ; paſſing on he was ſurpriſed to find a ſpot of ground all torn up, and the earth looking freſh. Coming to the place he found a great maſs of fragments of a ſtrange looking ſtone.

Here were ſtriking proofs of a violent colliſion ; a ridge of micacious ſchiſtus, lying nearly even with the ground, and ſomewhat inclining like the hill to the ſouth-eaſt, was ſhivered to pieces to a certain extent by the impulſes of the ſtone, which thus received a ſtill more oblique direction, and forced itſelf into the earth to the depth of three feet, leaving a hole of five feet in length, and four and a half in breadth ;

throwing large maſſes of turf, and fragments of ſtone and earth, to the diſtance of 50 and 100 feet.

This ſtone was all in fragments, none of which exceeded the ſize of a man's fiſt. From the beſt information we could obtain of the quantity of fragments of this laſt ſtone, compared with its ſpecific gravity, we concluded that its weight could not have fallen much ſhort of 200 pounds. All the ſtones when firſt found were friable; this was eſpecially the caſe where they had been buried in the moiſt earth, but by expoſure to the air they gradually hardened.

The ſpecimens obtained from all the different places are perfectly ſimilar. The moſt careleſs obſerver would inſtantly pronounce them portions of a common maſs, different from any of the ſtones commonly ſeen on this globe.

Of their form nothing certain can be ſaid. Few of the ſpecimens weigh one pound; moſt of them leſs than half a pound, from that to the fraction of an ounce. On many of them, however, may be diſtinctly perceived portions of the external part of the meteor.

It is every where covered with a thin black cruſt, deſtitute of ſplendour, and bounded by portions of the large irregular curve, which ſeems to have encloſed the meteoric maſs. This curve is far from being uniform; it is ſometimes depreſſed with concavities, ſuch as might be produced by preſſing a ſoft ſubſtance. The ſurface of the cruſt feels harſh, like prepared fiſh ſkin or ſhagreen. It gives ſparks with ſteel. There are certain portions of the ſtone, covered with the black cruſt, which appear not to have formed a part of the outſide of the meteor, but to have received this coating in the interior parts, in conſequence of the fiſſures or cracks produced by the intenſe heat to which the body ſeems to have been ſubjected.

The ſpecific gravity is 3.6, water being 1.

The colour of the maſs of the ſtone is principally a dark aſh or leaden colour. It is diſperſed with diſtinct maſſes, from the ſize of a pin's head to the diameter of one or two inches, which are almoſt white, reſembling the cryſtals of feldtſpar in ſome varieties of granite, and in that ſpecies of porphyry known by the name of *verd antique*.

The texture of the ſtone is granular and coarſe, reſembling grit ſtone. It cannot be broken with the fingers, but gives an irregular fracture with the hammer.

On inſpecting the maſs four diſtinct kinds of matter may be perceived by the eye.

1ſt. The ſtone is thickly interſperſed with black globular maſſes, moſt of them ſpherical, ſome oblong. The largeſt are of the ſize of a pigeon ſhot; but generally much ſmaller; they can be detached, and leave a concavity in the ſtone. They are not attractable by the magnet, and can be broke by the hammer.

2d. Maſſes of yellow pyrites may be obſerved.

3d. The whole ſtone is thickly interſperſed with metallic points, many of them viſible to the eye, and numerous with a lens. Their colour is whitiſh, and miſtaken by the diſcoverers of the ſtone for ſilver. They appear to be malleable iron alloyed with nickel.

4th. The lead-coloured maſs which cements theſe together has been deſcribed already, and conſtitutes by far the greater part of the ſtone. After being wet and expoſed to the air, the ſtone becomes covered with reddiſh ſpots, which do not appear in a freſh fracture, and ariſe from the ruſting of the iron.

Finally, the ſtone has been analyſed in the laboratory of this college, according to the inſtructions of Howard, Vauquelin, and Fourcroy. The analyſis was haſty, the exact proportions and the ſteps of the analyſis are reſerved for more leiſure.

It is ſufficient to obſerve that the ſtone appears to conſiſt of the following ingredients; ſilex, iron, magneſia, nickel, and ſulphur.

The two firſt conſtitute by far the greateſt part of the ſtone; the third in conſiderable proportion, but much leſs than the others; the fourth probably ſtill leſs, and the ſulphur exiſts in a ſmall but indeterminate quantity.

Moſt of the iron is in a perfectly metallic ſtate; the whole ſtone attracts the magnet, and this inſtrument takes up a large proportion of it when pulverized. Portions of metallic iron may be ſeparated ſo large that they may be eaſily extended under the hammer. Some of the iron is in combination with ſulphur in the pyrites, and probably moſt of the iron is alloyed by nickel.

In the Tranſactions for 1803 is an account by C. Greville, eſq. of three ſpecimens in different muſeums in France, of ſtones which have fallen to the earth, all ſimilar in their general character to thoſe deſcribed by Mr. Howard; and alſo of a maſs of native iron found in Perſia in the year of the Hegira 1030, according to the annals of the empire, written by the emperor, and of which he is ſtated to have made ſome ſabres and daggers; but until other iron was mixed with that of the maſs deſcribed, the iron was not malleable.

But the moſt beautiful ſpecimen of perfect iron was brought from the Cape of Good Hope. Barrow, in his travels into that country, deſcribes the original maſs as exiſting in the interior of Africa, and it is thought that ſome traditionary ſuperſtition is connected with it by the natives.

Notwithſtanding every doubt ſeems now to be removed as to the general authenticity of the above relations, yet philoſophers are not perfectly agreed either as to their origin or mode of formation. Of the different theories that have been propoſed, that which ſuppoſes them formed in the air, that is, in our atmoſphere, is certainly the leaſt analogous to our preſent ſtate of chemical knowledge. Others are more inclined to aſſign them an aſtronomical origin, though great doubts ſtill exiſt as to the particular claſs of bodies from which they are moſt probably derived. Some aſtronomers imagine they have been thrown from a lunar volcano: there is nothing, perhaps, philoſophically inconſiſtent in this theory, for volcanic appearances have been ſeen in the moon; and a force ſuch as our volcanoes exert would be ſufficient to project fragments that might poſſibly arrive at the ſurface of the earth. It is demonſtrated by mathematicians, that if a ponderable body be projected from the earth's ſurface with a force ſufficient to give it a certain initial velocity, it will never return. This velocity is about ſeven miles an hour. From the moon, the velocity requiſite to produce a ſimilar effect is about four times as great as that of a cannon-ball, ſo that there is nothing impoſſible in the ſuppoſition of theſe bodies having been projected from the moon. But probability is certainly againſt it, and it ſeems more likely that they are fragments of comets; becauſe theſe bodies, from their great numbers, render the queſtion of mere probability favourable to this hypotheſis; and beſides, from their own nature they muſt be ſubject to chemical changes of a very violent nature; add to this, that from the ſmallneſs of their dimenſions, a fragment projected from them with a very ſlight velocity would never return to the maſs to which it originally belonged, but would traverſe the celeſtial regions till it met with ſome planetary or other body ſufficiently ponderous to attract it to itſelf. Many arguments likewiſe concur, which lead to the conjecture that the comets themſelves are nothing more than larger fragments of matter, which have been themſelves ſeparated by volcanic violence from other celeſtial bodies of greater magnitude than themſelves; perhaps from fixed ſtars. The theory of the new planets, as ſuggeſted by Olbers, likewiſe continues to gain ground in the eſtimation of aſtronomers; theſe are by him ſuppoſed to be only portions of a large planet which once revolved about the ſun in an entire form. Warranted by ſuch ſtrong indications, why ſhould we heſitate to extend the analogy from our own earth to the great ſiderial ſyſtem? On our own planet, not only the volcanoes at preſent exiſting, but the indubitable veſtiges of the paſt, are ſufficient to convince us that great and marvellous changes are continually taking place in conſequence of the chemical and mechanical action of the different elements on each other: ſo it is, probably, throughout the whole creation. The immenſely long periods in which theſe changes are accompliſhed appear relatively to our limited ſcale of exiſtence to be of great importance; but contemplated by intellect of a higher order than our own, the whole hiſtory of the ſiderial univerſe may be a phenomenon almoſt inſtantaneous. To return, however, to this ſublunary world, it ſtill remains to add a few words on the different theories that have been ſuggeſted to explain the ſudden ignition of theſe meteors, and the violent electric or ſtormy appearance which has been obſerved to accompany them.

Of the number of theories that have been ſuggeſted to explain the ignition of theſe bodies, and the exploſions that often attend their arrival, very few deſerve even to be noticed. So imperfect is our meteorological knowledge, that we muſt content ourſelves with mere conjecture. The leaſt improbable opinion of thoſe that have been hazarded ſeems to be this, that the inflammation and combuſtion of the ſtones proceeds from the heat neceſſarily extricated by the ſudden compreſſion of the air, in conſequence of the great velocity they poſſeſs on their firſt entering our atmoſphere, which velocity is afterwards much diminiſhed by the conſtant reſiſtance of the air. In this caſe, however, we muſt ſuppoſe them of the nature of pyrophori, an hypotheſis far from ſatisfactory. Mr. Davy's late diſcoveries ſeem likely to lead us nearer to the truth. If theſe earthy bodies were in their metallic ſtate of exiſtence previous to their arrival on the confines of our world, their ſudden inflammation would be eaſily accounted for, and would at the ſame time afford us a curious circumſtance in their hiſtory, as it would be evident they came from a place where no oxygen was to be found; they could not, therefore, come from the ſurface of a habitable world like ours. They may, however, even on this hypotheſis, have been part of the internal nucleus of ſome planetary or cometary body having an atmoſphere, but not of ſufficient thickneſs to have produced that inflammation which takes place when they enter ours. The electrical appearances that ſo often accompany theſe bodies in their deſcent indicate that the equilibrium of the atmoſphere is more eaſily deranged than otherwiſe might be imagined; for certainly it is much more rational to ſuppoſe that this diſturbance is rather the effect of the meteor than the cauſe of it. If there be any truth in the prevailing opinion of ſeamen, that the firing of cannon ſtills the wind, this fact will ſtrengthen the opinion that great apparent changes may take place in the atmoſphere by the various chemical operations that may accidentally take place within it. But we ſhall abſtain, however, from farther conjecture, and truſt, that one day the future progreſs of ſcience will enable philoſophers to explain, in a ſatisfactory manner, all the circumſtances which at preſent ſeem to be involved in ſuch compleat obſcurity.

But whatever be really their origin, the hiſtory of theſe productions we muſt acknowledge to be highly intereſting; from the earlieſt times theſe fragments have been continually arriving at the ſurface of the earth, though it is only lately that they have attracted the notice of philoſophers, and their hiſtory been authenticated by the ſuperior lights of modern ſcience. From the moſt ancient period of hiſtory there are repeated accounts of ſtones falling from heaven, which, but for the careful inveſtigations above deſcribed, would for ever have been confounded with the fabulous prodigies ſo familiar to ancient credulity. And this affords a ſingular and ſtriking inſtance, in which the true hypotheſis was embraced by the ignorant and credulous part of mankind at the ſame time that it was rejected by philoſophers. In favour of learning, however, we ſhould obſerve, that it could only have been by the ſuperior ſcience of the preſent age, that facts of ſuch an extraordinary nature could have been authenticated and ſeparated from the multitude of fabulous and wonderful events which have been believed and recorded by the ſame hiſtorians.

We ſubjoin the following epitome of the analyſis of theſe bodies from Thomſon's Chemiſtry, and a table is ſubjoined from a French work of M. Izarn.

Subſtances.	Places where they fell.	Period of their fall.	Teſtimony.
Shower of ſtones	At Rome	Under Tullus Hoſtilius	Livy.
Shower of ſtones	At Rome	Conſuls C. Martius and M. Torquatus	J. Obſequens.
Shower of iron	In Lucania	Year before defeat of Craſſus	Pliny.
Shower of mercury	In Italy		Dion.
A very large ſtone	In Thrace	2d year of 78th Olympiad	Pliny.
Three large ſtones	In Thrace	B. C. 452	Ch. of count Marcelli.
Shower of fire	At Queſnoy	January 4th, 1717	Geoffroy le Cadet.
Stone of 72 lbs.	Near Lariſſa, Macedonia	January, 1706	Paul Lucas.
About 1200 ſtones, one of 120 lbs. Another of 60 lbs.	Near Padua, in Italy	In 1510	Cardon Varcet.
Another of 59 lbs.	On Mount Vaiſe, Provence	November 27th, 1627	Gaſſendi.
Shower of ſand for 15 hours	In the Atlantic	April 6th, 1719	Pere le Feuilles.
Shower of ſulphur	Sodom and Gomorrah		Moſes.
Sulphureous rain	In the duchy of Mansfeld	In 1658	Spangenberg.
The ſame	Copenhagen	In 1646	Olaus Durmius.
Shower of ſulphur	Brunſwick	October, 1721	Siegeſber.

TABLE *continued.*

Subſtances.	Places where they fell.	Period of their fall.	Teſtimony.
Ditto of a viſcid unknown matter	Ireland	In 1695	Muſchenbroek.
Two large ſtones, weighing 20 lbs.	Liponas, in Breſſe	September, 1753	De la Lande.
A ſtony maſs	Niort, in Normandy	In 1750	De la Lande.
A ſtone of 7½ lbs.	At Luce, in Le Main	September 13th, 1768	Bachelay.
A ſtone	At Aire, in Artois	In 1768	Gurſon di Boyaval.
A ſtone	In Cotentin	In 1768	Morand.
Extenſive ſhower of ſtones	Environs of Agen	July 24th, 1790	St. Amand Baudin, &c.
About 12 ſtones	Sienna, Tuſcany	July, 1794	Earl of Briſtol.
A large ſtone, 56 lbs.	Wold Cottage, Yorkſhire	December 13th, 1795	Captain Topham.
A ſtone of about 20 lbs.	Sale, department of the Rhone	March 17th, 1798	Le Lievre and De Drée.
A ſtone of 10 lbs.	In Portugal	Feb. 19th, 1796	Southey.
Shower of ſtones	Benares, Eaſt Indies	Dec. 19th, 1798	J. Lloyd Williams, eſq.
Shower of ſtones	At Plunn, near Taber, Bohem.	July 3d, 1753	B. de Born.
Maſs of iron, 70 cubic feet	America	April 5th, 1800	Phil. Magazine.
Maſs of ditto, 14 quintals	Abakank, Siberia	Very old	Pallas, Chladni, &c.
Shower of ſtones	Barboutan, near Boquefort	July, 1789	Darcet, jun. Somet, &c.
Large ſtone, 260 lbs.	Enſiſheim, Upper Rhine	November 7th, 1492	Butenſchoes.
Two ſtones, 200 and 300 lbs.	Near Verona	In 1762	Acad. de Bourd.
Stone of 20 lbs.	Sales, near Ville Franche	March 12th, 1798	De Drée.
Several ditto, from 10 to 17 lbs.	Near L'Aigle, Normandy	April 26th, 1803	Fourcroy.
Large ſtone	Glaſgow	April 5th, 1804	
Shower of ſtones	Connecticut	Dec. 1807	

The ſtony bodies, when found, are always hot. They commonly bury themſelves ſome depth under ground. Their ſize differs from a few ounces to ſeveral tons. They are uſually roundiſh, and always covered with a black cruſt. In many caſes they ſmell ſtrongly of ſulphur. The black cruſt, from the analyſis of Howard, conſiſts chiefly of oxyd of iron.

The outer ſurface of theſe ſtones is rough; when broken, they appear of an aſh-grey colour, and of a granular texture, like ſand-ſtone. When examined with a microſcope, four different ſubſtances may be diſcovered, of which the ſtone is compoſed: 1ſt, a number of ſpherical bodies, varying in ſize from a pin-head to a pea, of a greyiſh-brown colour, opaque, breaking eaſily in every direction, of a compact texture, capable of ſcratching glaſs, and of giving a few feeble ſparks with ſteel; 2d, fragments of pyrites, of an indeterminate ſhape, of a reddiſh-yellow colour, granular, and eaſily reduced to powder; the powder has a black colour; 3d, grains of iron in the metallic ſtate, ſcattered like the pyrites through the ſtone; 4th, the three ſubſtances juſt mentioned are cemented together by a fourth, of an earthy conſiſtence, and ſo ſoft that all the other ſubſtances may be eaſily ſeparated by the point of a knife, and the ſtone itſelf crumbled to pieces between the fingers; this cement is of a grey colour. The proportion and ſize of theſe different conſtituents vary conſiderably in different ſpecimens; but all of them bear a ſtriking reſemblance to each other. Their ſpecific gravity varies from 3.352 to 4.281.

From the analyſis of Howard, which was conducted with much preciſion and addreſs, and which has been fully confirmed by Vauquelin and Klaproth, we learn that the black cruſt conſiſts of a compound of iron and nickel, partly metallic and partly oxydated. The pyrites conſiſt of iron, nickel, and ſulphur. The metallic grains conſiſt of iron, combined with about a third of its weight of nickel, and the yellow globules are compoſed of ſilex, magneſia, iron, and nickel. The count Bournon obſerves, that theſe globules reſemble the chryſolite of Werner, and that their chemical analyſis correſponds exactly with Klaproth's analyſis of that mineral. The earthy cement conſiſts of the very ſame ſubſtances, and nearly in the ſame proportion, as the globular ſubſtances. But it will be neceſſary to exhibit a ſpecimen of ſome of the analyſes, as publiſhed by the philoſophers to whom we are indebted for them. A ſtone which fell at Benares in India was analyſed by Howard. The pyrites conſiſted of

2.0	Sulphur
10.5	Iron
1.0	Nickel
2.0	Earths and foreign bodies.
15.5	

The ſpherical bodies conſiſted of

50.0	Silex
15.0	Magneſia
34.0	Oxyd of iron
2.5	Oxyd of nickel.
101.5	

The earthy cement conſiſted of

48.0	Silex
18.0	Magneſia
34.0	Oxyd of iron
2.5	Oxyd of nickel.
102.5	

A ſtone which fell in Yorkſhire, deprived as much as poſſible of its metallic particles, gave Mr. Howard, from 150 grains,

75 Silex

75	Silex
37	Magneſia
48	Oxyd of iron
2	Oxyd of nickel.
162	

The increaſe of weight was owing to the oxydizement of the metallic bodies.

Stones which fell at l'Aigle in France, in 1803, yields, by the analyſis of Vauquelin and Fourcroy,

54	Silex
36	Oxyd of iron
9	Magneſia
3	Oxyd of nickel
2	Sulphur
1	Lime.
105	

The celebrated ſtone which fell at Enſiſheim in Alſace, in 1492, yielded to the ſame philoſophers,

56.0	Silex
30.0	Oxyd of iron
12.0	Magneſia
2.4	Nickel
3.5	Sulphur
1.4	Lime.
105.3	

FALLINGBOSTEL, in *Geography*, a town of Germany, in the principality of Luneberg-Zell; 14 miles N.E. of Rethem.

FALLOPIA, in *Botany*, named by Loureiro in honour of Gabriel Fallopius, the celebrated anatomiſt, who excelled in the knowledge of plants. He wrote ſeveral tracts on their virtues, and alſo a commentary on Dioſcorides. Lour. Cochinch. 335. Claſs and order, *Polyandria Monogynia.* Nat. Ord. *Tiliaceis affine?*

Gen. Ch. *Cal.* Perianth inferior, of five ovate, coloured, ſomewhat ſpreading leaves. *Cor.* Petals five, ovate-oblong, ſmall, equal, erect. *Stam.* Filaments about 50, thread-ſhaped, unequal, inſerted into the receptacle; anthers roundiſh. *Piſt.* Germen ſuperior, roundiſh; ſtyle thick, awl-ſhaped, ſhorter than the ſtamens; ſtigma ſimple. *Peric.* Berry globular, of one cell, with four roundiſh ſeeds.

Eſſ. Ch. Corolla of five petals. Calyx of five leaves. Berry ſuperior, of one cell. Seeds four.

Obſ. We have preſumed to correct, from analogy, the deſcription of Loureiro, who conſiders as a nectary the five ſmall leaves which we eſteem petals, and takes our calyx for the corolla. He thinks there is no true perianth, but calls a common calyx what we judge by his deſcription to be bracteas.

1. F. *nervoſa.* Hai pú ip of the Chineſe. Found wild in the neighbourhood of Canton. A *tree*, eight feet high, with ſpreading branches, and a fibrous or hemp-like bark. *Leaves* ſcattered, ovato-lanceolate, ſomewhat ſerrated, ribbed, ſmooth. *Flowers* white, in ſmall terminal cluſters; partial ſtalks, each bearing three flowers, encompaſſed with twelve linear-lanceolate, deciduous bracteas.—As we have only Loureiro's account to direct us, we cannot aver that this plant is not already known to ſyſtematic botaniſts by ſome other name and characters, but we have not been able to refer it to any already publiſhed.

FALLOPIAN Tubes, in *Anatomy*, two ſmall tortuous canals, connected to the fundus of the uterus. See Generation, *Organs of.*

FALLOPII Ligamentum, the inferior border of the tendon of the obliquus externus abdominis, extended from the anterior ſuperior ſpine of the ileum to the angle of the pubes. See Obliquus.

Fallopii *Aquæductus*, a canal in the temporal bone, through which the facial nerve paſſes. See the deſcription of that bone in the article Cranium.

FALLOPIO, Gabriel, or, with the Latin termination, Fallopius, in *Biography*, a phyſician of Modena, celebrated for his knowledge of anatomy. His biographers are not agreed as to the year of his birth, and conſequently as to his age at the time of his death, in 1563. Caſtellani, Guilandini, and Haller believe that he was born in 1523, and died in his fortieth year; which opinion ſeems to be the moſt correct. Fallopio exhibited, in his youth, the moſt ardent zeal in the purſuit of knowledge. After having ſtudied anatomy under Braſſavola, and others, he left Italy in order to profit by the inſtructions of the moſt eminent profeſſors in other countries; and he is ſaid to have attained to a depth and extent of information unuſual at his age. Botany, chemiſtry, and aſtrology were among the ſtudies to which, beſides anatomy, he particularly directed his attention. He was appointed profeſſor of anatomy at Piſa in 1548; and thence went to Padua, where the ſame honourable office was confided to him in 1551. He alſo taught botany at Padua, but with leſs celebrity. In fact, his anatomical excellence not only did honour to the univerſity of Padua, where a crowd of pupils was annually induced to reſort for the advantage of his inſtructions, but procured for himſelf the reputation of the moſt able phyſician of his age. He died at Padua in 1563, as already ſtated. Fallopio was not only diſtinguiſhed as a phyſician and anatomiſt, he was alſo eminent in the practice of ſurgery; of which ſubject, however, he has left no writings, unleſs the notes written by ſome of the pupils who attended his lectures, and publiſhed in a careleſs manner by them, can be conſidered as ſuch. Douglas has characterized him in a few words: “in docendo maxime methodicus, in medendo feliciſſimus, in ſecando expeditiſſimus.” He contributed to elucidate the ſcience of anatomy by his unceaſing induſtry, although he had certainly been anticipated in ſeveral of his diſcoveries, the credit of which he claimed. In attaching his name to the uterine tubes, which are believed to receive the ovum from the ovarium, and to convey it to the uterus, and are in general called the *Fallopian tubes*, anatomiſts acknowledge his title to the diſcovery of them. It muſt be admitted, however, Eloy obſerves, that theſe tubes were known to the ancient anatomiſts, Herophilus and Rufus the Epheſian, who have left us very accurate deſcriptions of them. The character of this great phyſician, however, is little deteriorated by ſuch circumſtances; for, if he did not make all the diſcoveries uſually attributed to him, he at leaſt reſtored thoſe of the ancients which had fallen into oblivion. The following is a catalogue of his works. 1. “Obſervationes Anatomicæ, in libros v. digeſtæ,” Venice, 1561; one of the beſt works of the ſixteenth century, in which ſome of the errors which had eſcaped his maſter, Veſalius, are modeſtly corrected. 2. “Libelli duo, alter de Ulceribus, alter de Tumoribus, præter naturam,” ibid. 1563. 3. “De Thermalibus aquis, libri ſeptem; de Metallis et Foſſilibus, liber,” ibid. 1564; being the ſubſtance of part of his lectures on Dioſcorides, publiſhed by one of his pupils, André Marcolinus. 4. “De Morbo Gallico Tractatus,” Venice, 1564.

5. "De ſimplicibus Medicamentis purgantibus," ibid. 1566; the ſubſtance of lectures in the form of commentary on the firſt book of Dioſcorides. 6. "Opuſcula varia," Padua, 1566. 7. "Expoſitio in librum Galeni de Oſſibus," Venice, 1570; publiſhed by Francis Michini. 8. "De compoſitione medicamentorum," ibid. 1570. 9. "De parte Medicinæ quæ Chirurgia nuncupatur, necnon in librum Hippocrates de vulneribus capitis dilucidiſſima interpretatio," ibid. 1571. 10. "De Humani Corporis Anatome compendium," ibid. 1571. 11. "Lectiones de partibus ſimilaribus Corporis Humani," Nuremberg, 1575; publiſhed by Coiter. 12. "Opera genuina omnia, tam Practica, quam Theorica, in tres tomos diſtributa," Venice, 1584. This work was publiſhed at Francfort in 1600, and a ſupplement, forming a fourth volume, in 1606. But the ſuperior bulk of this Francfort edition is made up of a collection of notes taken from the oral lectures of the author, and which are not in a ſtyle calculated for publication. A work was publiſhed at Venice in 1650, entitled "Secreti racolti dal Falopia," reſpecting which it may be obſerved, that Fallopio was too candid and communicative to conceal any information that might be uſeful to mankind, and that this was probably an inſtance of the advantages which quackery does not fail to take of poſthumous reputation to foiſt its impoſitions upon the public. Eloy Dict. Hiſt. Manget. Bibl. Med. Pract.

FALLOW, a colour of a paliſh red, like that of a brick half burnt: ſuch is that of a fallow deer, &c.

FALLOW, in *Agriculture*, ſignifies ſuch land as has been repeatedly ploughed over, and expoſed to the influence of the atmoſphere, for the purpoſe of rendering it mellow and clean from weeds, not being ſown, but left to reſt after the tillage it has undergone.

But fallows have different names given to them, and are of different kinds, according to the purpoſes for which they are intended, and the manner in which they are made. A naked fallow is that in which the ground is ploughed and harrowed at ſuitable intervals for ſeveral times, according to the kind of crop that is ultimately to be grown upon it, but without being ſown till it has lain for ſome length of time afterwards. A green fallow is that where the land has been rendered mellow and clean from weeds, by means of ſome kind of green crop, ſuch as turnips, tares, peas, potatoes, &c. In this mode of fallowing no time is loſt by the land being left idle, or in an unproductive ſtate.

They are alſo ſometimes diſtinguiſhed by the ſeaſon of the year in which the buſineſs is either principally or wholly accompliſhed; hence we have ſummer, winter, and ſpring fallows, and likewiſe further, from their being in particular inſtances only performed in a partial manner, we have baſtard fallows. They are alſo not unfrequently denominated from the particular crops which are grown upon them, or by which they are produced; conſequently, we have wheat, turnip, potatoe, pea, bean, and other ſimilar fallows.

Whatever the nature of the fallow may be, it is of great conſequence that it be well made. See FALLOWING *of Land.*

FALLOW-*Cleanſing Machine*, an implement contrived for the purpoſe of rendering fallows clean from weeds, roots, and other prejudicial matters. It was long ſince invented by a blackſmith of the name of Aaron Ogden, reſiding at Aſhton-under-Line, near Mancheſter, in the county of Lancaſter. It is a complex unwieldy tool, which has been ſuperſeded by thoſe of a much more cheap, ſimple, and applicable kind, ſuch as rakes, drags, cultivators, &c. By the uſe of theſe fallows can be rendered not only fine, but perfectly free from couch, and all other ſorts of root weeds. But, beſides this, the introduction of green fallow crops, by preventing, in a great meaſure, the neceſſity of naked or ſummer fallowing, has contributed to render the uſe of this ſort of machinery much leſs frequent than formerly. In improved huſbandry implements of this nature are of courſe ſeldom or ever employed. A full repreſentation of this machine is however given in the "Complete Farmer, or General Dictionary of Huſbandry."

FALLOW *Deer*. See DEER.

FALLOW-*Finch*, or *Fallow-ſmick*, in *Ornithology*, a name of the oenanthe, more commonly called the *wheat-ear*, and by ſome authors *octiflora*. See MOTACILLA.

FALLOW *Hounds*. See HOUNDS.

FALLOWING *of* LAND, in *Agriculture*, is the operation or proceſs of rendering tillage-ground proper for the growth of different ſorts of crops of the grain or green kinds, by repeated ploughing, harrowing, and other ſimilar means, during the ſummer, autumnal, or winter and ſpring months.

This is a practice which was had recourſe to at a very early period of the art of huſbandry, and which has prevailed in different countries. It was moſt probably firſt introduced and adopted as the means of bringing the more rough and coarſe kinds of tillage-land into a ſtate proper for the production of various ſorts of grain crops, and afterwards continued for the purpoſe of keeping ſuch as had been brought into that ſtate free from thoſe vegetable productions which have a tendency to injure and deſtroy ſuch crops.

The more frequent introduction of green crops has ſince conſiderably leſſened the neceſſity for this practice in different diſtricts.

It has been obſerved, that in the preparation of land for the reception of grain or other ſorts of crops, by repeated ploughings and harrowings, or the frequent expoſure of new and freſh ſurfaces to the action and influence of the atmoſphere, a variety of alterations and changes are produced in the earthy, as well as other kinds of materials that enter into the compoſition or conſtitution of the ſoils. "The heavier or more earthy particles of the land, by being under different circumſtances of the air and ſeaſons thus frequently ſtirred and turned over, are ſo effectually divided or ſeparated from each other, and broken down, that even in moſt of the ſtiffer ſorts of ground, as well as thoſe of the lighter kinds, there is a degree of pulverization and mellowneſs effected that could ſcarcely have been induced by any other means: in conſequence of which the portions of vegetable matter that are preſent, and that may have been reduced into the carbonaceous ſtate, with the calcareous, the argillaceous, and other earthy ingredients, and ſuch metallic ſubſtances as may exiſt in the condition of oxyds or calces, become ſo uniformly, and ſo extenſively blended and incorporated, and the manures that are afterwards applied ſo minutely intermixed with them, that the fibrous roots of the growing crops, of whatever nature they may be, are enabled to penetrate and extend themſelves more fully, and of courſe to draw more regular and varied, as well as more abundant ſupplies of nouriſhment." And that "on account of the extreme diviſion and pulverization that take place, and the great irregularity of ſurface which is produced in this way, the dews and light refreſhing rains that are ſo frequently occurring in the early ſpring months are more capable of being admitted and diffuſed through, and detained in the hollows and interſtices of the ground, and thus of contributing powerfully to the ſupport of the crops in the more incipient ſtages of vegetation." Alſo, "by the repeated turning-in and deſtruction of different ſorts of plants of the weed kind, much vegetable mucilaginous and ſaccharine matter may alſo be added, as well as the land improved by the putrefactive fermentation that muſt from theſe cauſes be conſtantly taking place." It is added, that "there are alſo other modes in which advantages may be gained by the repeated turning over and breaking down of the particles of ſoils, as from much of the atmoſpheric air being by ſuch methods of huſbandry blended with the fine particles of the ſoils, and detained in the numerous hollows and cavities formed by ſuch degrees of pulverization, a larger proportion of oxygen may be ſupplied, which, by its union with the carbon and other inflammable materials that are moſtly contained in ſoils, may produce the carbonic or other acids, according to the circumſtances of the caſes in greater abundance, and in this manner aid the growth of vegetables in a high degree. And as the water, or moiſture that is included in large quantities in the pores of ſoils in ſuch powdery ſtates may undergo the proceſs of decompoſition more fully, by coming more minutely in contact with the portions of atmoſpheric air that are covered up and impriſoned with it in them, the ſupplies of ammonia or volatile alkali, by the combination of its hydrogen with azote, may be more regular and copious, as well as thoſe of nitre, by the more complete union of its ſuper-abundant oxygen with ſome other portion of the abounding nitrogen, or azote of ſuch air. And it has likewiſe been ſuggeſted, that as the atmoſpheric air conſiſts, or is conſtituted of oxygen, azote, and the fluid matter of heat, if the heat that cauſes them to exiſt uncombined in the form of gaſes be drawn away from them by ſome other material, while they are confined in the cavities of the ſoil, they may, by their nearer approach to each other, combine ſo as to produce nitrous acid; or the oxygen, in its fluid ſtate, not in its aerial one, may more readily unite with carbon, and thus conſtitute a fluid, not an aerial carbonic acid, which is ſuppoſed to be of great utility in promoting the growth of plants. And further, that if any proceſs of the putrefactive kind be going on where atmoſpheric air is in this way confined in the interſtices of the ſoil, and by the deprivation of its heat is converted from a gas to a fluid, the azote may combine with the hydrogen of the decompoſing water, or contribute to decompoſe it, and in this manner form volatile alkali, which, like nitrous acid, may, either during the proceſs of its formation, or after that has been compleated, be of very material utility in promoting vegetation, while at the ſame time the oxygen afforded by the decompoſing water may, like that of the atmoſphere, contribute to the production of the carbonic, nitrous, or phoſphoric acids; and in this way render carbon, phoſphorus, and the baſis of nitre, capable of being taken up by the abſorbent roots of growing plants. From the great diminution of bulk that has been found from experiment to take place where atmoſpheric air is confined in contact with water, it is conceived that there may be a decompoſition of both the water and the air, and a production of both ammonia and nitrous acid, which are known to be beneficial in promoting vegetation, or the growth of plants. It is conceived that in theſe different views the practice of fallowing may in various inſtances be highly beneficial, notwithſtanding the objections that have been ſo repeatedly brought againſt it by writers on huſbandry; but at the ſame time it muſt be admitted that in ſome ſorts of ſoil it will, for ſimilar reaſons, be much more advantageous and uſeful than in others. On the lighter kinds of land, where full and luxuriant crops of different ſorts of plants, as turnips, potatoes, &c. may be grown, that produce a cloſe, thick foliage, and which, as has been ſhewn by experiment, afford under ſuch circumſtances much carbonic acid, which, from its being greatly heavier than the common air of the atmoſphere, muſt fall upon and be mixed with the ſoil in ſuch ſtagnated ſituations, and thus, together with the more conſtant moiſture that muſt be preſent in ſuch caſes, promote the ſolution and decay of various vegetable matters, and continually add carbonaceous and other materials ſo as to greatly improve the ſoils; it can but ſeldom be neceſſary. Beſides, as in theſe ſoils, by the uſe of the drill, and repeated hand or horſe-hoeing during the growth of the crops, the ground may be kept perfectly clean from weeds, and in a fine mellow or powdery ſtate, without the danger of being injured by too much evaporation and expoſure in the way of fallowing; and likewiſe in ſoils of the ſame nature, that are rich from the frequent applications of manure, and in which the proceſſes by which the different nutritious ſubſtances that have been deſcribed are formed and prepared, are properly going on, it muſt be injurious and improper to expoſe their ſurfaces frequently to the influence of the air, ſun, and rain, as is the caſe in fallowing, as by ſuch means the portion of carbonic acid that may exiſt in the ſtate of a fluid may be made to aſſume the gaſeous form, and be more readily diſſipated, as alſo the phoſphorus and the other materials in their different conditions before they form nitrous acid or ammonia. Thus, beſides the injury that may be done in fallowing ſuch ſorts of land, by the carbon and other inflammable materials which they contain, combining with the oxygen of the ſurrounding atmoſphere, and afterwards by their further union with other ſubſtances ſo as to form inſoluble compounds, ſuch as phoſphat of lime and calcareous nitre, as has been ingeniouſly ſuggeſted by lord Dundonald, there may be others of not leſs conſequence ariſing from the diſſipation and loſs of the carbonic or nitrous acid, or of volatile alkali in the gaſeous ſtate, as ſhewn by Dr. Darwin.

But that in all the wet bottomed, ſtiff, adheſive, and clayey ſorts of ſoil, which conſtitute a large proportion of the lands of the kingdom, where, from the cloſeneſs of their textures, and the great tenacity of their particles, but a very ſlight, or indeed ſcarcely any, degree of pulverization has been effected, the practice of naked ſummer fallowing may often be highly uſeful and advantageous, not only by the great mechanical alterations that muſt of neceſſity take place in them by the repeated ploughing or turning-up of their parts to the influence of the atmoſphere, but by their admitting the particles of the manures that may afterwards be applied to be blended and incorporated with them in a more minute and extenſive manner; and their becoming ſo perfectly aërated, as that the different proceſſes that have been mentioned may take place and properly proceed, ſo as to form in them ſuch ſubſtances as have been found of utility in aiding the growth of crops; and which could not poſſibly have been produced without ſuch pulverization as is the effect of fallowing in the naked method.

It may be further ſtated likewiſe, that the degree of friability and mellowneſs that is produced in this way in ſuch ſoils has alſo other advantages, ſuch as thoſe of admitting the roots of the growing plants to penetrate them with greater facility, and preſenting a more extenſive ſurface for them to draw their nouriſhment from. And as in lands of theſe kinds there is a conſtant tendency to throw up abundant crops of root and other weeds, it is, perhaps, only by the frequent turning over of the ſoil and the tearing of them up by harrowing, as is the caſe in ſummer fallowing, that they can be effectually eradicated and deſtroyed. It is principally in this view that the working of ſuch ſoils in the early ſpring or ſummer months becomes ſo particularly neceſſary, as at the period in which the ſeed is to be put into the ground, neither the ſeaſon nor the ſtate of the weather will admit of their being ſufficiently broken down and reduced by ploughing, or the weeds to be deſtroyed. And it may be added, that wet lands, by being turned over during the winter ſeaſon, are liable, in many caſes, to become more ſtiff and adheſive, by which the roots of the crops muſt be more limited and confined in their means of acquiring nouriſhment from them. It has been lately well obſerved, that "when land of a dry gravelly quality gets foul, it may be eaſily cleaned without a plain ſummer fallow; as crops, ſuch as turnips, &c. may be ſubſtituted in its place, which, when drilled at proper intervals, admit of being ploughed between as often as neceſſary; whereas, wet ſoils, which are naturally unfit for carrying ſuch crops, muſt be cleaned and brought into good order by frequent ploughings and harrowings during the ſummer months."

Indeed it is ſtrenuouſly contended by the ſame writer, that the moſt judicious intermixture of crops upon clay ſoils will not preclude the neceſſity of a ſummer fallow; though it is admitted that it may go a great way in preventing the neceſſity of its being ſo frequently repeated. But another writer, whoſe experience has been conſiderable, while he allows that there is no queſtion at all of the merit of fallowing when compared with bad courſes of crops, and who thinks, that if the huſbandry is not correct in this reſpect, the fallowiſt will certainly be a much better farmer than his neighbours, contends that there are courſes which will clean the fouleſt land as well as any ſummer fallow, by means of plants which admit all the tillage of ſuch as fallow. "Cabbages," he ſays, "are not planted before June or July: winter tares admit of three months' tillage, if tillage be wanted. Beans, well cultivated, will preſerve land clean, which has been cleaned by cabbages; and in any caſe two ſucceſſive hoeing crops are," he thinks, "effective in giving poſitive cleanneſs. Theſe obſervations are not," he adds, "theory; they are practice: and it is high time that mankind ſhould be well perſuaded, that the right quantity of cattle and ſheep cannot be kept on a farm, if the fallows of the old ſyſtem are not made to contribute to their ſupport. There are probably, however, many ſituations of clayey ſoils ſo exceedingly ſtiff and wet, that though turnips, cabbage, or bean crops, may be grown upon them, it cannot, from the great labour and difficulty of their preparation, and the high degree of injury that muſt be done in the eating them or carrying them off the land, be to much advantage, or ſuch as to admit of that ſort of culture during their growth that will keep the ground perfectly clean from weeds.

In ſuch caſes no courſe of cropping, however judicious, can probably be effectual in this reſpect; it is indeed well known to ſuch practical farmers as have had the management of ſoils of this nature, that it is ſcarcely poſſible to be effected even by ſummer fallowing itſelf. It has alſo been juſtly obſerved, that ſoils of this deſcription are ſo frequently, from neceſſity, ploughed over when wet, that an adheſion and ſoundneſs are produced that cannot be removed without expoſure to the heat of the ſummer's ſun, and the pulverization afforded by the repeated operations of the plough and the harrow. There is no ſort of crop that can in ſuch caſes ſupply the place of fallow, as turnips are highly detrimental; and drilled beans, though they may anſwer in the way of an aſſiſtant to fallow, and have the tendency of keeping lands clean that are already in a proper condition, it is ſuppoſed, from the neceſſity there is of ſowing them early, can never be beneficially ſubſtituted for the radical improvement that is produced by a clean naked ſummer fallow.

It is, however, added, that even if ſuch ſorts of land could be kept perfectly clean and free from weeds by the judicious interpoſition of bean, cabbage, or other ſimilar crops that might be cultivated on them, it is evident that the various beneficial products which have been mentioned, and which are the reſult, in a great meaſure, of the perfect pulverization and high degree of aëration that are produced by means of ſummer fallowing, could never be formed in ſuch an abundant manner as to be of much utility in aiding the growth of crops: nor could they be in ſo ſuitable a condition for the admiſſion and extenſion of the abſorbent roots of the plants that may be cultivated upon them as crops.

But though theſe circumſtances may demonſtrate the practice of fallowing to be occaſionally neceſſary and highly uſeful on ſuch wet, adheſive, clayey ſoils, as the proper and moſt advantageous quantity of ſtock for the improvement of ſuch farms can ſeldom be kept where it greatly prevails, the repetition of the practice ſhould, in this view, be prevented as much as poſſible, by the cultivation and growth of green crops as often as the lands may be in a ſtate for them, and they can be had recourſe to with any chance of ſucceſs. The ruta baga, or Swediſh turnip, as being a plant ſomewhat more adapted to wet, ſtiff ſoils, than either the common cabbage or turnip, might probably, in ſuch caſes, be advantageouſly ſubſtituted as a green crop, and by being eaten off in the later ſpring months, when the ground became ſufficiently dry to bear the cattle or ſheep without injury, admit of a pea-crop; after which, the land would probably be in a ſuitable condition for wheat; or a crop of clover might be taken, and then wheat. But in all ſuch caſes much muſt depend upon the degree of cleanneſs, pulverization and aëration, that has been accompliſhed by the occaſional uſe of ſummer fallowing. And as there is much variety in the conditions of ſuch ſoils as may occaſionally require the aid of naked or ſummer fallowing, in order to render them ſuitable for the growth of clean grain or other crops; ſome, from the nature of their ſituations and the ſub-ſoils on which they are placed, being more inclined to the retention of injurious moiſture or wetneſs than others, conſequently more diſpoſed to be cold, and to the throwing up of large crops of weeds; while others, from the large proportion of clayey or tenacious loamy materials that may be mixed and incorporated with the pebbly or other ingredients, may be more ſtiff and retentive, and of courſe more difficult or more incapable of ſufficient pulverization, and of admitting the roots of ſuch plants as are capable of being cultivated upon them, to readily eſtabliſh themſelves, and draw from them proper ſupplies of nouriſhment. And beſides the varieties of theſe different ſtates, there may probably be others that have not hitherto been well aſcertained or attended to, ſuch as may proceed from the differences in the qualities or properties of the clays or loams as they enter into or exiſt in their compoſitions, upon each of which ſome diverſity in reſpect to the neceſſity, repetition, or method of conducting the buſineſs of fallowing may depend. The correct farmer ſhould, therefore, conſtantly keep them in view, whenever it may be requiſite for him to prepare land by means of ſummer or naked fallowing.

It is ſtrenuouſly contended by a late writer. that one great purpoſe of the fallow ſyſtem is that of deſtroying weeds which, in conſequence of previous bad management and of over-cropping, have increaſed to ſuch a degree, as to render cultivation for grain no longer profitable. Land being allowed to reſt for a ſeaſon from yielding a crop, and being repeatedly ploughed, the ſoil expoſed to the influence of the different ſeaſons, and at the ſame time completely pulverized, its fertility is again ſomewhat reſtored, ſo that, by the application of a ſmaller portion of manure than would be otherwiſe neceſſary, it is rendered fit for again producing valuable crops of grain or graſs. It is univerſally acknowledged, that all ſoils, even thoſe naturally the moſt fertile, are capable of being rendered unproductive by conſtant and ſevere cropping, and that the more improper the modes of cropping are, the ſooner, and the more certainly, will a comparative barrenneſs enſue. Hence the propriety of fallowing, where imperfect modes of culture are adopted. Fallowing, in what may be called the infancy of improvements in agriculture, is alſo, it is conceived, eſſentially neceſſary. If land be greatly exhauſted, no matter by what ſort of previous miſmanagement, fallowing is, it is ſuppoſed, the moſt expeditious, the moſt effectual, and every thing conſidered, the leaſt expenſive method that can be adopted for reſtoring its fertility, and rendering it productive. It is the moſt expeditious, becauſe it is completely done in the courſe of one ſeaſon, whereas ſeveral years of culture, and a great additional quantity of manure, would be requiſite, were any other leſs effectual mode of tillage adopted. It is the moſt effectual, becauſe the farmer has it in his power to deſtroy every weed, to turn over and expoſe the ſoil to the influence of the weather in the different ſeaſons, and alſo to level and ſtraighten the ridges, drain the land, and remove every obſtruction to the introduction of better modes of huſbandry, none of which could be ſo conveniently or effectually performed between the harveſt of one year and the ſeed time of the next. Fallowing is alſo, upon the whole, the leaſt expenſive method by which the fertility of land greatly exhauſted can be reſtored, and the only one that can be adopted with a certainty of ſucceſs, for the removal of every obſtacle to the introduction of more perfect agriculture. Manure operates more powerfully when applied to a field that has been properly ſummer fallowed than when laid on one that has been long under an improper courſe of cropping. The returns, after fallowing, will be to a certainty greater; and, therefore, although the actual expence of fallowing is conſiderable, yet the crop that ſucceeds is ſo much greater as to counter-balance that expence, while thoſe that follow, if properly adapted to the ſoil, will yield the farmer a proper compenſation for his extra trouble and expence. In the above ſtatement it is obſerved, however, that the writer had chiefly in his eye the practice of fallowing as recently adopted in the ſouthern parts of Scotland, and the principles on which the farmers regulate their conduct, where new and better modes of culture became general.

It is remarked by an able writer, in the ſecond volume of "Communications to the Board of Agriculture," that many farmers regard fallowing as the greateſt improvement that ever was introduced into the agricultural art; by others, it is either unknown, or is deſpiſed as an unneceſſary waſte of labour, and a ſacrifice of the produce of the land. Much of the contrariety of opinions which prevails on this ſubject may, he thinks, be accounted for, from the quality of the ſoil on which the farmer operates, or from his local ſituation. Strong clays require a more frequent repetition of fallow than thoſe ſoils that are dry and friable, from containing a great proportion of ſand. In thoſe diſtricts where exceſſive rains abound during ſummer, it is ſeldom convenient for the farmer to be encumbered with too great a proportion of fallow, as it is often impoſſible to get it properly wrought, before the land is turned into a mire, if the fineſt parts of the ſoil be not waſhed away. In ſuch ſituations green crops, adapted to the quality of the ſoil, are, in general, the moſt eligible mode of fallowing. As in ſuch diſtricts paſturage ought to be the principal object, ſo this mode of fallowing is calculated to provide for the wants of the live ſtock in winter as well as in ſummer. There is no ſoil or ſituation, it is ſuppoſed, where naked fallowing might not be rendered leſs frequently neceſſary, if not wholly ſuperſeded, by adopting a proper rotation of crops. Were a drilled green or pulſe crop interpoſed between every two corn crops, the land would always be kept clean and in fine tilth, and a much greater value would be extracted from the ſame quantity of manure. As the quality of the ſoil ought ever to be conſidered in deciding the ſpecies of fallow for which it is beſt adapted, ſo the quality of the ſoil ought alſo to determine the mode by which the fallowing ought to be conducted. Some ſoils ought always to be turned up before winter, that their parts may be ſplit and pulverized by the froſt: others ſhould not be ſtirred until ſpring, as exceſſive pulverization renders them liable to become miry with rain, which chills the crop, and they conſolidate into a hard maſs at the approach of drought. Thus it is more convenient to have ſuch ſoils rather broken into ſmall pieces than reduced to a fine powder; but where the object in view is a drilled crop, it is always advantageous to turn over the land before winter, or even to give it a ſtirring or two during that ſeaſon, becauſe working it in drills afterwards prevents the effects already ſtated.

For land already in cultivation, the great uſes of fallow are, it is conceived, to reduce or preſerve the land in a ſtate of fine tilth, to clean it of weeds, and, by turning it up to the air, to cauſe a more perfect putrefaction of the animal and vegetable matters it may contain. This laſt effect is ſo clearly aſcertained, that the moſt experienced farmers have aſſured the writer, that land which has been repeatedly dunged has been found to yield a much better crop, in conſequence of a fallow without dung, than from a complete doſe of dung without a fallow; and this too after the productive power of the land had been much exhauſted by cropping. But for land that is to be reclaimed from a natural ſtate, or from a rude and imperfect ſtate of cultivation, a fallow is always indiſpenſably neceſſary for various reaſons, and particularly thoſe of affording a convenient opportunity to level the inequalities, and to lay the land in the moſt proper form for future cultivation.

And it is ſtated by the intelligent authors of the "Agricultural Survey of the County of Northumberland," that the practice of making naked fallows on all kinds of ſoils, once in three or four years, was general through that county, till the introduction of turnips; in a few years the fallows of the dry-lands were covered with this valuable plant. On ſuch other ſoils as were found improper for this root, the naked fallows ſtill prevail with an almoſt univerſal opinion that it is abſolutely neceſſary to the fertility of the land; yet there are ſome few, they ſay, who dare to doubt this long eſtabliſhed doctrine, and preſume to think that naked fallows might be diſpenſed with in many ſituations, by cultivating leguminous crops drilled at wide intervals, to admit being ploughed or horſe-hoed between; to which, if proper hand-hoeings be added, the land will be as well prepared for wheat as if it had been a complete naked fallow. This is not, they ſay, advanced on ſpeculation or theory; inſtances can be produced where no naked fallows have been made on fields of ſtrong loam for twelve years, yet they are as clear of quickens, couch-graſs, or other pernicious weeds as any fields in the diſtrict that have been under naked fallow two or three times in the ſame period. It may, however, be neceſſary to obſerve, they think that, previous to the adoption of this ſyſtem, the land was cleared of quicken or couch-graſs, by a complete ſummer fallowing.

But though they are diffident in giving a decided opinion in reſpect to the neceſſity of fallowing, yet, from obſervations made on the above facts, they cannot help being inclined to think that the quantity of naked fallow might be very much reduced, and in another century, they ſuppoſe, will probably be totally aboliſhed, if no fortuitous circumſtances ariſe to check the exertions and ſpirit for improvement, which have been ſo prevalent of late years, and ſo generally diffuſed through that diſtrict.

In the Report of the County of Mid-Lothian in Scotland, it is ſtated, that fallowing is practiſed there not ſo much as making part of a rotation, as from other circumſtances, which render it ſometimes neceſſary. Thus when lands are rendered foul, from the occurrence of a bad ſeaſon, or barren, from too frequent repetition of exhauſting crops, ſummer fallow is introduced as a corrective, and its effects are always ſalutary. On light or dry lands, however, it is ſeldom found neceſſary to fallow; for theſe can be got into good order for a crop of potatoes, or of barley, or of turnip; or even more early in the ſeaſon for beans and peaſe: but heavy or wet lands are not ſo pliable; and although it is clearly poſſible to labour them alſo, without fallowing, yet it is found to be more profitable to have recourſe from time to time to that expedient, and its operation is generally more effective and laſting on ſuch ſoils, ſo that it is ſeldom neceſſary to be repeated oftener than once in ſeven years.

And it is aſſerted by the author of the "New Farmer's Calendar," that the practice of fallowing, the miſerable ſubſtitute of former times for manure, and the hoe-culture, can be no longer neceſſary on *any* ſoils, under the preſent improved ſtate of huſbandry. In thoſe parts where judicious cropping has been ſubſtituted to fallows, every ſpecies of product including the rental, has experienced a wonderful increaſe, to the certain emolument of all parties concerned, the landlord, the tenant, and the public. The ſame kind of land in all reſpects, whether rich or poor, has been proved, in numberleſs inſtances, equally, or more fruitful under conſtant crops than under the fallowing ſyſtem, including thoſe particular ſpecies of ſoil which it was pretended could never be ſucceſsfully tilled without fallows. How often does it happen that, upon theſe very ſoils, an enlightened cultivator ſhall be found cropping his lands according to the improved practice, and making larger crops of wheat than the ſurrounding fallowiſts; upon the ſelf-ſame ſoil, parted but by the hedge, one man ſhall make an expenſive fallow for wheat, and gain two quarters and a half: his neighbour ſhall alſo obtain the ſame quantity of wheat, after a fallow crop of cabbages or carrots, the aereable profit of which ſhall far exceed that of the wheat itſelf, and his land ſhall be at the ſame time left in the beſt heart and cleaneſt tilth. The writer ſpeaks of facts, which he has himſelf often witneſſed; and were proofs neceſſary, he could fill his book with them, drawn from the moſt authentic records. The advocates for fallowing within his knowledge, and he has reaſon to believe in general, have contented themſelves with mere aſſertions of the ſuperiority of their practice, without ever once deigning to make trial of any other, or with making only a few deſultory and ill-conducted eſſays; after which they have again relapſed, unconvincing, unconvinced, and unimproved, into their old habits. By indolent men like theſe, and by landed gentlemen, who are ſo ill adviſed as to commit the management and the letting of their farms to perſons totally ignorant of any principle of agriculture, is the vexatious and unprofitable ſyſtem of fallowing perpetuated. There ſeems ever to have been a ſtriking deficiency both of ſolid argument and experimental proof for the neceſſity of fallows. The fallowiſts have, in his opinion, contented themſelves with ſimply aſſerting that their lands will not do without reſt, and with exclaiming againſt innovation and new-fangled practice. If they have brought forth any arguments at all, thoſe have been generally of that well-known claſs which men are wont to uſe in the ſervice of a favourite hypotheſis they have previouſly determined to ſupport. It has, he conceives, been taken for granted, and with a confidence ſuch a notion never merited, that the earth, like a ſyſtem of animal organization, ſtands in need of reſt, and that it may be totally exhauſted by the action of perpetual vegetation; a notion which the earth herſelf, by her conſtant and invariable habits, has ſaved us the trouble to refute. It may be very properly demanded of fallowiſts, how it happens that a defect of this ſingular kind ſhould inhere in their lands excluſively? And why the pooreſt lands in foreign countries, as well as our own, ſhould proſper under continual cropping? Whence ariſes the difference between their farms and their gardens? And why do the latter never ſtand in any need of reſpite, but produce exuberantly under perpetual feeding? They are well manured and well tilled. Should the garden culture be rejected as a parallel example, from its preſumed ſuperiority, he inſiſts it is entirely without reaſon; for the open field has the advantage, both in point of air, and even the poſſibility of ſuperior tillage, from the improved implements and increaſed population of the preſent times. The earth is deſtined by nature to an everlaſting round of vegetation; and whilſt confined to her ſpontaneous exertions, requires no aſſiſtance from the hand of man. The ſeeds of theſe productions ſhe poſſeſſes in her own bowels, and the waſte and loſs of ſubſtance ſhe has ſuſtained are amply returned to her in their falling and putrid remains, and in the rains, dews, and fat vapours of her atmoſphere. Thus production, maturity, corruption, and re-production, run in a neceſſary and everlaſting circle. But if more be required than the earth would ſpontaneouſly produce, and the ſubſtance itſelf be withdrawn from the ſoil which produced it, an artificial amends muſt be made for the conſequent exhauſtion; hence the uſe of tillage and manure. This amends, however, being made to the neceſſary amount, the vegetable proceſs will go on unimpeded, and the land continue to produce for ever, without demanding truce or reſpite. Experiences of a date too ancient for chronology to aſcertain have evinced the truth of this theory, on ſoils of every poſſible deſcription. Land, then, of a quality however inferior, can never want to be fallowed under the idea of giving it reſt, which it will at the inſtant reject by ſpontaneous labour, to produce a crop of weeds; and as it muſt and will produce ſomething, that ſomething had ſurely better be ſuch as will repay the expence of culture. But the truth is that, excluding the idea of reſt, the general ſyſtem of tillage is ſo defective, and the operation of that moſt uſeful and neceſſary implement the hoe, ſo much neglected, that in the courſe of two or three crops the farmer finds himſelf totally at a ſtand. He has been painfully and fooliſhly cultivating weeds as well as corn; the farmer has ſo far occupied and exhauſted his land, as no longer to leave either ſpace or nouriſhment for a crop of corn, ſufficient to defray the attendant expence, excluſive of all expectation of profit. He muſt, indeed, in this caſe, have recourſe to a fallow, as the only method now left to extirpate a part of the weeds, that he may again crop his land; and this meaſure is at the expence of a year's rent, taxes, and labour, to fall as a ſurcharge in the product of the ſucceeding crops. That ſuch ſurcharge is totally thrown away, and a poſitive loſs to all parties, is, he contends, irrefragably proved by the new practice; and if a landlord ſhould ſuppoſe that he ſpares his lands by making a covenant for fallows, he alſo ought to take into the account that, unleſs he permits the new practice, he can have no title to expect a new rent.

After ſuppoſing the following hints and obſervations, which are contained in the Agricultural Reports of Stafford-ſhire and Kent, to be erroneous, namely, that "fallowing for wheat, on cold, wet, or ſtrong lands, and on all ſuch as are unfit for turnips, is abſolutely neceſſary ; and that he who ſhall attempt to manage ſuch land without fallowing will have occaſion to repent his miſtake ;" and that as "the mixed ſoils now in queſtion, which are too moiſt for turnips, have a particular propenſity to the protection of the root-graſſes, ſummer fallowing becomes abſolutely neceſſary, and every attempt to crop without it, for any length of time, on ſuch land, has terminated to the injury of the land, and the loſs of the occupier ;" the writer contends, that, if theſe farmers will be at the pains to ſearch out of their own counties, they may find numerous practical refutations of the above doctrines, in the very converſe of which he really believes the truth to reſide. He has never obſerved couch to be eradicated by fallowing ; a portion only is deſtroyed, and a ſufficient quantity of roots left to produce a crop, which will ſpeedily demand another fallow, and ſo on for ever. Regular periodical fallows may, in truth, he thinks, be ſtyled the nurſeries and hot-beds of couch, ſince, on lands ſubject to the practice, we ever ſee the greateſt quantity of it. Not that he entirely agrees with the too ſanguine advocates of the hoe, that it will, of itſelf, entirely root out couch-graſs ; at beſt, ſuch would be a long and tedious method, at which, he ſaid, even Tull himſelf heſitated. Nevertheleſs, after a good dragging, and burning the roots, during a month or two of dry weather, to the hoe only we muſt look for their gradual and total extinction ; and this method he has never known to fail in the worſt poſſible caſes of couch, colt's-foot, and other ſimilar kinds ; with the reſerve, however, that the lands muſt never be withdrawn from the hoe culture, whatever be the crop, until the enemy appear to be totally extinct, which will ſeldom be delayed beyond the third year. It ſeems ſingular to admit that fallowing may be ſuperſeded by turnips, and yet not by cabbages and beans, the appropriate hoe-crops of ſtrong lands; ſurely the latter will bear conſtant tillage, at leaſt equally well with the light and weak. But whilſt he contends that the earth requires no reſt, but rather exerciſe and good nouriſhment, he would not thence be underſtood that ſhe derives no benefit from reſt: all experience declares the contrary ; her ſpontaneous growth being returned to her boſom, this alſo laid open by tillage to the abſorption of the fattening dews, there can be no queſtion but ſhe is ſo nouriſhed and reſtored. All intended to be proved is, that the price is infinitely too high for the benefit received, and which, in truth, to its fulleſt extent, may be otherwiſe obtained gratis, and even with a premium annexed. Nor is he at all prepared to ſay, that thoſe ſtyled ameliorating crops, whether carrots, turnips, cabbages, graſſes, or what not, are ſuch, in the ſimple and reſtricted ſenſe of the word ; that they are really the vehicles of nouriſhment to the earth, like a fallow, or that the putrid fermentation occaſioned by their ſhade enriches, ſince, if it really have that effect, themſelves are extracting the benefit of it. No, all vegetable productions carried off the land, although not in equal degrees, detract, he contends, from the ſtrength of the ſoil, which may be impoveriſhed by the ſcythe as well as the ſickle ; yet graſs ſurely exhauſts it the leaſt. Thoſe plants abounding moſt in vegetable gluten, in weight and ſubſtance, are the greateſt exhauſters : at the head of them, undoubtedly, wheat ought to be placed ; potatoes, perhaps, next. Crops, then, can only be ſaid to be ameliorating, on the ſcore of their being hoed, and of a conſiderable part of their produce being returned to the land, in the dung of the animals which they feed. Omit the hoe, and ſell the crop, and, inſtead of amelioration you would ſoon, he thinks, find galloping conſumption ; and then, if in want of a convenient phraſe, you might ſay your land was tired of ſuch or ſuch a crop. Even the beſt tillage under the fallow-ſyſtem, he ſuppoſes, ſtands ſelf-convicted of deficiency, ſince it needs the invariable repetition of that expenſive aid; it evinces a defect of crops for the ſupport of cattle, of conſequence a defect of manure and of hoe-tillage. If the ſowing of white corn by broad-caſt muſt be perſiſted in, there is no poſſibility of keeping the land clean (generally ſpeaking) but by the intermixture, in due courſe, of pulſe-crops which are hoed ; with the aid of which, and a ſtrict attention to hand-hoeing and weeding the broad-caſt corn, the neceſſity of fallowing will be for ever precluded. It will be underſtood, that a ſummer's reſpite is neceſſary at firſt, in order to clear the ſoil of root-weeds ; and afterwards, the uſual intervals between the crops, the weather being dry, will afford opportunities of again uſing the drag, or cultivator, to the ſame end. Theſe occaſions always being diligently laid hold of, the roots will ſoon be totally deſtroyed. As to the ſeed-weeds, contrary to the common cuſtom of farmers, thoſe ought to be encouraged by all poſſible means of pulverization, to make their appearance, that they may be drawn or cut off previous to their bloom. Various circumſtances in tillage may induce the neceſſity of an occaſional winter fallow, which, by the land being laid up clean, will always be beneficial. It is, on the whole, concluded, by the practical author of "Modern Agriculture," that the practice of fallowing may, no doubt, be adopted with propriety in ſome caſes, while a ſlaviſh adherence to it in every inſtance would be highly improper.

In reſpect to the manner of performing the proceſs or operation of fallowing, it ſhould always, like moſt other proceſſes in huſbandry, be conducted with a due attention to the circumſtances and qualities of the ſoil, as more pulverization or breaking down will evidently be required where the land approaches to the nature of a perfect clay, than where it has more of the loamy quality ; and where the retention of moiſture is conſiderable, more regard will be neceſſary to the deſtruction of weeds, than where there is a greater tendency to dryneſs. In moſt caſes where the practice of naked fallowing is thought neceſſary to be performed, the moſt general method of proceeding is, for the land to be firſt ploughed up in the autumn, a ſecond time after the barley ſeed ſeaſon is finiſhed, and two or three times, or oftener, afterwards, as circumſtances may render neceſſary ; the ground being well broken and reduced by means of harrowing in the intervals of the different ploughings. But it has been obſerved, that "in many diſtricts ſeldom more than three ploughings are given to lands in a courſe of ſummer fallow ; one in autumn, or early in the ſpring ; another during the ſummer; and afterwards the ſeed-furrow." This preparation appears, however, it is further contended, extremely defective ; as in an ordinary ſeaſon it is ſcarcely poſſible that with ſo few ploughings either the root or ſeed weeds can be completely deſtroyed ; and when the ſummer happens to be wet or rainy, the lands under ſuch management muſt certainly be in a very bad ſtate for receiving the ſeed-corn. It has likewiſe been long ſince judiciouſly recommended, both in the preparation of lands by winter fallowing, for barley crops, and ſummer fallowing for thoſe of wheat, that when it is firſt ploughed up after the harveſt is over, (which ſhould always be done as deep as poſſible,) no time ſhould be loſt in rendering the new-turned-up ſoil as fine as poſſible by harrowing ; as repeated trials and attentive obſervation have fully ſhewn, that ſuch lands as are made fine before the ſharp froſt and winter rains come on, receive a much larger ſhare of their influence than any others. But that if the land be left in a rough ſtate, there is ſeldom time for the rains and froſt to penetrate or affect more than merely the outſide of the large clods or lumps that are preſent. The outſide may thus, indeed, be pulverized, or broken down, but the middle of the lumps, wherever they are large, are found nearly in the ſame hard ſtiff ſtate, as when turned up by the plough. Hence it is evident, that the benefit of the air, winter rains, and froſts, on lands thus left, muſt be only partial; and that of courſe the harrowing it in the ſpring, eſpecially when the latter of theſe are over, is too late for its receiving the full benefits which might otherwiſe have accrued from them, and the power of promoting vegetation not being nearly ſo great. Therefore, to make winter fallows as fine as poſſible in autumn, and ridge them up in that pulverized ſtate, is acting moſt agreeably to nature; the greateſt poſſible quantity of ſurface being thereby expoſed to the atmoſphere, and the land left in the ſtate wherein the rains and the froſts are moſt eaſily admiſſible; they are conſequently more capable of penetrating and enriching the whole maſs to a much greater extent. By this means, too, a larger proportion of atmoſpheric air is involved and incorporated with the mould, and of courſe a more perfect degree of aëration effected. It is contended, that it has been invariably found, that the froſt penetrates a quantity of earth, formed into a large hard clod, only partially, on account of its bulk and hardneſs, and that the ſame clod broken into four parts would be thereby penetrated four times as much, or, in other words, that four times the quantity of earth would be affected, and on a thaw be pulverized by it: for it is always found, after the breaking up of a ſevere froſt, that all the ſmall clods crumble eaſily into powder, while the large ones are only ſlightly reduced by the crumbling off of a portion of their external ſurfaces. It is ſuggeſted, that there cannot be much doubt but that by reducing ſuch ſtiff, adheſive ſoils, as require fallowing well, on their being firſt ploughed up, great advantages in the way of pulverization may be accompliſhed, as in the ſpring and ſummer months they are apt to cake, and become ſo hard and lumpy as to be wrought with difficulty But in order fully to aſcertain the utility of this method of preparing fallows, one half of a field of ten acres was left as nearly of an equal quality as poſſible, in the rough ſtate after ploughing; while the other was made very fine, by harrowing and beating in pieces any large hard clods which the harrows could not reduce. In the following ſpring it was obſerved, that that part which had been harrowed was much finer without any additional working, than the other could be rendered by repeated harrowings. It is conſequently concluded, that upon moſt ſorts of ſtiff, clayey ſoils, where fallowing becomes neceſſary, the firſt ploughings ſhould be given, if poſſible, before the commencement of the winter ſeaſon, and that they ſhould alſo be well reduced by means of harrowing, in order to promote the decay of ſuch vegetable matters as may be upon the ſurface of the land, as well as to promote a more complete ſtate of pulverization and aëration of the ſoil at the time. This is often moſt uſefully performed by gathering up the ridges, as in that way the ground is not only laid more dry, but the furrows more effectually opened for the draining off of the injurious moiſture.

In the ſecond ploughing in the ſpring, which is generally before the croſs-ploughing is given, theſe ridges ought to be cloven or turned back again, and after lying a ſuitable length of time, be well harrowed down for ſeveral times, and occaſionally rolled, that ſufficient opportunity may be given to collect and remove every ſort of weed that may be brought up to the ſurface of the ground. After this buſineſs has been properly performed, the land may be again ridged up by means of the plough, by which it is rendered leſs affected by wetneſs, and the portions of ſoil that had not been touched in the croſs-ploughing ſtirred. In this way a perfectly clean fallow may ſoon be produced in moſt caſes. It has, however, been maintained by ſome writers who have had much opportunity of examining the matter, that ploughing only is neceſſary; the collecting the roots of the weeds and removing them being uſeleſs and improper. But in the ſtiffer ſorts of clayey, wet ſoils, where we have conceived the fallowing ſyſtem to be chiefly occaſionally neceſſary, it is almoſt impoſſible to get perfectly clear of different ſorts of root weeds in this way, from the cloddy manner in which ſuch lands break up in the operation of the different ploughings, the earthy lumps often containing many that are not in the leaſt degree injured in their power of taking root, by the heat to which they have been expoſed under ſuch ploughings of the land.

In theſe caſes, they can only perhaps be effectually eradicated and deſtroyed, by the high degree of pulverization that may be accompliſhed by means of frequent harrowings and rollings; the weeds being afterwards carefully removed by the hand. In this way there may alſo frequently be a conſiderable ſaving of expence by the leſſening of the number of ploughings. The froſt in the winter months has alſo, as has been ſeen, a much more powerful action where ſuch reductions in the clods of ſuch ſoils have been effected. In ſuch ſoils there can ſeldom be any danger of their being made too fine by operations of this nature, as the ſeed furrow, when given ſufficiently deep, conſtantly leaves the land lumpy and irregular enough for the purpoſes of covering the grain, and protecting the young plants during the ſeverity of the winter ſeaſon. The benefits of affording as high a degree of pulverization or fineneſs as poſſible to the land in the management of this proceſs, has been fully ſhewn by the reſults of many well-conducted experiments. The produce of a field of barley and broad clover, one-half of which had been prepared in the moſt perfect mode of fallowing, and the other half in the common method, on being harveſted and kept ſeparate, was in the following proportions; that which had been conducted in the latter way only affording twenty-four buſhels to the acre, while the former yielded thirty-one, and the grain conſiderably better in quality.

There was alſo an equal ſuperiority in the clover crop the ſucceeding year; that on the moſt perfectly-prepared part being heavier by nearly half a ton on the acre. In addition to this, it cannot have eſcaped obſervation, that in large fields of wheat, where, from accident or other cauſes, ſome portions of them have received more frequent ploughings than others, that in theſe parts the crops generally appear, for a great length of time, more perfect and promiſing than on the other parts.

There is another mode of performing this proceſs, which has lately been practiſed in ſome places, which is to plough the land over firſt with a deep, broad, clean furrow, in a dry ſeaſon in the autumnal months, leaving it in this ſtate till the early ſpring, when, immediately after the ſeed period, it ſhould be harrowed down as fine as it can be made, clearing off all the couch and other refuſe matters at the ſame time, and conſuming them by fire. Then ploughing the land in exactly the ſame direction back again, breaking the root weeds as little as poſſible; after which letting it be well harrowed over again in the lengthways of the ridges, as croſſing them would be injurious; collecting and burning the whole of the refuſe materials as before. In this looſened condition of the ſoil, a powerful cultivator or ſcarifier is to be immediately paſſed in the croſs direction of the ridges and furrows to the full depth of the plough, by which means the roots of the couch and other weeds will in a great meaſure be drawn out at length, without being much broken, and the lumpy parts be brought to the ſurface to be reduced by the action of the harrows afterwards. When not ſufficiently broken down and cleared by theſe operations, the ſcarifier and harrows muſt be again had recourſe to as before; and when the root-weeds have been collected and burnt, any clods that may remain on the ſurface may be fully reduced by rolling, and afterwards another harrowing.

In this way it is found that in the fouleſt land a perfectly clean fallow may be made. In the execution of the buſineſs, however, much depends upon the work being performed when the land is in a proper dry condition, as when wet it cannot be done to advantage. The harrowing ſhould be ſo managed as to have the refuſe weedy matters in ſuch a ſituation as not to prevent the whole of the land from being operated upon, and as well as the ſcarifying be executed as ſoon as poſſible after it is left light by the ſecond ploughing. The ſcarifier, though an excellent tool for this purpoſe, cannot indeed perform its work properly, except when the ſoil is in this looſe ſtate of mould. Where this implement is to be uſed, there ſhould never be any croſs ploughing made, as that renders it incapable of performing its work in the moſt effectual manner. And where the land is inclined to the retention of moiſture, it ſhould be well drained to prevent the ſtagnation of water upon it, as it would thereby be greatly injured during the winter ſeaſon. By this method of preparing a fallow, the ſoil is reduced into a fine ſtate of mould, and rendered perfectly free from weeds, without having its parts ſo much expoſed to the influence of the atmoſphere as to rob it of a large portion of its fertility.

In Eſſex, and many other diſtricts where the ſoils are very ſtiff and heavy, it is uſual to plough the fallow lands over a great number of times, frequently even eight or ten, in different directions, in order that they may be rendered perfectly clean and mellow. In ſome caſes the firſt ploughing is given deep before Chriſtmas, then two clean croſs ploughings early in the ſpring; after this the land is ploughed up into ridges or ſtitches of different breadths, according to circumſtances, then ſplit out again, and laſtly ploughed back for the ſeed furrow; different harrowings being practiſed in the times between the ſeveral ploughings.

In the ſecond volume of "Communications to the Board of Agriculture," Mr. Headrick ſpeaks of a mode of fallowing by drills, invented by Mr. John M'Kenzie of Glaſgow, which, he ſays, is certainly the beſt of any yet attempted by the plough, either for levelling cold-bottomed ridges, or for pulverizing ſtubborn clay-ſoils already in a level ſtate; but it requires conſiderable dexterity in the ploughman. In performing this operation, the water furrows, he obſerves, are firſt gone round, and ploughed in on each ſide, ſo as to form a drill, when the third fur-ſlice from the rut thus made, on each ſide is raiſed, and thrown upon the ſecond: this a ſkilful ploughman can do by his eye with great exactneſs; but if he cannot truſt his eye, he may have a croſs ſpar nailed on the beam of his plough to mark out the diſtance from the former rut at which a ſlice ought to be raiſed. As the plough only ſtirs a third of the land by this firſt operation, it may go over about three acres in one day, laying it all dry, and in a condition to be fallowed ever after, in the wetteſt weather that cattle can work, without any danger of poaching. After the land is thus marked out, the cattle ever after walk in the ruts between the drills, and hence their feet never poach the ſtirred land. We have then, ſays he, got the third fur-ſlice, from the rut at which the operation commenced, raiſed and laid upon the ſecond, while the firſt and ſecond remain unſtirred, and the firſt is alſo uncovered. The plough, in its ſecond paſſage, throws the firſt ſlice upon the back of the third, previouſly laid upon the top of the ſecond. This converts all the land into red earth, and the third paſſage of the plough ſtirs the remaining ſecond fur-ſlice, with the third that reſts upon it throwing them in the ſame direction. Thus all the land is ſtirred, and aſſumes the appearance of three-furred drills, the equality and neatneſs of which depend much upon the accuracy of the firſt operation in marking them out. The land may now be wrought either backwards or forwards, as may be neceſſary, to bring it to a complete level, the horſes all the while walking in the bottoms of the ruts between the drills.

The figure annexed, (in *Plate Agriculture, Fallowing*,) No. 1, is the ſection of a ridge to be levelled, or, if the land be already level, it is a bout or ſtritch of land that has undergone the firſt operation of drill fallow. If it be a ridge, the water furrows, *a*, *a*, are firſt ploughed in, ſo as to form ſingle bout drills; then the third fur-ſlice from the rut on each ſide is raiſed by the plough, and laid upon the ſecond, and this is continued until the whole ridge or ſtritch is marked out. This lays the land perfectly dry, having a rut at every third furrow. Figure No. 2 is the ſame land, after being twice gone through with the plough. In this ſecond operation the fur-ſlice, No. 4, is ſtirred, and all the land becomes red earth; becauſe, though No. 2 yet remains unſtirred, it was previouſly covered by No. 3. Figure No. 3 is the ſame land after the third ploughing. In this No 2 is ſtirred, and the whole ſoil is now moved by the plough. The land now aſſumes the appearance of three furred drills. If it be now level, the drills may be reduced by a brake-harrow, and marked out again in ſome other direction, ſo as to have the effect of croſs-ploughing; only the direction muſt be ſuch, that the water may be diſcharged from them. In this way the land may be ploughed in various directions, and wrought in drills during the whole courſe of a fallow. This mode of fallow, it is obſerved, cauſes a violent vegetation of weeds, becauſe, by expoſing more ſurface to the air, it brings more of their ſeeds within that diſtance from the atmoſpherical influence, where their vegetation commences. By ſtirring only one fur-ſlice out of three at a time, every ſlice has full opportunity of meliorating by the influence of the ſun and air before another is thrown upon its back; it alſo renders the fallow wholly independent of exceſſive rains; which often render fallowing impracticable. When the land is brought to a perfect level, the weeds ſhould be deſtroyed by a ſtrong brake-harrow dragged acroſs the drills This will reduce the land to a ſmooth ſurface, in which ſtate it may be allowed to remain until more weeds ſpring up; but if exceſſive rains ſhould ſurpriſe the land in this ſtate, a plough can be ſent through to mark out new drills as before, which will render the whole dry. In fallowing, he ſays, croſs-ploughing is eſſentially requiſite to cut the roots of weeds in an oppoſite direction, and to preſent new ſurfaces of the ſoil to the air. Now, by this mode of fallow, croſs-ploughing can be effected with greater advantage by drills croſſing the former, and marked out after the land is laid ſmooth by the brake: ſuch drills ſhould always be ſo drawn as to diſcharge the water. Thus a field may be ploughed in ſeveral different directions, always keeping it in drills, and remain, independent of the weather. After land is croſs-ploughed in the ordinary way, it often happens that exceſſive rains render it a perfect mire, and it is frequently unworkable during that ſeaſon. In the fallow by drills, this, the writer thinks, can have no place; and ſhould the weather be too wet, at the time it comes to be ridged, to admit of ſmoothing the drills, the ridges can be formed of a certain number of drills thrown together. In executing this mode of fallow, care ſhould be taken always to make the furrows clean, ſo that no clods or earth may fall back and cauſe water to ſtagnate in the ruts. When very high ridges are ſuddenly levelled by this mode of fallow, it is obvious that the good ſoil will be buried down, as happens in every mode of levelling with the plough; but the freſh ſoil that is turned up, being brought in ſucceſſion within the influence of the atmoſphere, and always worked in drills, is much ſooner meliorated than by the method of cloſe ploughing. If, however, the ridges be very high, it is ſafeſt to ſplit and reduce them conſiderably in the courſe of cropping, previous to their being effectually levelled. When the levelling at laſt commences, it is proper to get through as much of it as poſſible before winter, that the new ſoil which is turned up may receive the benefit of the froſt. With theſe precautions high ridges levelled by a drill fallow will diſcover no inequality in their ſubſequent fertility. It is hardly neceſſary to obſerve, that in all modes of levelling high ridges the old water furrows ſhould be raiſed ſomewhat higher than the old crowns of the ridges; as the ſoil in the former, being very looſe, ſubſides, and if not in ſufficient quantity would again become a hollow.

It is further remarked, that, in many parts of the Lothians, they have a practice ſomewhat ſimilar to this mode of fallow, of *ribbing* the land that is intended for barley before winter ſets in. This is done by laying one fur-ſlice upon another, which remains unſtirred, and it divides the whole land into very narrow drills. Theſe keep it perfectly dry during winter, and admit the froſt to the bottom of the ſoil. On clay lands, and ſuch as have a cold bottom, this is found to be very beneficial, for barley does not thrive on ſuch ſoils unleſs they be finely pulverized in the mould.

This mode of fallowing is probably beſt adapted to the bringing of ſuch lands as have been in the ſtate of waſte into a condition fit for the growth of grain crops.

When dung is applied on the fallows, it is generally laid on, Mr. Donaldſon ſays, about the end of Auguſt, immediately after the laſt ploughing has been given; but in many caſes, where the ſoil is naturally good, it is forborne till the ſecond enſuing crop, as it is found that the firſt crop is in danger of being too rank, and of courſe lodged before it is ripe, if the land be dunged the ſame year that it is in ſummer fallow.

It has been remarked, that though the advantages that have been ſtated to ariſe from the perfect pulverization, aëration, and cleanneſs, occaſioned by ſummer fallowing in thoſe ſoils where it has been found to be occaſionally requiſite, can ſeldom be ſo fully obtained by other methods of cultivation; yet as that method is conſtantly attended with a heavy expence to the farmer, and as many of the benefits that are produced by it may be effected by the repeated partial fallowings that muſt occur in the hoe-culture of different ſorts of crops, it ſhould be conſtantly the aim of the farmer, where the climate will admit of it, to leſſen the neceſſity of ſummer fallowing even on the wet clayey as well as the light kinds of ſoil, by the judicious interpoſition of ſuch ſorts of cloſe, thick, green crops, as can be grown and cultivated on them under the hoe ſyſtem. This is ſtill more neceſſary, on account of the loſs that muſt be ſuſtained from the land often remaining ſuch a great length of time totally unproductive where the fallowing proceſs is going on. It cannot, indeed, be diſputed, but that the practice of ſummer fallowing may be greatly leſſened in many diſtricts by the proper ſubſtituting of green fallows, or what are termed fallow crops, ſuch as beans, peas, cabbages, tares, and rape for the heavier ſorts of land; and buck wheat, potatoes, and turnips, for ſuch as are of the lighter kind. It is likewiſe maintained as a fact, that where large and luxuriant crops of theſe preparatory kinds are grown, thoſe by which they are ſucceeded the following ſeaſon are for the moſt part ſtill larger, ſo that the lands are more improved by large crops than ſuch as are poor. This amelioration or increaſe of fertility has been attributed to different cauſes: as the prevention of evaporation from the ſoil by the ſhade produced by ſuch large crops; the putrefaction of the various vegetable matters, which may be more abundant after ſuch large crops, taking place more completely and more effectually under ſuch circumſtances; and laſtly, to the repeated pulverization and aëration that are produced by the different hoeings: but it is probable that advantages may be derived in each of theſe ways, as well as from the carbonic acid or fixed air that is afforded by the ſhaded leaves of the plants being depoſited upon or united with the ſoil. That the melioration in ſuch caſes muſt depend on cauſes of this kind there can be little doubt, as much of the nutritious properties of the land muſt obviouſly have been conſumed during the growth of ſuch crops, which muſt have been again reſtored to it by ſome ſuch proceſſes. But in whatever manner this effect may be produced, as it is conſtantly found that land is in a better condition, and when turned up in a more friable and mellow ſtate after ſuch crops as are large, than thoſe that are poor and light; it is of courſe evident, that if ground can be covered with ſmothering crops of the fallow kind, or thoſe that will admit of frequent pulverization by means of the plough or hoe, ſo as to keep it clean and free from the growth of uſeleſs plants, it may be more beneficial to the farmer, not only for the ſake of the immediate crop, but alſo on account of the increaſe of manure produced by ſuch means, and the advantageous condition of the land for the reception of ſuch crops as may be afterwards cultivated upon it. In theſe different views, as well as thoſe that have been already mentioned, the introduction of green crops of ſome ſort or other ſhould probably be more frequently attempted on all deſcriptions of ſoils; and it would ſeem probable, that on the ſtiff and heavy kinds of land, from its having been found, that in many well cultivated diſtricts, by the growing of proper leguminous crops in drills or rows, ſo as to admit of the ground between them being frequently ſtirred, either by means of the plough or the hoe, ſuch kinds of land, after they have been once well cleaned by a ſummer fallow, may be kept perfectly clean and in ſuitable tilth for the production of good grain crops; they may be much more generally had recourſe to than has commonly been the caſe: but on ſuch ſorts of land great attention is neceſſary to introduce ſuch kinds of green crops as are adapted to them, and that as little injury as poſſible be done by the treading of animals in the feeding them upon or taking them from the ground. But as neither the full effects of pulverization or aëration, nor the complete deſtruction of root weeds, can in ſome caſes be ſo perfectly obtained by the cultivation of fallow crops as by the making of naked ſummer fallows, it may be advantageous to the farmer to have recourſe to them occaſionally with theſe intentions on the heavy and more wet ſorts of land, as well as thoſe that have been injured by improper methods of cropping, as is frequently the caſe in particular diſtricts.

Yet though fallowing may be uſeful and neceſſary in altering the textures of particular kinds or qualities of ſoils, there are numerous facts that ſhew, in the moſt clear and ſatisfactory manner, that great injury and diſadvantage are often the reſult of expoſing land in its naked ſtate too much to the action of light and heat, as happens in the fallow proceſs, and which can only be avoided by having recourſe to ſheltering crops of the green kind.

FALLUM, in ſome of our *Law Lexicographers*, is ſaid to be a ſort of land; and for proof of this, they quote the Monaſticon Anglicanum. "De duobus acris et viginti fallis in, &c." Jacob. But from this paſſage it would rather ſeem that fallum ſignified a meaſure of land as well as acra. And to this day a fall is a meaſure of length in Scotland.

FALMOUTH, in *Geography*, a market and ſea-port town in the hundred of Kerriar, and county of Cornwall, England, is ſeated beneath a high hill, on the ſouthern ſhore of a harbour, which has long been noted for the ſafe accommodation it affords to ſhipping in tempeſtuous weather, having ſufficient depth to contain the largeſt veſſels, and being defended by the two caſtles of Pendennis, and St. Maw's. About two centuries paſt, Falmouth conſiſted of only a few fiſhing huts, till increaſing in population it was known as the village of Smithwick, but it did not acquire its preſent name till the reſtoration, when the king iſſued a proclamation that it ſhould, after the 20th of Auguſt 1660, be called by the name of Falmouth, and granted it a charter of incorporation in the following year, by the deſcription of "our town of Falmouth." By this charter the government was veſted in a mayor, aldermen and burgeſſes; and the privileges of a market and two fairs were granted. The new town gradually extended: in 1664 the houſes amounted to two hundred; in 1691 they were three hundred and fifty; and in 1801 they were returned as four hundred and ſixty-eight, inhabited by three thouſand ſix hundred and eighty-four perſons, included within the boundaries of the town. Previous to the year 1664, Falmouth was part of the chapelry of Budock and pariſh of Gluvias; but was, by an act paſſed in that year, ſeparated and made a diſtinct pariſh. Such were the origin and growth of Falmouth. Its improvement and progreſs during the laſt century have, in a conſiderable degree, been connected with the eſtabliſhment of the packet-boats here for Spain, Portugal, and the Weſt Indies. From the facilities theſe veſſels have afforded to the merchants, of tranſporting their reſpective commodities, and receiving returns in a ſhort time, the commerce of the town has very much increaſed, and it is now the reſidence of many opulent families. The houſes are principally diſpoſed in one ſtreet, nearly a mile in length, and running by the ſide of the beach. The quay is exceedingly convenient, as the water will admit veſſels of conſiderable burthen to land their goods upon the wharf. The cuſtom-houſe and ſalt-office for moſt of the Corniſh towns are eſtabliſhed at Falmouth. Great quantities of gold, both in ſpecie and in bars, are brought into this port by the packets from Spain and Portugal. The pilchard trade has likewiſe been a ſource of much emolument. Falmouth is ſituated 273 miles S. W. from London: has good markets on Tueſdays, Thurſdays, and Saturdays; and two annual fairs. At the eaſtern extremity of the town ſtands Arwinnick houſe, the ancient manſion of the Killegrew family.

On the weſtern ſide of Falmouth harbour Pendennis caſtle occupies the brow of a hill, which forms a peninſula between the Britiſh channel and this harbour, and appears to riſe from the bay like an iſland. The fortreſs is proudly exalted on a rock upwards of three hundred feet above the ſea, and, from its elevated ſituation, has a complete command over the entrance to the bay. The fortifications are of an irregular ſhape, including an area of rather more than three acres. On the north, or land front, the hill is defended by four cavaliers, mounted with ſeventy pieces of cannon, in excellent order, and at a ſhort diſtance are ſome traces of a horn and crown-work, which was conſtructed in the time of Oliver Cromwell. The banks and ditch of the citadel ſtill remain, the ſituation of which was admirably calculated to protect the caſtle from the approach of an enemy over the iſthmus. On the eaſt face is an half-moon battery; and cloſe to the water's edge another battery of five guns, called the Crab quay. On the ſouth the hill ſlopes to the ſea, and forms a kind of natural glacis. Within the works are barracks for troops, and various ſtore-houſes and magazines; and in the ſouth part of the garriſon ſtands the old caſtle, built in the reign of Henry VIII. It conſiſts wholly of granite, and over the door-way are the arms of that monarch. The works were afterwards ſtrengthened and enlarged by queen Elizabeth, but have undergone many alterations and repairs of late years.

On the eaſtern ſide of Falmouth harbour is St Maw's caſtle, oppoſite to Pendennis, to which it is very inferior, both in ſize and ſituation, though erected nearly at the ſame time, and by the ſame monarch. The works are completely commanded by a hill, which riſes immediately behind it. The adjoining hamlet, honoured with the appellation of Borough town, and repreſented by two members, conſiſts of ſcarcely twenty houſes, inhabited only by a few fiſhermen; and has neither church, chapel, or meeting-houſe. The chief magiſtrate is the portreve, who is complimented with the title of mayor. Polwhele's Hiſtory, &c. of Cornwall, 4to.

Falmouth *Harbour*, on the ſouth coaſt of Cornwall, is a conſiderable extent of creeks and inland waters, forming a ſafe harbour for ſhips of the royal navy, and others, the fartheſt of any in England towards the ſouth-weſt. The towns of Falmouth, Penryn, Tracilian-bridge, Truro, Tregony, St. Maw's, and others, are ſituate near to theſe waters. The eaſtern ſide of the main harbour is deep and commodious for large ſhips, which go up as far as Kea: the weſtern branches to Perran and Mylor-bridge are ſhallow, and only navigable for barges. The Falmouth tram-road connects with this harbour at Reſtonguet and at Pile.

Falmouth *Tram Road*, in Cornwall, is one of thoſe branches of inland communications which have been carried into effect ſince our general account of theſe important eſtabliſhments were preſented to our readers in the article Canal. It was conſtructed without an act of parliament, in the year 1806. at the expence of Meſſrs. Fox and Co.; Vivian and Co.; Ralph Allen Daniel, eſq. and others, according to a ſurvey made by Mr. Moſs, an engineer. This tram-road has a courſe of nearly ten miles, almoſt in a N.W. direction; it commences at two points, *viz.* the Pile and Reſtonguet ſhipping wharfs, in Falmouth harbour, (above,) and proceeds by a regular inclination, (ſteep, inclined planes being unneceſſary,) to the copper-mines, near Camborne, to which mines a recent tram-road has alſo been conſtructed from Portrath harbour on the north coaſt of the county. The ſhelly ſand with which this coaſt abounds is now, by theſe tram-roads, carried cheaply up into the interior of the county, by which the agriculture thereof cannot fail of being much improved, as well as the mines, which thus receive coals to work their ſteam-engines, and ſend down their ore for exportation to the coal diſtricts of South Wales, where it is ſmelted and manufactured.

Falmouth, a townſhip of America, formerly including Portland county, in Cumberland county, Maine, containing 3422 inhabitants. It is ſituated on Caſer bay, 120 miles N.N.E.

N.N.E. of Boſton, and was incorporated in 1718.—Alſo, a townſhip in Hants county, Nova Scotia; ſituated on the S.E. ſide of the baſin of Minas, oppoſite to Windſor, 28 miles N. W. of Halifax.—Alſo, a maritime poſt-town, in Barnſtaple county, Maſſachuſetts, ſituated on the N.E. part of the Vineyard Sound, on the weſt ſide of the bay of its name; 77 miles S.E. by S. of Boſton. About 60 veſſels are employed in this town, ſome as fiſhing veſſels, others coaſters, and more than 30 for carrying lumber to the ſouthern ſtates, and Weſt India iſlands. It was incorporated in 1686, and contains 1882 inhabitants. N. lat. 41° 33′. W. long. 70° 35′.—Alſo, a poſt-town in Stafford county, Virginia, ſituated on the north bank of Rappahanock river, almoſt oppoſite to Frederickſburg. It contains an epiſcopal church, and about 40 compact houſes; 23 miles S.W. of Dumfries, and 207 ſouth-weſterly of Philadelphia. Conſiderable quantities of tobacco are inſpected here.—Alſo, a town in Lancaſter county, Pennſylvania, on the S.E. ſide of Conawago creek, 20 miles weſterly of Lancaſter.—Alſo, a town and harbour on the ſouth ſhore of the iſland of Antigua; having Engliſh harbour on the E., and Rendezvous bay on the W., and ſituated in St. Paul's pariſh, at the N.W. corner of the harbour, which is well fortified. N. lat. 17° 9′. W. long. 61° 28′.—Alſo, a town of Jamaica, more commonly called the "Point;" ſituated on the S. ſide of Martha-Brae harbour, and including the adjoining villages of Martha-Brae and the Rock, and containing 220 houſes. This town and its vicinity have been wonderfully increaſed; for in 1771 the three villages of Martha-Brae, Falmouth, and the Rock, contained together but 18 houſes, and the veſſels which entered annually at the port of Falmouth did not exceed ten. It has ſince boaſted of upwards of 30 capital ſtationed ſhips, which load for Great Britain, excluſively of ſloops and ſmaller craft. N. lat. 18° 31′. W. long. 77° 31′.—Alſo, a ſmall low iſland in the Chineſe ſea. N. lat. 11°. E. long. 112° 12′.

FALONICHI, or Filanixe, a large town towards the eaſtern coaſt of the iſland of Majorca, containing near 6000 inhabitants, in which the monks of St. Auguſtine have built a handſome monaſtery: the land about it is rich and fertile. The inhabitants procure more corn than is ſufficient for their own conſumption, and have, beſides, large herds of cattle, and furniſh the iſland with excellent brandy.

FALOUR, a town of Hindooſtan, in Lahore; 50 miles E. S. E. of Sultanpour.

FALSA Quinta, *Ital.* in *Muſic*, falſe 5th. See Semi-Diapente.

FALSE Ribs, in *Anatomy*, are the five inferior ones on each ſide, and are diſtinguiſhed from the true ribs by not having their cartilages articulated to the ſternum. See Trunk.

False *Bay*, in *Geography*, a bay to the eaſt of the Cape of Good Hope, and frequented by ſhips during the prevalence of N. W. winds, which begin to blow in May, and make it dangerous to lie in Table bay. S. lat. 34° 10′. E. long. 18° 30′.—Alſo, a bay on the weſt coaſt of the northermoſt iſland of New Zealand. S. lat. 36° 33′. W. long. 185° 38′.

False *Cape*, or *Falſo*, the E. point of Falſe bay, E. of the Cape of Good Hope. S. lat. 34° 16′. E. long. 18° 44′.—Alſo, a cape, called *Falſe Point*, on the E. coaſt of Hindooſtan, at the mouth of the river Mahanada. N. lat. 20° 20′. E. long. 86° 48′.—Alſo, a cape on the S. coaſt of Hiſpaniola, a little W. of Cape Beata.—Alſo, a cape on the coaſt of Yucatan, in the bay of Honduras. N. lat. 20° 52′. W. long. 87. 45′.

False *Cape Horn*, the ſouth-weſtern point of Terra del Fuego.

False *Iſland*, an iſland in the bay of Bengal, near the coaſt of Ava. N. lat. 18°. E. long. 94° 15′.

False *River*, one of the mouths of the Ava.

False *Alarm*, in *War*. See Alarm.

False *Arms*, in *Heraldry*, are thoſe wherein the fundamental rules of the art are not obſerved: as if metal be put on metal, or colour on colour. See Arms.

False *Attack*, in *War*. See Attack, *Falſe*.

False *Braye*, in *Fortification*. See Faussebraye.

False *Claim*, in the *Foreſt Laws*, is where a man claims more than his due, and is amerced or puniſhed for the ſame.

False *Conception*. See Conception.

False *Flower*, a flower which does not ſeem to produce any fruit, as thoſe of a hazel, mulberry-tree, &c.

A flower of this kind does not ariſe from any embryo, and does not knit; ſuch are the male flowers of the melon, cucumber, &c.

False *Galena*. See Blind and Galena.

False *Gallop*, in the *Manege*. See Gallop.

False *Impriſonment*, in *Law*, is a treſpaſs committed againſt a man, by impriſoning him without ſufficient authority; which authority may ariſe either from ſome proceſs from the courts of juſtice, or from ſome warrant from a legal officer, having power to commit, under his hand and ſeal, and expreſſing the cauſe of ſuch commitment (2 Inſt. 46.); or from ſome other ſpecial cauſe, warranted, on account of the neceſſity of the thing, either by common law, or act of parliament; ſuch as the arreſting of a felon by a private perſon without warrant, the impreſſing of mariners for the public ſervice, or the apprehending of waggoners for miſbehaviour in the public highways. (Stat. 13 Geo. III. cap. 78.) Falſe impriſonment alſo may ariſe by executing a lawful warrant or proceſs on an unlawful day, as on a Sunday, (ſtat. 29 Car. II. cap. 7. Salk. 78. 5 Mod. 95.) or in a place privileged from arreſts, as in the verge of the king's court. The means of removing the actual injury of falſe impriſonment are fourfold; *viz.* by a writ of mainprize, by writ de odio & atia, by writ de homine replegiando, and by writ of habeas corpus. The ſatisfactory remedy for this injury is by an action of treſpaſs, *vi & armis*, uſually called "an action of falſe impriſonment;" which is generally, and almoſt unavoidably, accompanied with a charge of aſſault and battery alſo; and therein the party ſhall recover damages for the injury he has received; and alſo the defendant is, as for all other injuries committed with force, or *vi & armis*, liable to pay a fine to the king for the violation of the public peace.

False *Judgment*. See Falso *Judicio*.

False *Keel*, in a ſhip, is a ſecond keel, which is ſometimes put under the firſt, to make the veſſel deeper, and to preſerve the lower ſide of the main keel. In our largeſt ſhips of war the falſe keel is generally compoſed of two pieces, which are called the upper and the lower falſe keels. See Keel.

False *Muſter*, is when ſuch men paſs in review, as are not actually liſted as ſoldiers. See Faggot, &c.

False *News*, *ſpreading of*, in order to make diſcord between the king and nobility, or concerning any great man of the realm, is puniſhable by common law with fine and impriſonment (2 Inſt. 226. 3 Inſt. 198.); which is confirmed by ſtatutes Weſtm. 1. 3 Edw. I. cap. 34. 2 Ric. II. ſtat. 1. cap. 5. & 12 Ric. II. cap. 11.

False *Oath*. See Perjury.

False, or *Falſe Poſition*, in *Arithmetic*. See Position.

False *Prophecies.* See Prophecies.

False *Quarters of a Horſe.* See *Falſe* Quarters.

False *Relation*, in *Muſic*. In the beginning of counterpoint, before the ear was tired with conſonance, every perfect concord, rendered ſharp or flat, was called falſe relation, "and abſolutely forbidden." (See Pepuſch, p. 8.) Such as the flat 5th and ſharp 4th; but at preſent thoſe intervals produce effects more agreeable to the ear, than in their moſt perfect ſtate; even a flat and ſharp uniſon and octave have been ſucceſsfully hazarded by Emanuel Bach, Haydn, and Mozart.

False *Roof of a Houſe*, is that part between the upper room and the covering.

False *Return.* On a falſe return by a mayor, &c. to a mandamus, or by a ſheriff, &c. to a writ, a ſpecial action on the caſe will lie. See Mandamus

False *Root*, is that of which the value is negative. *E. gr.* in the equation $a^2 + b^2 = x^2$, if x be a negative quantity as -5, the root is ſaid to be falſe; if it be a poſitive quantity it is called a real or true root; if it be the root of a negative quantity, it is ſaid to be imaginary; as $\sqrt{-5}$.

False *Sheat*, on board a ſhip. See Sheat.

False *Stem*, in a ſhip. See Stem.

False *Tokens*, in *Law*, is uſed where perſons get money or goods into their hands by forged letters, or other counterfeit means. This is puniſhable by impriſonment by ſtat. 33 Hen. VIII. cap. 1. By 30 Geo. II. cap. 24. a farther penalty is inflicted on thoſe who obtain money or goods by falſe tokens and pretences. See Cheats.

False *Tone*, in *Muſic*. Some call the interval of two ſemi-tones major by this name; but others more properly call it a diminiſhed third.

False *Verdict*. See Attaint.

False *Weights*. See Weights.

FALSET, from Falsetto, *Ital.* a feigned voice, an octave above its natural pitch, to ſupply the want of ſopranos or feeble voices. "Before the year 1600, when Caſtrati were firſt employed in the ſervice of the Papal chapel, at Rome, to ſing the ſoprano, or higheſt part, it was the cuſtom to have it performed by Spaniards in falſet." Santarelli. But long before that period, in early times of diſcant, the upper part uſed to be ſung in falſet. Du-Cange derives the word falſet from *fauſetum*, a term uſed, during the middle ages, in the ſame ſenſe; and this, he ſuppoſes, from *faucibus*, whence the high tones of voice proceed. *Pipeth* was ſometimes uſed in a ſimilar ſenſe to expreſs piping, or ſuch high ſinging as imitated the ſound of pipes or ſmall flutes.

FALSHOOD, Falsity, in *Philoſophy*, an act of the underſtanding, repreſenting a thing otherwiſe than it is, as to its accidents; or a falſe enunciation, or judgment of any thing.

The circumſtance, as to its accidents, is of abſolute neceſſity in the definition, becauſe a thing cannot be repreſented otherwiſe than it is as to eſſentials; for in ſuch caſe the eſſence of the thing would not be repreſented; and ſince the eſſence is the thing itſelf, it would not be that thing which is repreſented, but another.

There is no falſhood in apprehenſion or ſenſation; our ideas of ſenſe are all juſt and true, ſo far as they go; and all our deluſions ariſe from our reaſonings and concluſions from them.

FALSI, Crimen, in the *Civil Law*, is a fraudulent ſubornation or concealment, with deſign to darken or hide the truth, and make things appear otherwiſe than they are.

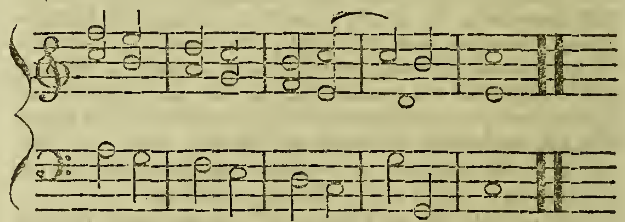
The crimen falſi is committed three ways. By words, as when a witneſs ſwears falſely. By writing, as when a man frames or alters ſomething, antedates a contract, or the like. (See Forgery.) And by deed, as when he ſells by falſe weights and meaſures, debaſes the coin, &c.

FALSIFY, in *Law*, is uſed for proving any thing to be falſe. Hence we find

FALSIFYING *a Record*, for ſhewing it to be erroneous. Thus lawyers teach, that a perſon purchaſing land of another, who is afterwards outlawed of felony, &c. may falſify the record, not only as to the times wherein the felony is ſuppoſed to have been committed, but alſo as to the point of the offence. But where a man is found guilty by verdict, a purchaſer cannot falſify as to the offence: though he may for the time where the party is found guilty generally in the indictment, becauſe the time is not material upon evidence. 2 Hawk. Pl. Crown, 459. We alſo meet with

Falsifying *a Recovery*. Thus, it is ſaid, the iſſue in tail may falſify a recovery ſuffered by a tenant for life, &c. And alſo the terms of falſifying an attainder, the coin, judgment, &c. occur. See the ſeveral articles.

FALSO-Bordone. See Faux-Bourdon. Plain muſic, of note againſt note, with which the pſalms and canticles are often chaunted. But the Italians particularly ſtyle falſo-bordone a manner of ſinging in three parts, compoſed of a ſucceſſion of 8ths, 3ds, and 6ths.



Falso *Judicio*, in *Law*, a writ which lies for falſe judgment, given in the county-court, court-baron, or other court, not of record.

Falso *Retorno Brevium*, a writ which lies againſt the ſheriff, who has execution of proceſs, for making falſe returns of writs.

FALSTER, in *Geography*, an iſland of Denmark, ſituated at the entrance of the Baltic, S. of Zealand, from which it is ſeparated only by a narrow ſea; about 60 miles in circumference, very fertile, and abounding in game. The principal towns are Nyekioping and Stubbekioping. N. lat. 54° 50′. E. long. 12°.

FALSTERBO, a ſea-port town of Sweden, in the province of Schonen, noted for its light-houſe and herring-fiſhery; 22 miles S. S. W. of Lund. N. lat. 55° 21′. E. long. 12° 34′.

FALVATERRA, a town of Italy, in the Campagna; 15 miles S.E. of Fruſinone.

FALUGA, a ſmall iſland in the Mediterranean, near the W. coaſt of Sardinia; 12 miles S. of cape Argentera.—Alſo, a town of the Arabian Irak, on the W. bank of the Euphrates, whence an arm of that river iſſues to join the Tigris; 25 miles S.E. of Bagdad.

FALUN. See Fahlun.

Falun, a river of Switzerland, which runs into the lake of Neufchatel, near Yverdun.

Falun, a word uſed in many parts of France, as the name of a particular ſort of manure of lands, which is dug out of the earth, and is no other than fragments of ſea ſhells buried at conſiderable depths, and amaſſed in prodigious ſtrata.

ſtrata in many parts of that kingdom. Theſe they ſpread upon the lands in the manner of dung; and being as it were calcined and very friable, they readily diſſolve, and are the fineſt manure of any for ſome ſoils.

FALX Cerebelli and Cerebri, in *Anatomy*, are two portions of dura mater, which ſeparate certain of the contents of the cranium from each other. See Brain.

Falx, the *ſickle-fiſh*, in *Ichthyology*, a ſmall fiſh of the tænia kind, common about the ſhores of the Mediterranean, but ſeldom brought to ſale, becauſe of its glutinous nature, being wholly converted into a ſort of glue when dreſſed. It is a ſoft and ſmooth oblong fiſh, and has its name from reſembling a ſickle in figure. It is often found an ell long, and with that length is not above the breadth of one's hand. It is of a ſilvery colour, but its back-fin is red. Its eyes are large, and its head very ill-ſhaped. The common people call it the marmot-fiſh.

FAMAGULA, in *Geography*, a town of New Mexico; 50 miles S.W. of Cinaloa.

FAMAGUSTA, a ſea-port of the iſland of Cyprus, formerly called *Arſinoe*, after the name of the ſiſter of Ptolemy Philadelphus, who is ſaid to have founded it. It derives its name Famaguſta from Amocuſta, *q. d. built in the ſand*, as it is ſurrounded by a thin ſandy earth. It is ſituated on the eaſtern coaſt of the iſland, is built on a rock, and is about two miles in circumference. The walls are thick and ſtrong, and encompaſſed by a deep cavity formed out of the ſolid rock, and flanked by twelve enormous towers. In the interior part of the city there are a pharos, three baſtions, and a rampart conſiſting of two rows of cannon, and alſo a citadel. It was fortified in 1193 by Guy de Luſignan, and poſſeſſed by the Genoeſe for near a century, by James the Baſtard, and, laſtly, by the Venetians. It has two draw-bridges, one towards the land-ſide, and another towards the ſea, which latter leads to the harbour, that is narrow, and is ſhut every morning by a chain fixed to one of the ends of the pier. On the eaſt it is defended by a chain of rocks from the impetuous waves of the ſea. In this place the Luſignans were crowned kings of Jeruſalem, which cuſtom continued till the Genoeſe took the city; after which they inſtalled themſelves ſovereigns, both of Cyprus and Jeruſalem, in the cathedral of Nicoſia. In the 15th century this city was taken by James the Baſtard, after a ſiege of three years, ſtipulating that the Genoeſe laws ſhould be preſerved. In 1490 it fell again into the hands of the Venetians, and was governed by a plenipotentiary. In September, 1570, the baſhaw Muſtapha, general of ſultan Selim, commenced the ſiege of it; and in April, 1571, encamped near the town. But it was vigorouſly defended againſt the united forces of the Ottoman empire by a ſmall band of valiant men, till at laſt, in Auguſt, 1571, it was compelled to ſurrender on honourable conditions, which were baſely violated by Muſtapha; who cauſed the brave Bragadin and his attendants to be butchered without mercy. The Ottoman army conſiſted of 200,000 men, whilſt the citizens capable of bearing arms amounted only to 4000. During the ſiege, which laſted ten months, the Turks fired 540,000 bombs; the remains of which are ſtill viſible in the adjacent gardens and fields, and in the ditches which ſurround the city. N. lat. 35° 10′. E. long. 33° 30′.

FAM-CHAM, a town of China, of the third rank, in the province of Petcheli; 25 miles S.W. of Peking.

FAM-CHAN-POU-HOTUN, a town of Aſia, in the kingdom of Corea; 612 miles E.N.E. of Peking.

FAMARS, a town of France, in the department of the North; 3 miles S. of Valenciennes.

FAME, in the ordinary acceptation of the term, is well underſtood, and the love of it is a principle of very powerful and extenſive influence, and needs only proper direction and government in order to be as uſeful as it is powerful.

Fame, in *Mythology*, was one of the ancient divinities. Heſiod has deſcribed her, but without giving her genealogy. She had an eſtabliſhed worſhip, eſpecially at Athens, as we learn from Pauſanias (in Attic.); and a temple, as Plutarch informs us in his life of Camillus. But no figures or ſtatues can exhibit this goddeſs in ſtronger characters than the picture drawn of her by Virgil:

"Now Fame, tremendous fiend! without delay
Thro' Libyan cities took her rapid way.
Fame, the ſwift plague, that every moment grows,
And gains new ſtrength and vigour as ſhe goes.
Firſt ſmall with fear, ſhe ſwells to wondrous ſize,
And ſtalks on earth, and tow'rs above the ſkies.
Whom, in her wrath to heav'n, the teeming earth
Produc'd the laſt of her gigantic birth.
A monſter huge, and dreadful to the eye,
With rapid feet to run, or wings to fly.
Beneath her plumes the various fury bears
A thouſand piercing eyes and liſt'ning ears,
And with a thouſand mouths and babbling tongues appears.
Thund'ring by night through heav'n and earth ſhe flies,
No golden ſlumbers ſeal her watchful eyes:
On tow'rs or battlements ſhe ſits by day,
And ſhakes whole towns with terror and diſmay;
Alarms the world around, and perch'd on high
Reports a truth, or publiſhes a lie." &c. &c.
Pit's Æneid, iv. 259, &c.

Ovid has alſo given a very fine picture of the ſame goddeſs; and ſome other poets have likewiſe exerciſed their poetical genius upon the ſame ſubject. From all theſe we may infer, that Fame, like all the giants, was the daughter of the Earth, who, to be avenged of the gods, and of Jupiter in particular, who had thunderſtruck her children, brought forth this monſter to blaze abroad their crimes, and make them known to all the world; for Fame ſpares neither gods nor men. The common repreſentation of Fame exhibits her in a flying attitude, ſounding a trumpet, to denote the ſurpriſe, attention, and diſcourſe ſhe occaſions; with a flowing robe, wrought all over with eyes, ears, and tongues; the whole upper part of her wings is quite ſtudded, as it were, with eyes; and Virgil obſerves that ſhe had an eye almoſt under every feather.

FAMES Canina. See Bulimy.

FAMIA, or Famieh, in *Geography*, a town of Syria, anciently called *Apamea*, where, according to Strabo, the Seleucidæ had eſtabliſhed the ſchool and nurſery of their cavalry. The ſoil of the neighbourhood, abounding in paſturage, had no leſs than 30,000 mares, 300 ſtallions, and 500 elephants; inſtead of which the marſhes of Famia at preſent ſcarcely afford a few buffaloes and ſheep. To the veteran ſoldiers of Alexander, who here repoſed after their victories, have ſucceeded wretched peaſants, who live in perpetual dread of the Turks, and the inroads of the Arabians; 90 miles N. of Damaſcus. N. lat. 35°. E. long. 36° 43′. Volney's Travels, vol. ii.

Famia. See Papua.

FAMILIA, Family, commonly implies all the ſervants belonging to a particular maſter.

In another ſenſe, family is taken for a portion of land, *viz.* ſo much as is ſufficient to maintain one family.

The term hide is by our writers ſometimes rendered a manſe, ſometimes a family, and ſometimes *carucata*, or plough-land; containing as much as one plough and oxen could cultivate in a year. See Hide.

Familia, in *Natural Hiſtory*, a term uſed by authors to expreſs a certain order of animals, or other natural productions, agreeing in their principal characters, and containing numerous individuals, not only different from one another, that in whole ſets, ſeveral numbers being to be collected out of the ſame family, all of which have the family character, and all ſome ſubordinate diſtinction peculiar to that whole number, or though found in every individual of it, not found in thoſe of any others.

It has been too common to confound the words claſs, family, order, &c. in natural hiſtory. But the determinate meaning of the word familia ſeems to be that larger order of creatures, under which claſſes and genera are ſubordinate diſtinctions. Among the quadrupeds, the ſeveral genera of the unguiculated creatures agree one with another in many general characters common to all; and in which they differ from the ungulated animals, which have alſo their ſeveral peculiar characters common to all, and yet different from all thoſe of the others. Theſe naturally conſtitute certain larger diviſions into families, and no one would ever break through theſe, or bring the cat and the horſe into the ſame family.

In the ſame manner, in *Ichthyology*, there are ſeveral genera of fiſhes, which agree perfectly in certain common characters, and diſagree from all others in them.

The arrangement of natural bodies into theſe families, or general and larger claſſes, is of the utmoſt uſe to natural hiſtory, when it is properly done, and the diviſions are genuine and natural; when otherwiſe, it is hurtful.

Theſe diviſions of animals into families are of two kinds, the one artificial or hypothetical, the other natural.

In the ſyſtematic arrangement of organic foſſils, particularly of the relics of the plants of the primary race which inhabited this globe or its waters, it is found impracticable to aſcertain the genera on the principles of Linné, owing to the entire abſence of the parts of fructification; hence the families in the arrangement of ſuch reliquia by Mr. W. Martin (Outlines, &c. p. 187 and 202) anſwer in ſome degree, to the genera of recent plants, of which the foſſil remains make but one genus, *viz. Phytolithus*, which ſee.

FAMILIARS *of the Inquiſition*, perſons who aſſiſt in apprehending ſuch as are accuſed, and carrying them to priſon. They are aſſiſtants to the inquiſitor, and called familiars, becauſe they belong to his family. In ſome provinces of Italy they are called croſs-bearers, and in others the ſcholars of St. Peter the Martyr; and they wore a croſs before them on the outſide garment. They are properly bailiffs of the inquiſition: and the vile office is eſteemed ſo honourable, that noblemen in the kingdom of Portugal have been ambitious of belonging to it. Nor is this ſurpriſing, when it is conſidered that Innocent III. granted very large indulgences and privileges to theſe familiars; and that the ſame plenary indulgence is granted by the pope to every ſingle exerciſe of this office, as was granted by the Lateran council to thoſe who ſuccoured the Holy Land. When ſeveral perſons are to be taken up at the ſame time, theſe familiars are commanded to order matters, that they may know nothing of one another's being apprehended; and it is related, that a father and his three ſons, and three daughters, who lived together in the ſame houſe, were carried priſoners to the inquiſition without knowing any thing of one another's being there till ſeven years afterwards, when they that were alive were releaſed by an act of faith. Geddes's Tracts, vol. i. p. 425—429. Limborch's Hiſt. of the Inquiſ. by Chandler, p. 187.

FAMILY *of Curves*. See *Family of* Curves.

Family *of Love*, in *Eccleſiaſtical Hiſtory*, the name of an anabaptiſt ſect, founded in Holland, in 1555, by Henry Nicholas, a Weſtphalian. This deluded fanatic maintained that he had a commiſſion from heaven to teach men, that the eſſence of religion conſiſted in the feelings of divine love; that all other theological tenets, whether they related to objects of faith, or modes of worſhip, were of no moment; and that it was a matter of perfect indifference what opinions Chriſtians entertained concerning the Divine nature, provided their hearts burned with the pure and ſacred flame of piety and love. Dr. Henry More wrote againſt this ſect, in his "Grand Explanation of the Myſtery of Godlineſs," book vi. cap. 12—18. George Fox, the founder of the ſect of quakers, alſo expoſed them, and called them a motley tribe of fanatics, becauſe they took oaths, danced, ſung, and made merry. The principles of this ſect were propagated in England, and produced no ſmall confuſion. The form of abjuration tendered to them, and the ſevere proclamation iſſued againſt them by queen Elizabeth, in 1580, may be ſeen in Wilkins's Concilia Magnæ Brit. &c. vol. iv. p. 296, 297.

Family *Iſlands*, in *Geography*, a cluſter of ſmall iſlands near the N.E. coaſt of New Holland, 12 miles N.W. of cape Sandwich.

Family *Lake*, a lake of North America. N. lat. 52° 35′. W. long. 93° 20′.

FAMINE, or Famene, a ſmall country of the Netherlands, in the weſtern part of the duchy of Luxemburg, on the borders of the biſhopric of Liege; the principal towns are Marche and Roche. It is now ceded to France.

Famine, *Port*, a fortreſs ſituated on the N.E. coaſt of the ſtraits of Magellan, in South America; now neglected in conſequence of a Spaniſh garriſon having periſhed for want. In the year 1581, the Spaniards built a town at this place, which they called Phillippeville, and left in it a colony, conſiſting of 400 perſons. When our celebrated navigator, Cavendiſh, arrived here in 1587, he found only one ſurvivor, all the others having died through famine, except about 23 perſons, who ſet out for the river Plata, and were never afterwards heard of. Cavendiſh called the place Port Famine. It is a very fine bay, in which there is convenient room for many ſhips to moor in great ſafety. Here are alſo good wooding and watering, and plenty of fiſh and different ſorts of fowl. The place alſo abounds with wild celery. S. lat. 53° 42′. W. long. 71° 28′. Variation 2 points weſterly.

FAM-TAM-HOTUN, a town of Aſia, in the kingdom of Corea; 625 miles E.N.E. of Peking.

FAN, Flabellum, a machine uſed to raiſe wind, and cool the air, by agitating it.

The effect of fanning ourſelves when warm, in order to cool us, though the air is itſelf warm which we drive with the fan upon our faces, may be thus explained: the atmoſphere round, and next to our bodies, having imbibed as much of the perſpired vapour as it can well contain, receives no more, and the evaporation is therefore checked and retarded till we drive away that atmoſphere, and bring drier air in its place, that will receive the vapour, and thereby increaſe and facilitate the evaporation, and thus contribute to cool us.

That the uſe of the fan was known to the ancients is very evident from what Terence ſays,

"Cape hoc flabellum, et ventulum huic ſic facito;"

and from Ovid, Art. Amand. I. 161.

"Profuit et tenues ventos moviſſe flabello."

The fans of the ancients were made of different materials; but the moſt elegant were compoſed of peacock's feathers, or perhaps painted, ſo as to repreſent a peacock's tail.

The cuſtom that now prevails among the ladies, of wearing fans, was borrowed from the Eaſt, where the hot climate renders the uſe of fans and umbrellas almoſt indiſpenſable.

In the Eaſt they chiefly uſe large fans made of feathers, to keep off the ſun and the flies. In Italy and Spain they have a large ſort of ſquare fans, ſuſpended in the middle of their apartments, and particularly over the tables: theſe, by a motion at firſt given them, and which they retain a long time, on account of their perpendicular ſuſpenſion, help to cool the air and drive off flies.

In the Greek church, a fan is put into the hands of the deacons in the ceremony of their ordination, in alluſion to a part of the deacon's office in that church, which is to keep the flies off the prieſts during the celebration of the ſacrament.

Wicquefort, in his tranſlation of the embaſſy of Garcias de Figueroa, gives the name fans to a kind of chimneys or ventiducts in uſe among the Perſians, to furniſh air, and wind into their houſes; without which the heats would be inſupportable. What is called a fan amongſt us, and throughout the chief parts of Europe, is a thin ſkin or piece of paper, taffety, or other light ſtuff, cut ſemi-circularly, and mounted on ſeveral little ſticks of wood, ivory, tortoiſeſhell, or the like.

If the paper be ſingle, the ſticks of the mounting are paſted on the leaſt ornamental ſide: if double, the ſticks are placed betwixt them. Before they proceed to place the ſticks, which they call *mounting the fan*, the paper is to be plaited in ſuch manner, as that the plaits may be alternately inward and outward.

It is in the middle of each plait, which is uſually about half an inch broad, that the ſticks are to be paſted; and theſe again are to be all joined and rivetted together at the other end; they are very thin, and ſcarce exceed one third of an inch in breadth; and where they are paſted to the paper, are ſtill narrower, continuing thus to the extremity of the paper. The two outer ones are bigger and ſtronger than the others. The number of ſticks rarely exceeds twenty-two. The ſticks are uſually provided by the cabinet-makers or toy-men: the fan-painters plait the papers, paint, and mount them.

The common painting is either in colours or gold-leaf, applied on a ſilvered ground, both prepared by the gold-beaters. Sometimes they paint on a gold ground, but it is rarely; true gold being too dear, and falſe too paltry. To apply the ſilver leaves on the paper, they uſe a compoſition which they pretend is a great ſecret, but which appears to be no other than gum Arabic, ſugar-candy, and a little honey melted in common water, and mixed with a little brandy. This compoſition is laid on with a ſponge; then laying the ſilver leaves thereon, and preſſing them gently down with a linen ball ſtuffed with cotton, they catch hold, and adhere together. When, inſtead of ſilver, gold ground is laid, the ſame method is obſerved.

The ground being well dried, a number of the papers are well beaten together on a block, and by this means the ſilver or gold get a luſtre, as if they had been burniſhed.

Fan *Machine*, in *Agriculture*, an inſtrument, or machine, contrived for the purpoſe of winnowing, or cleaning different ſorts of grain, ſeeds, &c. from the chaff and other injurious matters. There are ſeveral different machines of this kind in uſe. It has been remarked by Mr. Donaldſon, in his Treatiſe on Modern Agriculture, that wind is eſſentially neceſſary in cleaning grain, or ſeed of any kind. The huſks, or chaff, being lighter than the ſeeds which they incloſed, are, by the force of wind, carried to a greater diſtance, and thereby a complete ſeparation takes place. The natural action of the winds being ſo extremely inconſtant, no doubt, he thinks, induced the ancients to conſtruct inſtruments by which the operation of cleaning grain was rendered leſs difficult and precarious. What theſe inſtruments were, except the ſhovel for throwing grain from one part of the barn, or threſhing-floor, to another, is now uncertain; probably, however, the ſail-fan, formerly ſo commonly uſed in this country, was among the number. It was not, he conceives, till little more than thirty years ago, that any other means were thought of in Scotland for ſeparating grain from the chaff, than the action of the natural wind operating between the two doors of the barn. There a perſon ſtood for the purpoſe of dropping the undreſſed grain from a kind of ſcuttle, or ſieve, and in quantities proportioned to the force of the wind at the time. About the above period the fan, fan-machine, or fanner, was introduced from Holland, where that kind of machine had been for a conſiderable time in common uſe, having been firſt brought to that country from the Eaſt Indies, where theſe machines had been long uſed in cleaning rice.

The fan, which is the acting part of the machine, is capable of being turned round on its axis with a greater or leſs degree of velocity, according to the force of wind neceſſary to anſwer the intended purpoſe. One man works the machine eaſily by means of a winch, or handle; another is employed in filling the hopper; and a third in riddling and laying aſide the grain, if not meaſured up at the time: when that is the caſe, more hands are neceſſary. Since threſhing-mills, or machines, have been introduced, the fanners are generally connected with, and wrought by them, in place of being ſet in motion by manual labour, by which means the unthreſhed grain, after entering between the feeders of the threſhing-mill, becomes inviſible, till it again appears in three diviſions, each entirely ſeparate from the other; the grain being forced to one place, the chaff to another, and the ſtraw to a third, a degree of perfection in regard to barn management, the writer ſuggeſts, which was unknown in any other age or country.

Theſe machines are well conſtructed in many parts of Lancaſhire, and other more northern counties, both for being employed ſeparately, and in combination with the threſhing-machine. A repreſentation of one is given in the *Plate* of *Agriculture*.

Fan *Palm*. See Chamærops.

Fan, *Sea*. See Gorgonia.

Fan, in *Geography*, a town of China, of the third rank, in Chan-tong; 17 miles N.E. of Po.

FANAES, an iſland in the Atlantic, near the coaſt of Africa, about nine or ten miles in circumference, a little to the ſouth of the Line.

FANANO, a town of Italy; 18 miles S. of Modena.

FANATIC, a wild, extravagant, viſionary, enthuſiaſtical perſon, who pretends to revelation and inſpiration, and believes himſelf poſſeſſed with a divine ſpirit.

The word is formed of the Latin *fanum*, *a heathen temple;* for which reaſon the Chriſtians called all the Gentiles fanatics; and accordingly the ancient chronicles of France call Clovis fanatic and pagan.

Among the heathens themſelves there was a ſort of prophetic prieſts, called fanatici, from whom the denomination ſince paſſed to all the reſt. They had their name from the Latin *fanum*, *temple*, becauſe they lived all together.

gether in temples. Struv. Antiq. Rom. Synt. cap. 6. p. 312.

Of this kind, particularly, were the prieſts of Iſis, of the mother of the gods, of Bellona, and ſome others, who were called fanatici. In Gruter, p. 312. n. vii. we have an inſcription, wherein one L. Cornelius Januarius is called Fanaticus, AB. ISIS. SERAPIS. ABAEDEM BELLONE. And, p. 645. n. vii. Fanaticus de æde Bellonæ.

What might give occaſion to the appellation of fanatics was, that they performed their ſacrifices in a wild, enthuſiaſtical manner: and the appellation has been generally applied in modern times to thoſe who have made pretences to inſpiration, and who have conducted their worſhip or practice in an extravagant and licentious manner. Such were ſome of the German anabaptiſts and Engliſh quakers, at their firſt riſe, and the modern prophets, Muggletonians, Behmeniſts, &c. And the name fanatics, as well as ſectaries, has been often invidiouſly applied to diſſenters from the church of England.

FANATIO, in our *Ancient Cuſtoms*, the fawning-time, or fence-months in foreſts.

FANBYN, in *Geography*, a town of Sweden, in the province of Angermanland, near the gulf of Bothnia. N. lat. 63° 24′. E. long. 19°.

FANCOURT, Samuel, in *Biography*, was born in the weſt of England about the year 1678. Of his early life we have no account, but in the beginning of the laſt century he was ſettled with a congregation of Proteſtant diſſenters at Saliſbury, a ſituation which he was obliged to quit on account of ſome change in his ſentiments. He came to London, and about the year 1740, or, as others think, 1745, he ſet on foot the firſt circulating library in the metropolis, at a ſubſcription of a guinea a-year for reading. He afterwards changed the plan, and made the ſubſcribers proprietors; but he was unſucceſsful in almoſt all his projects. The public are, however, indebted to him for the firſt idea of eſtabliſhments which have been, and ſtill are, exceedingly uſeful to the community; and we may hope, of great advantage to the morals and improvement of almoſt all claſſes of ſociety. Mr. Fancourt, after experiencing a thouſand changes, which poverty too frequently inflicts, was obliged to part with his library, and retire to Hoxton, where his neceſſities were relieved by ſome of his brethren till his death, which took place in 1768, when he was in the 90th year of his age. Gen. Biog.

FANCY. See Phantasy and Imagination.

FANDANGO, the name of a riotous Spaniſh dance.

This is a very ancient national dance; and is ſuppoſed to be that of which Martial ſpeaks, when he aims the whole force of his invective againſt the wanton dances of Betica; eſpecially of the diſtrict of Cadiz, and the voluptuous manner in which they are performed by the women. Baretti juſtly defines it, "a regular and harmonious convulſion of all parts of the body." The "bolero" is an imitation of it, but ſhortened, modified, and ſtripped of all thoſe acceſſaries which give to the fandango ſo very free a character. The paſſion of the Spaniards for theſe dances is extreme. Accordingly, Mr. Townſend, in his "Travels," obſerves, that if a perſon were to come ſuddenly into a church, or a court of juſtice, playing the fandango, or the bolero, prieſts, judges, lawyers, criminals, audience, one and all, grave or gay, young or old, would quit their functions, forget all diſtinctions, and all ſet themſelves a dancing. The fandango and bolero are danced in couples, to the ſound of the guitar, and the noiſe of caſtanets, which the men employ with equal preciſion and ſportiveneſs to mark the time and animate their motions. In the bolero the men and women perform the ſame motions, but thoſe of the women are more lively, more animated, and more expreſſive. The fandango is graver than the bolero: the ſteps are neither ſo lively, nor is their time ſo ſtrongly marked; they more reſemble different modes of balancing; but the inflexions of the body are more varied, and add to its gracefulneſs. Motions of the eyes and features mark all the poſtures of this dance; the moſt lively expreſſion of all the paſſions that agitate the heart is then exhibited. The fandango and bolero are alſo executed in the form of a ballet or a figure dance; they are then danced by eight, four men and four women; and at intervals each couple in its own corner goes through all the motions of theſe dances: theſe are what they call "ſequidillas." Theſe dances are uſually performed to the ſound of the guitar, accompanied by the voice of the player. The women mark the time very correctly with the heel: theſe dances are not in general practiſed in genteel ſociety.

FANEGA, a meaſure in Spain, containing, in the vicinity of Carthagena, 3312 ſolid inches, and weighing a quintal, or 102¼ avoirdupois: and among the merchants 5¼ fanegas are reckoned equal to eight Wincheſter buſhels of 2178 ſolid inches: but upon a rough calculation, two fanegas of grain may be reckoned equal to three buſhels; and one fanega of land, being that quantity on which they ſow one fanega of wheat or two of barley, may be conſidered as three-quarters of an acre.

FANFARE, *Fr.* a kind of military air, or flouriſh, generally ſhort and ſpirited, either performed by trumpets, or by other inſtruments in imitation of them. The fanfare is uſually ſounded by two trumpets, accompanied by kettle-drums, and, if well executed, it has a certain martial and animated effect perfectly ſuited to its uſe. Of all the troops in Europe, the Germans (in 1768) were thoſe which had the beſt military inſtruments, conſequently their marches and fanfares had an admirable effect. It is worthy of remark, that in the whole kingdom of France there was not a ſingle trumpet that played in tune; ſo that the moſt warlike nation in Europe had the moſt diſcordant inſtruments, which was not without its inconvenience. During the laſt war the Bohemian, Auſtrian, and Bavarian peaſants, all born muſicians, unable to imagine that regular troops had inſtruments ſo falſe and ſo deteſtable, took all the old corps for new-raiſed troops, whom they began to deſpiſe, and it is incredible how many brave men loſt their lives by falſe intonation. So true it is, that in preparations for war, nothing ſhould be neglected that occupies the ſenſes. Rouſſeau. All Europe ſeems now convinced of the wiſdom of this remark; and all the regiments of every nation have either German bands or German maſters to inſtruct their young muſicians.

FANFOUE, in *Geography*, one of the Navigator's iſlands, in the South Pacific ocean, about five miles in circumference. S. lat. 14° 4′. W. long. 170° 20′.

FANG, a town of China, of the third rank, in Hou-quang; 40 miles S. of Yuan-gang.

Fang, in *Mining*, ſignifies a trunk or caſe of wood, made to convey wind or freſh air down into a mine. It alſo ſignifies, in ſome places, a ſleak, or ſhelter, to ſcreen the ore-dreſſers or miners from wind, or the dropping of water.

FANGOOMBA, in *Geography*, a town of Africa, in Kaarta. N. lat. 14° 15′. W. long. 70° 30′.

FANGS, or *Lee-fangs*, in *Rigging*, a rope faſtened to a cringle, near the foot of a ketch's wing-ſail, to haul in the foot of the ſail for lacing on the bonnet, or taking in the ſail.

FANJEAUX, a town of France, in the department of the Aude and chief place of a canton in the diſtrict of Caſtelnaudary; 13 miles W. of Carcaſſone. The place contains 1807, and the canton 9015 inhabitants, on a territorial extent of 232½ kiliometres, and in 16 communes. N. lat. 43° 11′. E. long. 2° 7′.

FANIMBOO, a town of Africa, in Bambara. N. lat. 14° 40′. W. long. 4°.

FANIONS, in *Military Language*, ſmall flags carried along with the baggage. See FLAG.

FANKI, in *Geography*, a town of China, of the third ranks, in Chan ſi; 17 miles N. E. of Tai.

FANNA, a town of Italy, in Friuli; ſeven miles N.N.E. of Aviano.

FANNISSIMA, a town of Japan, in the iſle of Niphon; 100 miles N. W. of Jeddo.

FANO, a town of Naples, in Abruzzo Ultra; nine miles S. S. W. of Teramo.

FANO, a ſea-port town of the duchy of Urbino, on the Adriatic, the ſee of a biſhop; ſurrounded with a lofty wall of brick and ditches, with towers at ſmall diſtances, and baſtions towards the ſea. It has ſeveral monaſteries, and ſome beautiful churches. It was anciently called "Fanum Fortunæ," from a temple built by the Romans to the goddeſs Fortune, after the defeat of Aſdrubal, on the banks of the Metaurus. Here are the remains of a triumphal arch, erected in honour of Auguſtus, who ſent hither a colony, called "Julia Faneſtris." It was deſtroyed by Totila, and rebuilt by Beliſarius; 16 miles E. N. E. of Urbino. N. lat. 43° 52′. E long. 12° 56′.

FANOE, or FOENOE, a ſmall iſland of Denmark, in the Little Belt, ſituated about two miles S. from Middlefahrt, in the iſland of Funen. N. lat. 55° 30′. E long. 9° 43′.—Alſo, a ſmall iſland of Denmark, near the coaſt of Sleſwick, in the German ocean, about 15 miles in circumference, chiefly inhabited by fiſhermen. N. lat. 55° 25′. E. long. 8° 43′.

FANPOTEN, a town on the E. coaſt of Madagaſcar. N. lat. 15° 45′. E. long. 50° 40′.

FANSHAW, CAPE, a cape on the W. coaſt of North America, and N. ſide of Frederick's Sound. N. lat. 57° 11′. E. long. 226° 44′.

FANSHAWE, *Sir* RICHARD, in *Biography*, was born at Ware-Park, Herts, in the year 1608. He ſtudied at Jeſus college, Cambridge, and from thence he removed to the Inner Temple. Having travelled into France and Spain, he was appointed ſecretary to the embaſſy at Madrid, under lord Aſton. In the civil wars he adhered to the royal party, and attended the court at Oxford. He was ſecretary of war to prince Charles, and afterwards treaſurer of the navy under prince Rupert. He was created baronet in 1650, and ſent to Madrid to ſeek a loan for his maſter. He next acted as ſecretary of ſtate for Scotland, and accompanied Charles II. on his expedition to England, and was taken priſoner at the battle of Worceſter. He was ſoon admitted to bail, and went to the ſeat of lord Strafford in Yorkſhire, where he amuſed his leiſure by tranſlating the "Luſiad." The year before the reſtoration he repaired to the king at Breda, by whom he was knighted, and, after his return, appointed maſter of requeſts and Latin ſecretary. In 1661, he was elected one of the repreſentatives in parliament for the univerſity of Cambridge, and ſoon after was ſworn a privy councillor for Ireland. He was next appointed envoy-extraordinary to Portugal, and then ambaſſador to that court, for the purpoſe of negociating the king's marriage with the infanta Catharine. He acted in other important diplomatic miſſions, but was at length recalled by the king, who was diſpleaſed on his ſigning a treaty with Spain. As he was preparing to return, he was ſeized with a fever, which carried him off at Madrid in the year 1666. Sir Richard ſuſtained an amiable character, and his talents for general ſtate affairs was univerſally acknowledged. He is likewiſe known as a literary character, chiefly by his poetical tranſlations. That of "Guarini's Paſtor Fido," firſt publiſhed in 1646, obtained for him the reputation of an elegant and eaſy verſifier. He likewiſe tranſlated the Luſiad, and ſome parts of Virgil and Horace, with other things. Biog. Brit.

FANSHIRE, in *Geography*, a river of Madagaſcar, which runs into the ſea, 15 miles S. W. of Fort Dauphin.

FANTASIA, *Ital.* FANTASIE *Fr.* an inſtrumental compoſition in *Muſic*, executed at the ſame time that it is conceived. There is this difference between a capriccio and a fantaſia, that the capriccio is a ſtring of ſingular and unconnected ideas, produced by a heated imagination, and which may, however, be compoſed at leiſure; whereas the fantaſia may be a very regular production, which differs from written muſic no otherwiſe than by being played immediately from the head, and that it no longer exiſts after performance. So that the capriccio depends on the aſſortment and choice of ideas, and the fantaſia on the promptitude with which it preſents itſelf. It follows that a capriccio may be written down, a fantaſia never; for as ſoon as it is written or repeated it is no longer a fantaſia, it is a common piece of muſic. Theſe were the ideas of Rouſſeau 40 years ago, and are now the general ideas of all who beſtow a thought on the ſubject. But in the 17th century, when inſtrumental muſic firſt began to be cultivated, the acceptation of the word fantaſie or fancy was very different from the preſent, which on the organ is termed a voluntary; on the harp or piano forte a toccata, toccatina, or prelude to ſomething elſe. But of what were termed fantaſia, previous to the invention of ſonatas, quartets, or concertos becoming general, the following is the hiſtory. The reign of our James the Firſt is a very early period in the cultivation of muſic, merely inſtrumental. The words concerto and ſonata ſeem at this time not to have been invented even in Italy: as the Cruſca dictionary gives no inſtance of ſo early a uſe of them in muſic-books. Concento and ſuono implied nearly the ſame things in the days of Boccaccio, as concerto and ſonata ſince; but concertare and concertanti were at firſt applied to the union of inſtruments with voices, in motets and madrigals, by doubling the voice-parts. It was not till late in the ſeventeenth century that inſtrumental pieces, of many parts, began to be called concertos, and of few, ſonatas.

The earlieſt compoſitions we have found in Italy, for three or more inſtruments of the ſame ſpecies, are ricercari and fantaſie. But of theſe, none ſeem to have been printed when the elder Doni publiſhed the ſecond edition of his Libreria, 1557; as all the inſtrumental muſic that appears in his catalogue of muſical compoſitions, which had then been publiſhed in Italy, are "Intabolature da organi, et da leuto, d'Anton da Bologna, di Giulio da Modena, di Franceſco di Milano, di Jaches Buas, piu di dieci volumi, e la continua."

About the beginning of the ſeventeenth century madrigals, which were almoſt the only compoſitions, in parts, for the chamber, then cultivated, ſeem to have been ſuddenly ſupplanted in the favour of lovers of muſic by a paſſion for fantaſias of three, four, five, and ſix parts, wholly compoſed for viols and other inſtruments, without vocal aſſiſtance. And this paſſion ſeems to have ariſen from the calling in theſe inſtruments to reinforce the voice-parts, with which they played in uniſon, in the performance of motetti and madrigals, thence termed concertati. At length, the inſtrumental performers diſcovered, that both the poetry and ſinging of the times might be ſpared without any great loſs or injury to muſical effects ; as the words, if good, were rendered unintelligible by fugue, imitation, and multiplicity of parts ; and the ſinging, being often coarſe and out of tune, could be better ſupplied by their own performance. Thus vocal muſic not only loſt its independence, but was almoſt totally driven out of ſociety ; as the ancient Britons, calling in the Saxons to aſſiſt them in their conflicts with the Picts, were themſelves ſubdued and forced from their poſſeſſions, by too powerful auxiliaries.

We are the better enabled to ſpeak of the inſtrumental muſic of this period, by being fortunately in poſſeſſion of ſeveral conſiderable manuſcript collections of fancies ; particularly one in ſix parts, folio, which had been made for the l'Eſtrange family, in Norfolk, by the celebrated compoſer of Charles the Firſt's reign, Mr. John Jenkins, and collated with other copies, and corrected not only by himſelf, but by ſix or eight other eminent maſters of the times.

Theſe pieces, which conſiſt more of motets, madrigals, and innomines, originally deſigned for voices, than fantaſie made expreſsly for inſtruments, were the productions of William Bird, Alfonſo Feraboſco, ſen. and jun. William White, John Ward, Thomas Ravenſcroft, William Cranforde, Thomas Lupo, Giovanni Coperario, and others. The ſtyle would appear now very dry and fancileſs, in ſpite of the general title of theſe pieces. Indeed, it would be difficult to ſelect one of them that would afford any other amuſement to our readers, than that of diſcovering how ingenious and well diſpoſed the lovers of muſic, during the former part of the laſt century, muſt have been, to extract pleaſure from ſuch productions.

Notwithſtanding the infinite pains that have been taken in collecting and collating theſe books, they only prove that however inſipid and deſpicable we may think their contents, our forefathers were of a different opinion ; and that, contemptible as they now ſeem, they were the beſt which the firſt muſicians of the age could then produce.

There is an infancy in every human production that is perfectable. The inſtruments to which theſe fantaſies were adapted were viols of different ſizes. (See Base Viol.) The paſſages, however, given to theſe ſeveral inſtruments at this time diſcover no kind of knowledge of the expreſſive power of the bow ; and even Orl. Gibbons, who compoſed ſo well for voices in the church, ſeems very little ſuperior to his cotemporaries in his productions for inſtruments. Indeed, his madrigals of five parts, as well as thoſe of many others, are ſaid in the title-page to be apt for viols and voices : a proof that with us, as well as the ancient Greeks, and other nations, there was at firſt no muſic expreſsly compoſed for inſtruments ; conſequently, the powers of theſe inſtruments muſt have been circumſcribed ; and when this muſic was merely played, without the aſſiſtance of the human voice and of poetry, capable of no great effects. The ſubjects of Orlando Gibbons's madrigals are ſo ſimple and unmarked, that if they were now to be executed by inſtruments alone, they would afford very little pleaſure to the greateſt friends of his productions, and thoſe of the ſame period. At the time they were publiſhed, however, there was nothing better with which to compare them, and the beſt muſic which good ears can obtain, is always delightful, till better is produced. Air, accent, grace, and expreſſion, were now equally unknown to the compoſer, performer, and hearer ; and whatever notes of one inſtrument were in harmony with another, were welcome to the player, provided he found himſelf honoured from time to time with a ſhare of the ſubject, or principal melody ; which happening more frequently in canons, and fugues, than in any other ſpecies of compoſition, contributed to keep them ſo long in favour with performers of limited powers, however tireſome they may have been to the hearers when conſtructed on dull and barren themes.

Muſic is ſo much a work of art, ſtudy, exerciſe, and experience, that every ſtyle muſt be beſt treated, even by men of the greateſt genius, in proportion to the attention and labour they beſtow on that particular ſpecies of compoſition. Orlando Gibbons, who appears to ſuch advantage as a church compoſer, is utterly contemptible in his productions for inſtruments, of whoſe powers he was ignorant. Indeed, all inſtrumental muſic, but that of the organ, ſeems to have been in a very rude ſtate at this time throughout Europe ; and, if we except the fugues of Freſcobaldi, all the muſic, even for keyed-inſtruments, is dry, difficult, unaccented, and inſipid.

FANTASTICAL Colours, are the ſame with thoſe called emphatical colours.

FANTIN, in *Geography*, a country of Africa, on the Gold Coaſt, extending about thirty miles along the coaſt of the Atlantic. It is bounded by Sabu on the weſt, the Iron mount, half a mile below Mawri, being its extremity. From the foot of this hill Fantin extends about ten miles eaſtward along the coaſt, having on the north ſide Arti Agua, and Tongua ; Akron on the eaſt ; and the ſea on the ſouth. The ſoil is fertile, producing fruits, maize, and palm wine. The European natives have long traded here for gold and ſlaves. But the natives trade freely with interlopers, frequently ſhut up all the paſſages to the inland countries, and prevent all trade between the Europeans and the merchants of the interior kingdoms in gold and ſlaves ; and they have ſometimes ſtarved the Dutch in their forts, till their demands have been complied with. The inhabitants are bold, cunning, and deceitful. Their government is ariſtocratical ; the braſſo, as their chief magiſtrate is called, leads their armies into the field, and poſſeſſes the chief power, though it is greatly reſtrained by the old men, who form a national council, the votes and acts of which are entirely independent of the braſſo. Every town and ſub-diviſion of the county has alſo its chief, who frequently aſſumes independence, and enters on a war with his ſovereign and the council of elders. Their inteſtine diviſions are the chief ſecurity of their neighbours, as they are able to aſſemble an army of 10,0.0 men. They reckon about 4000 fiſhermen on the coaſt, and their ſmall towns are very numerous. The capital, of the ſame name with that of the province, is about twelve miles up the country : and their other principal towns and villages are Anamaboa, where the Engliſh have a fort, Adja, or Aga, where the Dutch formerly had a fort, Little and Great Cormantin, Agua, Laguyo, Tantimquerè, and Manpran. N. lat. 5° 10′.

FANTOME Corn, in *Agriculture*, a term applied to ſuch thin or light corn as has but little bulk or ſolidity. In this ſort of grain there is but a ſmall portion of the farinaceous matter.

FANTONI, John, in *Biography*, a celebrated phyſician, was born at Turin in the year 1675. He ſtudied philoſophy and the belles lettres in the univerſity of his native city, and evinced a ſuperiority of talent in the rapid progreſs which he made. He then paſſed to the medical claſſes, in which he gave farther evidence of his abilities, and obtained his degree of doctor. He was enabled, through the liberality of his prince, to viſit foreign ſeats of learning in purſuit of improvement in his art, and traverſe France, Germany, and the Low Countries, every where making valuable additions to his knowledge. On his return to

Turin, he commenced public teacher of anatomy, and afterwards was ſucceſſively choſen to fill the chairs of theoretical and practical medicine. In the interim the king of Sardinia appointed him phyſician to the prince of Piedmont, his ſon. This office, however, did not interfere with his labours in the univerſity, where he was ſtill diſtinguiſhed near the middle of the ſucceeding century, notwithſtanding his advanced age.

The firſt publication of Fantoni was entitled "Diſſertationes Anatomicæ XI. Taurini, 1701." The ſecond "Anatomia corporis humani ad uſum Theatri Medici accomodata, Ibid. 1711." This edition, which is, in fact, a part of the preceding work, relates to the anatomy of the abdomen and cheſt only. 3. "Diſſertationes duæ de ſtructura et uſu duræ matris et lymphaticorum vaſorum, ad Antonium Pacchionum conſcriptæ, Romæ, 1721." 4. "Diſſertationes duæ de Thermis Valderianis, Aquis Gratianis, Maurianenſibus, Genevæ," 1725, in 8vo. and 1738 in 4to. 5. "Opuſcula Medica et Phyſiologica, Genevæ, 1738." This contains likewiſe ſome obſervations of his father. 6. "Diſſertationes Anatomicæ ſeptem priores renovatæ, de Abdomine, Taurini, 1745." 7. "Commentariolum de Aquis Vindolienſibus, Auguſtanis, et Anſionenſibus, ibid. 1747."

Fantoni, John-Baptist, the father of the preceding, though leſs diſtinguiſhed than his ſon, was alſo a teacher of anatomy and of the theory of medicine at Turin, as well as librarian, and firſt phyſician to Victor Amadeus II. duke of Savoy. He died prematurely in 1692, (having only attained the age of forty,) in the vicinity of Embrun, where the duke, his patron, was encamped, during the ſiege of Chorges. He left ſeveral unfiniſhed manuſcripts, which John Fantoni reviſed, and of which he publiſhed a collection of the beſt parts, under the title of "Obſervationes Anatomico medicæ ſelectiores," at Turin, in 1699, and at Venice in 1713. This work contains ſome uſeful obſervations relative to the diſeaſes of the heart. Eloy. Dict. Hiſtor.

FANU, in *Geography*, a ſmall iſland in the Mediterranean; 10 miles N.W. of Corfu.

FANUM, among the Romans, a temple or place conſecrated to ſome deity. The deified men and women among the heathens had likewiſe their fana; even the great philoſopher Cicero erected one to his daughter Tullia. Mem. Acad. Inſcript. vol. i. p. 488, ſeq.

Fanum *Dianæ*, in *Ancient Geography*, was built, according to Ptolemy, on the banks of the Rhine. Some authors have ſuppoſed that the caſtle of Batenſtein, now Vianen, was erected upon the foundation of this ancient temple.

Fanum *Fortunæ*, a town of Italy, in Umbria. See Fano.

Fanum *Jovis*, a temple of Jupiter, ſituated in Aſia Minor, near the Thracian Boſphorus and the Syrnæan promontory.

Fanum *Martis*, the denomination of ſeveral places in Gaul. Hence ſprung, according to the Notitia Imperii, the name of "Pagus Fanomartenſis," given to a great part of Hainaut. This is probably the place now called *Famars*; which ſee.—Alſo, another place of Gaul, mentioned in the Itinerary of Antonine, on the route from Alauna to Condate Redonum, between Coſedia and Fines, at the limits of the Abrincatui. It is placed by M. D'Anville a little to the ſouth of Conſtantia, on the ſea coaſt, at a place now called "Mont Martin."—Alſo, another place of Gaul, pointed out in the Peutingerian table, between Condate Redonum to the ſouth-eaſt, and Reginea to the north-weſt, upon the ſea-coaſt, the principal place of the Curioſolites.—Alſo, a place of Italy, in Etruria. Cluvius.

Fanum *Minervæ*, a town of Gaul, marked in the Itinerary of Antonine, and placed by M. D'Anville to the ſouth eaſt of Durocortorum or Rheims.

Fanum *Veneris*. See Portus *Veneris*.

Fanum *Voltumnæ*, a ſmall place of Italy, in Etruria, N.W. of Falerii.

FAN-YUAN, in *Geography*, a town of Corea; 23 miles E.S.E. of Koang-tcheo.

FANZARA, a town of Africa, in Fez; 15 miles S. of Salee.

FAON, Le, a town of France, in the department of Finiſterre, and chief place of a canton, in the diſtrict of Chateaulin; 13 miles N. of Quimper. The place contains 682 and the canton 5,400 inhabitants, on a territory of 95 kiliometres in 5 communes.

FAOUE', or Fouah, a town of Egypt, ſituated on the weſt branch of the Nile, was formerly a ſea-port, though it is now 20 miles from the ſea. When the Nile was allowed to fill the canals with its waters, which once ſupported trade and diffuſed abundance; when boats laden with the commodities of Europe and Aſia could navigate in tranquillity the coaſt of Alexandria, without being ſubject to the fury of the ſea and of the "Boghaſs," Fouah, which was ſituated at the entrance of this canal, was a large and flouriſhing city, where the Europeans had their commercial eſtabliſhments. The Venetians kept a conſul here, and merchandize was brought hither by the canal of Alexandria. But the ſupineneſs of the tyrants of Egypt having ſuffered the mud to collect in the bed of the canals, ſo as to obſtruct navigation, commerce was compelled to abandon the ſhore of Fouah, and carry its means and its riches to the harbour of Roſetta, where a variety of dangers render its progreſs uncertain. Fouah has, therefore, very conſiderably declined from its former ſplendour. Belon, who travelled in Egypt in 1530, ſays, that Roſetta was much ſmaller than Fouah; but the reverſe has ſince taken place. Its contracted limits, the ruined ſtate of its ancient edifices, and thoſe yet ſtanding, undermined by want and wretchedneſs, announce the rapid approach of a general decay. The fields, however, that ſurround Fouah diſplay a rich and ſmiling fertility; while its delightful gardens produce fruits, which, on account of their ſuperior excellence, are held in high eſtimation. Many have ſuppoſed that this city is the ancient Metelis, but Sonnini has placed this town near Roſetta, conceiving that Fouah was Naucratis, built by the Mileſians, as it is imagined, in the reign of Pſammetichus, and the country of Athenæus, a celebrated grammarian, who remarks that, in his time, there were fabricated in this town earthen vaſes, the covers of which had the appearance of ſilver. In front of Fouah the Nile forms, in the middle of its courſe, an iſland called "Geziret-el-Dahab," or golden iſland. Fouah is diſtant 16 miles S.E. from Roſetta, and 70 N.N W. from Cairo. N. lat. 31° 10'. E. long. 31°.

FAOUET, a town of France, in the department of Morbihan, and chief place of a canton, in the diſtrict of Pontivy, 18 miles N. of L'Orient. The place contains 2,591 and the canton 12,069 inhabitants, in a territory of 257½ kiliometres and 7 communes. N. lat. 48° 2'. W. long. 3° 24'.

FAPESMO, in *Logic*, one of the moods of ſyllogiſms. A ſyllogiſm in fapeſmo has its firſt propoſition an univerſal affirmative, the ſecond an univerſal negative, and the third a particular negative.

FAQUIER, in *Geography*, a county of America, in Virginia, bounded N. by London, and E. by Prince William; about 55 miles long and 20 broad, containing 12,575 free inhabitants, and 8751 ſlaves. It has a poſt-houſe; 51 miles from Waſhington.

FAQUIR. See Fakir.

FAR, in *Horſemanſhip*, an appellation given to any horſe's right ſide: thus the far foot, the far ſhoulder, &c. is the ſame with the right foot, right ſhoulder, &c.

FARA, or Faray, in *Geography*, one of the Orkney iſlands, two miles long and one broad, and two miles W. of Eday. In ordinary years its ſoil and ſurface are more than ſufficient to raiſe grain for the ſupply of its inhabitants. N. lat. 59° 4'. W. long. 2° 43'.

Fara, or *Faray*, one of the ſmaller Orkney iſlands, noted chiefly for its excellent ſheep-paſtures; near Riſſay and the eaſt coaſt of Waes, which at low ebbs forms one iſland with Hoy. N. lat. 58° 43'. W. long. 3° 1'.

Fara. See Fair *iſle*.

Fara, a town of Arabia Felix; 230 miles W. of Cathem.

FARAB. See Otrar.

FARABAT, a Perſian port on the Caſpian ſea. This port, and Madſhetiſar, are ſituated on the ſouthern coaſt, in the province of Maſanderan; they are both ſmall villages, of which Madſhetiſar is moſt commercial from its vicinity to Balfruſch, capital of the province, where the Ruſſians and Armenians carry their merchandize. See Balfrusch.

FARADEESE, a town of Africa, near the eaſt coaſt of Tunis, the inhabitants of which more than a century ago were the greateſt cruiſers and moſt experienced mariners of the country, though near four miles from the ſea, their port being a ſmall creek in the gulf of Hamam-et; but the ſuperior conveniencies for navigation at Hamam-et, and the increaſe of trade, have, of late years, drawn thither all the inhabitants; 11 miles W. of Hamam-et, and 30 S. of Tunis. Shaw's Travels, p. 91.

FARAGENOUS Mountains, in *Geology*, according to Mr. Kirwan (by others called tertiary), are ſuch as have reſulted from the ruins of other mountains or ſtrata, of different ſpecies jumbled together, according to the theories of theſe authors.

FARAHA, in *Geography*, a town of Arabia, on the S. coaſt of the Perſian gulf; 200 miles E.S.E. of El Catif. N. lat. 25° 7'. E. long. 51° 30'.

FARAM, one of the ſmaller Shetland iſlands. N. lat. 60° 4-'. W. long. 1° 26'.

FARAMA, a ruined town of Egypt, originally founded by the Arabs, and ſituated a little to the eaſtward of Peluſium. This town did not long ſubſiſt, for it was deſtroyed in the 13th century. It had a mauſoleum, which ſome have erroneouſly ſuppoſed to be the tomb of Galen, but which in reality was that of Pompey, placed by Pliny at ſome diſtance from mount Ceſius, in the vicinity of which are the ruins of Farama.

FARAMEA, in *Botany*, Aubl. Guian. v. 1. 102. t. 40. Juſſ. 209. A genus, conſiſting of two ſpecies in Aublet, whoſe fruit is not ſufficiently determined. It appears nearly related to the *Cephaëlis* of Swartz and Willdenow, *Callicocca* of Schreber, but wants the involucrum. The flowers are tetrandrous and four-cleft. Nat. Ord. *Rubiaceæ*, Juſſ. See Callicocca.

FARAN, in *Geography*, a valley of Arabia, which extends from the Red ſea to mount Sinai.

FARANAGUR, a town of Hindooſtan, in Dowlatabad; 36 miles S. of Amednagur.

FARAND-MAN, in our *Old Writers*, a traveller or merchant-ſtranger, to whom by the law of Scotland juſtice ought to be done with all expedition, that his buſineſs or journey be not hindered.

FARANI, in *Geography*, a town of Africa, in the kingdom of Ludamar; 30 miles N.W. of Benowm.

FARANSK, a town of Ruſſia, and one of the 13 diſtricts in the government of Viatka, ſituated on a rivulet falling into the Viatka.

FARAONI, a town of European Turkey, in Moldavia; 16 miles S. of Bakeu.

FARAT, a river of Nubia, which runs into the Red ſea, N. lat. 21° 40', with good depth of water at its mouth.

FARCE was originally a droll, petty ſhow, or entertainment, exhibited by charletans, or quacks, and their buffoons, in the open ſtreet, to gather the crowd together.

The word is French, and ſignifies literally *force-meat* or *ſtuffing*. It was applied on this occaſion, without doubt, on account of the variety of jeſts, jibes, tricks, &c. wherewith the entertainment was interlarded. Some authors derive farce from the Latin *facetia;* others from the Celtic *farce, mockery;* others from the Latin *farcire, to ſtuff.*

At preſent, farce poſſeſſes a little more dignity. It is removed from the ſtreet to the theatre; and inſtead of being performed by merry-andrews to amuſe the rabble, is now acted by our comedians, and become the entertainment of the politeſt audiences.

The poets have reformed the wildneſs of the primitive farces, and brought them to the taſte and manner of comedy. The difference between the two on our ſtage is, that the latter keeps to nature and probability; and, in order to that, is confined to certain laws, unities, &c. preſcribed by the ancient critics.

The former diſallows of all laws, or rather ſets them all aſide on occaſion. Its end is purely to pleaſe, or to make merry; and it ſticks at nothing which may contribute to this end, however wild and extravagant. Hence the dialogue is uſually low, the perſons of inferior rank, and the fable or action trivial or ridiculous; and nature and truth are every where heightened and exaggerated, to afford the more palpable ridicule.

FARCILITE, in *Mineralogy*, is a ſubſtance compoſed of maſſes of ſtone, cemented together by a ſtony cement. See Kirwan's Geol. Eſſ. p. 133. 225, and 338.

FARCIMINALIS Tunica, the ſame with allantois.

FARCIN, Farcy, or *Faſhions*, a diſeaſe in horſes, and ſometimes in oxen, &c. ſomewhat of the nature of a ſcabies or mange.

Geſner derives the word from *varices*, by changing the *v* into a digamma or *f*.

The farcin is infectious, and ſpreads like a true plague. Vegetius calls it *morbus farcinimoſus*. It conſiſts in a corruption of the blood, which ſhews itſelf in eruptions of hard puſtules, knots, or buds (as they are commonly called) along the veins. Hence they are erroneouſly ſuppoſed to conſiſt in a ſwelling of thoſe veſſels. Theſe tumours generally burſt, diſcharging a thin watery matter, and degenerating into foul ſpreading ulcers. The contiguous glands are uſually inflamed and ſwollen from an abſorption of the poiſon that occaſions the diſeaſe. This diſeaſe ſometimes makes its appearance in diffuſed ſwellings of the hind legs, or other parts of the body. The moſt common cauſe of farcy ſeems to be contagion, either from a glandered or farcied horſe; for, according to Mr. White (Treat on Veterinary Medicine, vol. i.), there can be no doubt that theſe diſeaſes will reciprocally produce each other. Whence we may conclude, that they both originate from the ſame poiſon, producing different effects, according to the parts on which its noxious influence is exerted. Its effects, however, are partial; the internal parts of the noſe are more particularly liable to be affected by it: the ſkin is likewiſe very ſuſceptible of its action; and when the diſorder has continued long, ſo that the poiſon has produced its full effect, the lungs do not eſcape the contagion. The farcy, ſays Mr. White, may be either conſtitutional or local. If glanderous matter, or the matter taken from a farcy-ulcer, be applied to the ſkin, when the cuticle has been abraded, a chancre or foul ulcer is produced, which is diſtinguiſhable from all others by its peculiarly foul appearance, the edges becoming thick, and the diſcharge conſiſting of a thin and rather glutinous matter. It generally ſpreads rapidly, and never looks red or healthy. The abſorbents or lymphatics about the ulcer become inflamed and ſwollen from an abſorption of its poiſonous matter. Theſe ſwellings are commonly miſtaken for veins, and hence it has been inferred that the blood-veſſels are the ſeat of the diſeaſe; the glands likewiſe, to which theſe lymphatics lead, become inflamed and enlarged; at length ſmall tumours or buds appear in the courſe of theſe abſorbents, which are ſmall abſceſſes ariſing from the inflammation of theſe veſſels. Thus far, ſays Mr. White, the diſeaſe is *local*, and the conſtitution untainted: at length, however, the poiſon, which has been arreſted by the glands, inſinuates itſelf into the circulation, and infects the whole maſs. The internal parts of the noſe are generally firſt attacked; the next part that is affected is uſually the ſkin, on various parts of which "farcy-buds" appear, and degenerate into foul ſpreading ulcers; at length the bones of the noſe become carious or rotten; and, finally, the poiſon falls upon the lungs, and ſoon terminates the animal's ſufferings. Sometimes the progreſs of the diſeaſe is very rapid, and in a ſhort time deſtroys the horſe; at other times it is remarkably ſlow, and continues for a long time, without ſenſibly affecting either the appetite or ſtrength.

In the firſt ſtage of the farcy, while it is local, a cure may be eaſily accompliſhed, and topical applications will be ſufficient to remove it. If the actual cautery be freely applied at this time, ſo as to deſtroy all the poiſoned parts, the diſeaſe will be completely eradicated, and the chancre converted into a common ſore, which will aſſume a red healthy appearance, and the cure may ſoon be completed by the application of digeſtive ointment. But if the diſeaſe has been neglected, or not perceived at its firſt commencement; if the lymphatics be enlarged or *corded* (as it is termed by the farriers); and if the neighbouring glands ſhould be ſwollen, the cure is much leſs certain. Some of the poiſon may, in this caſe, have got into the circulation, though its effects have not been viſible. In this ſtage, however, the chancre may be completely cured by the actual cautery, or other ſtrong cauſtics; and if the poiſon ſhould not have paſſed the glands, the cure will be radical; but if, on the contrary, the ſmalleſt portion of the poiſon ſhould have inſinuated itſelf into the blood, the whole maſs will be poiſoned, and the ſymptoms will be ſuch as have been already deſcribed. When the firſt appearance of the farcy has been neglected, it will be adviſable to give a ball, formed of muriate of quickſilver 1 ſc., powdered aniſeeds ½ oz., and any ſyrup, once, twice, or three times a day, if the horſe's ſtrength will admit of it, reſtraining its effect upon the bowels or kidnies by means of opium; at the ſame time it will be neceſſary to keep up the horſe's ſtrength by a liberal allowance of corn. Malt has been found uſeful on theſe occaſions. During this courſe of medicine the horſe muſt be warmly clothed, have regular exerciſe, and never be ſuffered to drink cold water. Some have recommended verdigris in this diſeaſe; but Mr. White has had no opportunity of obſerving its effect. The balls above-mentioned have proved ſo efficacious, that he has had ſeldom any occaſion for trying other remedies; but they ſhould be continued for two or three weeks after every ſymptom has diſappeared, or elſe the cure will ſeldom be permanent.

It is not improbable that the farcy, as well as the glanders, may ſometimes occur ſpontaneouſly; or at leaſt, in many caſes, it may not be traced to any aſſignable cauſe; and yet it might have ariſen from contact with poiſonous matter, though the mode of communicating it has not been aſcertained. With reſpect to that kind of farcy which appears in the form of diffuſed ſwellings of the limbs or other parts, Mr. White is of opinion that it ſeldom originates from infection, and does not often depend on the action of the glanderous matter, being merely common œdematous ſwellings, ſuch as accompany the greaſe. Hence we may account for the efficacy that has been ſometimes attributed to purgatives and diuretics, as remedies for the farcy. When large abſceſſes are formed in conſequence of farcy, they do not require any particular treatment, but the horſe's ſtrength ſhould be ſupported in ſuch caſes by means of corn and malt. Some have ſuppoſed that the farcy depends altogether upon debility; and hence medicines of the tonic or ſtrengthening kind have been recommended for its removal. When the diſtemper becomes inveterate, Gibſon recommends the following mixture, *viz.* half a pint of linſeed oil; oil of turpentine and nitre, of each three ounces; tincture of euphorbium and hellebore, of each two drams; the ſoldier's ointment, or oil of bays, two ounces; oil of origanum, half an ounce; double aqua fortis, half an ounce; when the ebullition is over, add two ounces of Barbadoes tar. With this mixture rub the tumours and corded veins once in two or three days, opening a paſſage to the matter iſſuing from the ulcers, if they are choaked up, with a ſmall hot iron, and deſtroying with vitriol the proud fleſh, which may be kept down by touching with oil of vitriol, aqua fortis, or butter of antimony. Dr. Bracken recommends the mercurial ointment for rubbing the cords and tumours before they break, in order to diſperſe them; and when they are broke, to dreſs the ſores with equal parts of Venice turpentine and quickſilver. Mercurials have been likewiſe given internally in various ways; two ounces of quickſilver divided with an ounce of turpentine, and made up into four balls with diapente and gum guaiacum, of each two ounces, and ſufficient quantity of honey, have been ſucceſsfully given in the quantity of one ball twice a week; but when mercurials are adminiſtered either internally or externally, gentle purgatives ſhould be interpoſed to prevent a ſalivation.

The water-farcin, which is a kind of dropſy, proceeds from a horſe's feeding on low watry grounds, and in pits or holes where the graſs grows above the water; for the horſe in picking out the graſs licks up the water, which occaſions him to ſwell under the belly or chaps.

The water-farcin is of two kinds; one produced by a feveriſh diſpoſition, terminating on the ſkin; and the other a true dropſy, in which the water is not confined to the belly and limbs, but it is found in different parts of the body, where a great number of ſoft ſwellings appear, which yield to the preſſure of the finger. The firſt ſpecies may be relieved by ſlight ſcarifications in the inſide of the leg and thigh with a ſharp penknife; but in the other ſpecies the water muſt be diſcharged, and the craſis of the blood recovered by a purge given every week or ten days, and immediately after the firſt the following balls: take of nitre, two ounces; ſquills powdered, three drams, or half an ounce; camphor, one dram, and a ſufficient quantity of honey to bring them of a due conſiſtence for balls. This ball ſhould be given once a day, and waſhed down with a horn or two of the following drink: take of black hellebore, freſh gathered, two pounds: waſh, bruiſe, and boil it in ſix quarts of water, till it is reduced to four: ſtrain off the liquor, and pour on the remaining hellebore two quarts of white-wine; place it in a gentle heat, and let it infuſe forty-eight hours; ſtrain it off, and mix both together, and give the horſe a pint of it night and morning. When the horſe begins to recover, complete the cure by giving him half a pint of the following infuſion every night and morning for a fortnight, and let him faſt two hours after it: take gentian-root and zedoary, of each four ounces; chamomile-flowers, and the tops of centaury, of each two handfuls; of Jeſuit's bark, powdered, two ounces; of juniper-berries, four ounces; of filings of iron, half a pound; infuſe the whole in two gallons of ale for a week, ſhaking the veſſel often.

We have in the Philoſophical Tranſactions an account of a horſe being cured of this diſeaſe by hemlock. The diſcovery was accidental; the maſter of the horſe, riding near a place where hemlock grew abundantly, ſuffered his horſe to eat greedily of it, and he became better from that time, and in a few days was wholly cured. We generally eſteem hemlock a poiſon; but beſides this proof of its ſalutary effect, it is well known that its ſeeds are eaten by ſome birds, particularly by the buſtards, in very great quantities, without any harm.

FARDAN, in *Geography*, a town of Perſia, in the province of Segeſtan; 155 miles S.W. of Zareng.

FARDEL *of Land*, in *Rural Economy*, is a term which, according to ſome, ſignifies a fourth, but which Noy aſſerts to be only the eighth part of a yard-land. See YARD-LAND.

FARDING-BAG, a term ſometimes uſed to ſignify the firſt ſtomach of a cow or any other ruminant animal. It is chiefly employed by farriers.

FARDING-*Deal*, or *Farding-Land*, in our *Ancient Cuſtoms*, ſignifies the fourth part of an acre, now called a *rood*. In the regiſter of writs we have alſo denariata, obolata, ſolidata, and librata terra, which muſt probably riſe in proportion of quantity from the farding-deal, as an half-penny, penny, ſhilling, and pound, riſe in value; on which footing obolata muſt be half an acre; denariata, an acre; ſolidata, twelve acres; and librata, twelve-ſcore acres.

Yet we find viginti libratas terræ, vel reditus; Reg. fol. 94. *a*, and 284. *b*. where librata terra ſhould ſeem to be as much as yields xx *s*. *per annum*; and centum ſolidatas terrarum, tenementorum, et redituum, fol. 249. *a*. Others hold oblata to be but half a perch, and denariata a perch.

FARDINGDEL, was the fourth part of a yard-land, or of a plough-land, according to Spelman. See FARDEL.

FARE, a voyage or paſſage, or the money paid for paſſing by water, &c.

For the fares of hackney coachmen, watermen, &c. ſee *Hackney*-COACHES.

FARE *of Pigs*, in *Rural Economy*, a provincial mode of expreſſing the number of pigs which a ſow brings forth at one time. See FARROW.

FAREHAM, in *Geography*, a market town in the hundred of that name, and diviſion of Portſdown, in Hampſhire, England, is ſituated at the north-weſtern extremity of Portſmouth harbour; and owes its chief importance to its vicinity to that naval eſtabliſhment, its principal trade and manufactures being thoſe of ſacking and ropes for ſhipping, of which it ſupplies great quantities to the dock. The town is well built; has a pariſh-church and two meeting-houſes. The civil government is veſted in a bailiff, two conſtables, and two ale-conners, who regulate all matters relative to weights, meaſures, trade, &c. Veſſels of large burthen are built at the quay. During the ſummer ſeaſon this town is much frequented for the purpoſe of ſea-bathing: and a commodious bathing-houſe has been lately erected. Fareham is 72 miles diſtant from London: has a good market on Wedneſdays, and an annual fair well ſupplied with corn, cheeſe, hops, &c. The population report made to parliament in the year 1801 was 555 houſes and 3030 inhabitants.

FAREL, WILLIAM, in *Biography*, the ſon of a gentleman in Dauphine, in France, was born in the year 1489. He diſtinguiſhed himſelf at the univerſity of Paris for rapid proficiency in the ancient languages, and though brought up with the Papiſts we find him preaching the principles of the reformed religion at Meaux, in the year 1521. Two years afterwards a perſecution was commenced by the Franciſcans againſt thoſe whom they choſe to ſingle out as heretics; among theſe was Farel, who, to provide for his own ſafety, fled from France. He retired to Straſburg, where he was acknowledged as a brother by Bucer and Capito, as he was by Haller, Œcolampadius, and other eminent reformers in Switzerland. At Bern he publicly defended his opinions, in ſet theſes, againſt the doctrines and practices of the Catholics, till he excited ſo much oppoſition as obliged him to quit the place. He now undertook the reformation of Montbeliard, and was very ſucceſsful in the attempt, but his zeal was too nearly allied to intemperance to produce all the effect that his talents were capable of commanding. On a proceſſion day, he tore from the hands of the prieſt the image of St. Anthony, and threw it into the river; which had well-nigh coſt him his life, and which, among other acts of violence, led Eraſmus to think and to ſpeak ſlightingly of him. His friend Œcolampadius was the means of moderating his temper, by ſeriouſly expoſtulating with him on the ſubject in an epiſtolary correſpondence. "Men," ſaid he, in one of his letters, "may be led, but will not be driven by force. Give me leave to ſay you do not ſeem in every reſpect to remember your duty, you were ſent to preach, not to rail. Pour on wine and oil in due ſeaſon, and demean yourſelf as an evangeliſt, and not as a tyrannical legiſlator." Farel travelled from place to place in the character of a reformer; and from many of the ſcenes of his exertions and labours he was driven by the bigotry and fanaticiſm of the times. At Neufchatel and Geneva he exerciſed the office of paſtor; and at Metz he planted a church, and obtained numerous proſelytes, but he and his followers were obliged to fly from that city, and take refuge in the abbey of Gorze, where the count of Furſtenberg took them under his protection. Their enemies were, however, more powerful than their friends; they beſieged them in their aſylum, and obliged them to ſurrender upon a capitulation. Farel eſcaped and returned to Neufchatel, where he reſumed his labours with much aſſiduity. In 1553 he was obliged to appear at Geneva, to anſwer a charge brought againſt him that would, if true, have affected his life, but, according to Calvin, it was an infamous fabrication, in return for his zeal in reproving public vice. At this time Farel, with utter inconſiſtency of character, and to his own eternal diſgrace, aſſiſted in the perſecution and murder of Servetus. In 1558 he married; and in 1565, as he was on a journey, he was taken ill and died, being about 76 years of age. He was diſtinguiſhed for an undaunted ſpirit; for a commanding voice, and for a powerful eloquence. His writings are neither numerous nor important. They conſiſt of theſes: diſputations, and ſome practical treatiſes. Bayle.

FARELAINS, in *Geography*, a town of Portugal, in the province of Entre Duero é Minho; ſix miles N.E. of Villa de Condé.

FARELLA, a ſmall iſland in the Eaſt Indian ſea. S. lat. 0° 48′. E. long. 104° 27′.

FARELLON Sŭcio, a ſmall iſland in the Spaniſh Main, near the coaſt of Darien. N. lat. 9° 43′. W. long. 79° 40′.

FAREN, in *Ichthyology*, a name given by the Swedes to a fiſh peculiar to their country. It is of the genus of the cyprini, and is diſtinguiſhed by Artedi by the name of the yellow-eyed cyprinus, with thirty-ſeven bones in the pinna ani. See Cyprinus.

FARESKUR, in *Geography*, a town of Egypt, on the eaſt branch of the Nile; ſeven miles S. of Damietta.

FAREWELL, Cape, a cape on the S.W. coaſt of Eaſt Greenland. N. lat. 59° 38′. W. long. 42° 45′.—Alſo, a cape on the N.W. coaſt of Tavai-Poenammoo, the ſouthern iſland of New Zealand. S. lat. 40° 33′. W. long. 186°.

FARFANA, a town of Spain, in Catalonia; five miles W. of Balaguer.

FARFARA, a name given by ſome of the ancient *Botaniſts* to the plant we call colt's-foot, from the river Farfarus, a river of Italy, mentioned by Ovid as remarkable for its ſhady banks, which afforded a very large quantity of this plant. Pliny mentions this plant with much confuſion, calling it alſo farfano and farfugio, and forgetting that he had before deſcribed it under the name of tuſſilago or belchion. See Tussilago.

FARFRUGUM, a name by which ſome authors have called the caltha paluſtris, or marſh-marygold.

FARGEAU, *St.* in *Geography*, a town of France, in the department of the Yonne, and chief place of a canton in the diſtrict of Joigny; 25 miles S.W. of Joigny. The place contains 2095, and the canton 6632 inhabitants, on a territory of 257½ kiliometres, and in ſeven communes. N. lat. 47° 38′. E. long. 3° 10′.

FARIAH, a town and province of the country of Balk, on the borders of Perſia; 90 miles W. of Balk. N. lat. 36° 18′. E. long. 63° 40′.

FARJAN, a town of Perſia, in the province of Irak; 75 miles S.W. of Hamadan.

FARIBE, a town of Africa, in the country of the Foulahs, on the Senegal. N. lat. 16° 45′. W. long. 14° 34′.

FARIDABAD, a town of Hindooſtan, in the ſoubah of Delhi; 18 miles S. of Delhi.

FARIGLIANI, a ſmall iſland near the eaſt coaſt of Sicily. N. lat. 37° 35′ E. long. 15° 15′.

FARILA, a town of Sweden, in Helſingland; 39 miles N. of Hudwickſwall.

FARILHOENS, two ſmall iſlands in the Atlantic, near the coaſt of Benguela. S. lat. 12° 35′.

FARIM, a town of Africa, and capital of a province or kingdom of the ſame name, belonging to the Papels, on the river St. Domingo. N. lat 12° 10′. W. long. 14° 30′.

FARIMA, or Bansju, a province of Japan, on the S. coaſt of the iſland of Niphon, abounding in manufactures of ſilk, cloth, paper, &c.

FARINA, in *Agriculture*, a term frequently uſed to ſignify the fine mealy ſubſtance afforded by pounding or grinding different ſorts of grain. It is very prevalent in wheat, conſtituting, in a great meaſure, the flour from which bread is made. It is found to partake ſomewhat of the nature of gum, but has conſiderably more taſte, is more fermentable, and greatly more nutritious. It is likewiſe abundant in many vegetables, being moſtly depoſited in certain parts of them, apparently for the purpoſe of being more beneficially accommodated to their nouriſhment and ſupport. Many of the bulbous and other roots, as well as thoſe of the potatoe, briony, &c. and ſuch as afford different preparations, as ſalep, caſſava, &c. contain a large portion of white feculæ, which greatly reſembles, and in reality poſſeſſes, the properties of farina. The leguminous claſs of plants, as peas, beans, &c. are alſo found to abound in this ſort of matter. The largeſt quantity of this material is, however, met with in grains, as wheat, barley, rye, and oats, which are in conſequence of it denominated farinaceous grains. It likewiſe abounds in rice, and other plants of the ſame kind.

When only ſlightly examined it ſeems to be a ſubſtance of a homogeneous nature; but from actual experiment it is found to be a compound, conſtituted of three different parts, which are eaſily ſeparable. Where it is taken from wheat, this is eaſily ſhewn by ſimply forming a paſte with a quantity of it and cold water, and then ſuſpending it in a bag of muſlin, or other ſimilar cloth; afterwards letting fall on it a ſtream of cold water from a height, the containing bag being occaſionally ſqueezed in a gentle manner: the water in its deſcent conveys away with it a very fine white powder, which may be received with the water in a veſſel placed below, underneath the bag. This proceſs is continued until no more of the white powder comes off, which is ſhewn by the water that paſſes through the bag, ceaſing to have a milky colour. The operation being completed, the farina is found to be ſeparated into three diſtinct ſubſtances: the glutinous, or *vegeto-animal* part remains in the bag; the *amylum*, or ſtarch, is depoſited at the bottom of the water, which has been received in the veſſel placed below the bag: and the mucous matter is held diſſolved in the water from which the ſtarch has been depoſited, and is capable of being brought to the conſiſtence of treacle, by evaporating the water in which it is held in the ſtate of ſolution.

It is likewiſe found, that theſe ſeveral different parts vary greatly in their ſenſible and chemical properties. The vegeto-animal part has a whitiſh grey colour, being a tenacious, ductile, elaſtic matter, partly poſſeſſing the texture of animal ſubſtances. When diſtilled in a retort it yields, like all animal matters, a true volatile alkali; and its coal affords no fixed alkali. It is not only inſoluble, but even indiffuſible in water; both which are ſhewn from its remaining in the bag after long continued lotions or waſhings. Like gums, it is ſoluble in alcohol, in oils, and in ether; but is inſoluble in water, and yields on diſtillation products very different from thoſe afforded by gums. It is conſequently of an animal nature, and would ſeem to approach nearer to the coagulable lymph of animals than to any other ſubſtance. The fixed alkali, by means of heat, diſſolves the vegeto-animal gluten; but when it is precipitated from this ſolution by means of acids, it is found to have loſt its elaſticity. The mineral acids, and eſpecially the nitrous, are likewiſe capable of diſſolving the vegeto-animal part of farina. The amylaceous, or ſtarchy matter, forms the principal part of the farina. As already noticed, it is that fine powder which is depoſited from the water which has pervaded the entire farina: it is of a greyiſh white colour, but is capable of being rendered much whiter by making it undergo a certain degree of fermentation. Starch is incapable of ſolution in cold water, but in hot water it forms a tranſparent glue: hence the neceſſity of employing cold water in ſeparating it from the vegeto-animal part. When diſtilled in a retort, it affords an acid phlegm; and its coal yields, like other vegetables, a fixed alkaline ſalt. As ſtarch conſtitutes the greateſt part of the farina, it is probably the chief nutritious conſtituent principle in bread. The mucous, or rather mucoſo-ſaccharine matter, is only in a very ſmall proportion in bread. Upon undergoing diſtillation it is found to preſent the ſame phenomena as ſugar. The uſe of this matter ſeems to be that of producing the vinous fermentation; and it is not improbable but that the making of good bread may depend on a proper proportion of the three different parts that have been already ſhewn; the vinous fermentation being promoted by the mucoſo-ſaccharine part, the acetous by the ſtarch, and the putrid by the gluten vegeto-animal; conſequently, that from the different degrees or ſtates of theſe ſeveral ſtages of fermentation the qualities or properties of good bread may in a great meaſure be derived. See BREAD.

Beſides this, it is found from actual experiment, as well as long experience, that thoſe ſubſtances which abound moſt in farina, are the moſt expeditious in fattening different ſorts of animals, as hogs, poultry, &c. and at the ſame time afford that ſort of fat which is the moſt firm and ſolid in its nature; hence it is found neceſſary in moſt caſes to feed out animals of theſe kinds with ſome material that contains it in a pretty large proportion.

FARINA *Fœcundans*, in *Botany*. See FECUNDATION *of Plants*.

FARINA, *Cape*, in *Geography*, a cape on the north coaſt of Tunis. N. lat. 37° 42′. E. long. 10° 30′.

FARINAGIUM, in *Rural Economy*, a term which was formerly employed to ſignify the toll of meal or flour.

FARINELLI, CARLO BROSCHI, DETTO, an Italian opera-ſinger, whoſe voice and abilities ſeem to have ſurpaſſed the limits of all anterior vocal excellence, was born at Andria, in the kingdom of Naples, in 1705. He learned the firſt rudiments of muſic of his father, according to his own account, and ſinging of Porpora, who generally accompanied him wherever he went. In 1722, at the age of 17, he went from Naples to Rome, with his maſter, then engaged to compoſe an opera for the Aliberti theatre, in that city; where, during the run of an opera, there was a ſtruggle every night between him and a famous player on the trumpet, in a ſong accompanied by that inſtrument: this, at firſt, ſeemed amicable, and merely ſportive, till the audience began to intereſt themſelves in the conteſt, and to take different ſides. After ſeverally ſwelling out a note, in which each manifeſted the power of his lungs, and tried to rival the other in brilliancy and force, they had both a ſwell and a ſhake together, by thirds, which was continued ſo long, while the audience eagerly waited the event, that both ſeemed to be exhauſted; and, in fact, the trumpeter, wholly ſpent, gave it up, thinking, however, his antagoniſt as much tired as himſelf, and that it would be a drawn battle; when Farinelli, with a ſmile on his countenance, ſhewing he had only been ſporting with him all this time, broke out all at once in the ſame breath, with freſh vigour, and not only ſwelled and ſhook the note, but ran the moſt rapid and difficult diviſions, and was at laſt ſilenced only by the acclamations of the audience. From this period may be dated that ſuperiority which he ever maintained over all his cotemporaries. Here he continued with Porpora till 1724, when he firſt went to Vienna. In 1725, he performed at Venice in Metaſtaſio's firſt opera of "Didone Abbandonata," ſet by Albinoni. After this he returned to Naples, where he performed with the celebrated female ſinger Teſi, in a ſerenata compoſed by Haſſe. In the early part of his life he was diſtinguiſhed throughout Italy by the name of "the boy." In 1726 he ſung at Milan, in "Ciro," an opera ſet by the elder Ciampi. In 1727, he performed at Bologna, with Bernacchi, in an opera ſet by Orlandini. In 1728, he went to Vienna a ſecond time; and afterwards returning to Venice in autumn, he ſung with Fauſtina, juſt returned from England, in Metaſtaſio's "Ezio," ſet by Porpora. Here he continued two years, performing, in 1729, with Gizzi and Nicolini, in "Semiramide Riconoſciuta," ſet likewiſe by Porpora, and in "Cato," by Leo: and in 1730, with Nicolini and Cuzzoni in Haſſe's celebrated opera of "Artaſerſe," in which he firſt appeared in England; and in "Idaſpe," ſet by his brother Riccardo Broſchi. Wherever he went his powers were regarded as miraculous; but he told the author of this article, that at Vienna, where he was three different times, and where he received great honours from the emperor Charles VI. an admonition from that prince was of more ſervice to him than all the precepts of his maſters, or examples of his competitors for fame: his imperial majeſty condeſcended to tell him one day, with great mildneſs and affability, that in his ſinging he neither *moved* nor *ſtood ſtill* like any other mortal; all was ſupernatural. "Thoſe gigantic ſtrides, ſaid he; thoſe never-ending notes and paſſages (ces notes qui ne finiſſent jamais) only ſurpriſe, and it is now time for you to pleaſe; you are too laviſh of the gifts with which nature has endowed you; if you wiſh to reach the heart, you muſt take a more plain and ſimple road." Theſe few words brought about an entire change in his manner of ſinging: from this time he mixed the pathetic with the ſpirited, the ſimple with the ſublime, and, by theſe means, delighted as well as aſtoniſhed every hearer. In the year 1734, he came into England, where every one knows who heard, or has heard of him, what an effect his ſurpriſing talents had upon the audience; it was extacy! rapture! enchantment!

In the famous air "Son qual Nave," which was compoſed by his brother, the firſt note he ſung was taken with ſuch delicacy, ſwelled by minute degrees to ſuch an amazing volume, and afterwards diminiſhed in the ſame manner, that it was applauded for full five minutes. He afterwards ſet off with ſuch brilliancy and rapidity of execution, that it was difficult for the violins of thoſe days to keep pace with him. In ſhort, he was to all other ſingers as ſuperior as the famous horſe Childers was to all other running-horſes; but it was not only in ſpeed, he had now every excellence of every great ſinger united. In his voice, ſtrength, ſweetneſs, and compaſs; in his ſtyle, the tender, the graceful, and the rapid. He poſſeſſed ſuch powers as never met before, or ſince, in any one human being; powers that were irreſiſtible, and which muſt ſubdue every hearer; the learned and the ignorant, the friend and the foe.

As general and indiſcriminate praiſe would convey to the mind of a muſical reader no diſtinct ideas of the powers of this extraordinary ſinger, it will be neceſſary to diſcriminate the ſpecific excellencies of which he ſeems to have been poſſeſſed.

No vocal performer of the laſt century has been more unanimouſly allowed by profeſſional critics, as well as general celebrity, to have been gifted with a voice of ſuch uncommon power, ſweetneſs, extent, and agility. Nicolini, Seneſino, and Careſtini, gratified the eye as much by the dignity, grace, and propriety of their action and deportment, as the ear, by the judicious uſe of a few notes within the limits of a ſmall compaſs of voice; but Farinelli, without the aſſiſtance of ſignificant geſtures or graceful attitudes, enchanted and aſtoniſhed his hearers by the force, extent and mellifluous tones of the mere organ, when he had nothing to execute, articulate, or expreſs. But though during the time of his ſinging he was as motionleſs as a ſtatue, his voice was ſo active, that no intervals were too cloſe, too wide, or too rapid for his execution. It ſeems as if the compoſers of theſe times were unable to invent paſſages ſufficiently difficult to diſplay his powers, or the orcheſtras to accompany him in many of thoſe which had been compoſed for his peculiar talent. And yet, ſo great were his forbearance and delicacy, that he was never known, while he was in England, to exclaim, or manifeſt diſcontent at the inability of the band, or miſtakes of individuals by whom he was accompanied. He was ſo judicious in proportioning the force of his voice to the ſpace through which it was to paſs to the ears of his audience, that in a ſmall theatre at Venice, though it was then moſt powerful, one of the managers of the opera complained that he did not ſufficiently exert himſelf—"let me then," ſays Farinelli, "have a larger theatre, or I ſhall loſe my reputation without your being a gainer by it."

On his arrival here, at the firſt private rehearſal at Cuzzoni's apartments, lord Cooper, then the principal manager of the opera under Porpora, obſerving that the band did not follow him, but were all gaping with wonder, as if thunder-ſtruck, deſired them to be attentive; when they all confeſſed that they were unable to keep pace with him: having not only been diſabled by aſtoniſhment, but overpowered by his talents. This band was ſmall, conſiſting only of Carbonelli, Mich. Chriſt. Feſting, Valentine Snow, afterwards ſerjeant-trumpet, and Mr. Vezan, a dancing-maſter, who was likewiſe a ſteady and excellent concert player on the violin, and conſtantly employed whenever Carbonelli or Feſting was the leader. It was from this worthy man that we had this anecdote.

There was not one of all Farinelli's excellencies by which he ſo far ſurpaſſed all other ſingers, and aſtoniſhed the public, as his meſſa di voce, or ſwell; which, by the natural formation of his lungs, and artificial economy of breath, he was able to protract to ſuch a length, as to excite incredulity even in thoſe who heard him; who, though unable to detect the artifice, imagined him to have had the latent help of ſome inſtrument by which the tone was continued, while he renewed his powers by reſpiration.

With theſe talents he went into Spain in the year 1737, with a full deſign to return into England, having entered into articles with the nobility, who had then the management of the opera, to perform the enſuing ſeaſon. In his way thither he ſung to the king of France at Paris, where, according to Riccoboni, he enchanted even the French themſelves, who at that time univerſally abhorred Italian muſic; but the firſt day he performed before the king and queen of Spain, it was determined that he ſhould be taken into the ſervice of the court, to which he was ever after wholly appropriated, not being once ſuffered to ſing again in public. A penſion of near 3000*l.* a-year was ſettled on him for life.

He ſaid, that for the firſt ten years of his reſidence at the court of Spain, during the life of Philip V. he ſung every night to that monarch the ſame four airs, two of which were compoſed by Haſſe, "Palido il ſole," "Per queſto dolce Ampleſſo," and "Ah, non laſciami no, bell idol mio," by Vinci: we forget the other, but it was a minuet which he uſed to vary at his pleaſure. He was honoured with the order of St. Jago by his firſt royal maſter. Of the manner in which he ſpent his time ſome idea may be gathered from what we have already related: the lovers of anecdotes might, indeed, be gratified with innumerable particulars concerning the effects of his amazing talents, if anecdotes were not below the dignity of lexicography; one or two, however, that do honour to his heart and natural diſpoſition, we hope our graver and more critical readers will excuſe.

It has been often related, and generally believed, that Philip V. king of Spain, being ſeized with a total dejection of ſpirits, which made him refuſe to be ſhaved, and rendered him incapable of attending council, or tranſacting affairs of ſtate, the queen, who had in vain tried every common expedient that was likely to contribute to his recovery, determined that an experiment ſhould be made of the effects of muſic upon the king her huſband, who was extremely ſenſible to its charms. Upon the arrival of Farinelli, of whoſe extraordinary performance an account had been tranſmitted to Madrid from ſeveral parts of Europe, but particularly from Paris, her majeſty contrived that there ſhould be a concert in a room adjoining to the king's apartment, in which this ſinger performed one of his moſt captivating ſongs. Philip appeared at firſt ſurpriſed, then moved; and at the end of the ſecond air made the virtuoſo enter the royal apartment, loading him with compliments and careſſes; aſked him how he could ſufficiently reward ſuch talents; aſſuring him that he could refuſe him nothing. Farinelli, previouſly inſtructed, only begged that his majeſty would permit his attendants to ſhave and dreſs him, and that he would endeavour to appear in council as uſual. From this time the king's diſeaſe gave way to medicine: and the ſinger had all the honour of the cure. By ſinging to his majeſty every evening, his favour increaſed to ſuch a degree, that he was regarded as firſt miniſter; but what is ſtill more extraordinary, inſtead of being intoxicated or giddy with his elevation, Farinelli, never forgetting that he was a muſician, behaved to the Spaniſh nobles about the court with ſuch humility and propriety, that inſtead of envying his favour, they honoured him with their eſteem and confidence. One day in going to the king's cloſet, to which he had at all times acceſs, he heard an officer of the guard curſe him, and ſay to another that was in waiting "honours can be heaped on ſuch ſcoundrels as theſe, while a poor ſoldier, like myſelf, after thirty years' ſervice, is unnoticed." Farinelli, without ſeeming to hear this reproach, complained to the king that he had neglected an old ſervant, and procured a regiment for the perſon who had ſpoken ſo harſhly of him in the anti-chamber; and in quitting his majeſty he gave the commiſſion to the officer, telling him that he had heard him complain of having ſerved thirty years, but added, "you did wrong to accuſe the king of neglecting to reward your zeal."

The following ſtory, which is leſs ſerious, was frequently told and believed at Madrid, during the firſt year of Farinelli's reſidence in Spain. This ſinger, having ordered a ſuperb ſuit of clothes for a gala at court, when the taylor brought it home, he aſked him for his bill. "I have made no bill, ſir, ſays the taylor, nor ever ſhall make one. Inſtead of money," continues he, "I have a favour to beg. I know that what I want is ineſtimable, and only fit for monarchs; but ſince I have had the honour to work for a perſon of whom every one ſpeaks with rapture, all the payment I ſhall ever require will be a ſong." Farinelli tried in vain to prevail on the taylor to take his money. At length, after a long debate, giving way to the humble intreaties of the trembling tradeſman, and flattered perhaps more by the ſingularity of the adventure than by all the applauſe he had hitherto received, he took him into his muſic-room, and ſung to him ſome of his moſt brilliant airs, taking pleaſure in the aſtoniſhment of his raviſhed hearer; and the more he ſeemed ſurpriſed and affected, the more Farinelli exerted himſelf in every ſpecies of excellence. When he had done, the taylor, overcome with extacy, thanked him in the moſt rapturous and grateful manner, and prepared to retire. "No," ſays Farinelli, "I am a little proud; and it is perhaps from that circumſtance that I have acquired ſome ſmall degree of ſuperiority over other ſingers; I have given way to your weakneſs, it is but fair, that, in your turn, you ſhould indulge me in mine." And taking out his purſe, he inſiſted on his receiving a ſum amounting to nearly double the worth of the ſuit of clothes.

After the death of Philip V. his favour continued under his ſucceſſor Ferdinand VI., by whom he was dignified with the order of Calatrava in 1750; but then his duty became leſs conſtant and fatiguing, as he perſuaded this prince to have operas, which were a great relief to him: he was appointed ſole director of thoſe ſpectacles; and had from Italy the beſt compoſers and ſingers of the time, and Metaſtaſio to write. He ſhewed me in his houſe four of the principal ſcenes in Didone and Netette, painted by Amiconi, who accompanied him firſt into England, and then into Spain, where he died.

When the late king of Spain aſcended the throne, he was obliged to quit that kingdom, but his penſion was ſtill continued, and he was allowed to bring away all his effects. The furniture of his houſe was very rich, as it was almoſt entirely compoſed of the preſents which he had received from great perſonages. He ſeemed very much to regret the being obliged to ſeek a new habitation, after having lived twenty-four years in Spain, where he had formed many friendſhips and connections that were dear to him; and it was a great proof of the prudence and moderation of his character, that in a country and court, where jealouſy and pride are ſo predominant, he continued ſo long to be the king's chief favourite, a diſtinction odious to every people, without the leaſt quarrel or difference with any of the Spaniards.

When he returned into Italy in 1761, all his old friends, relations, and acquaintances, were either dead, or removed from the places where he had left them; ſo that he had a ſecond life to begin, without the charms of youth to attach new friends, or his former talents to gain new protectors.

He ſaid that Metaſtaſio and he were twins of public favour. Their firſt acquaintance began at Naples, where Farinelli performed in Metaſtaſio's firſt dramas, in "Angelica," 1723, and in "Didone," 1724; in "Siroe," at Venice, 1725, and 1726. They ſeem not to have met again till Metaſtaſio was ſettled at Vienna, where Farinelli was engaged three ſeveral times, and where they ſaw each other for the laſt time in 1733, from which period their affection continued with undiminiſhed ardour to the end of their lives. The letters of Metaſtaſio to this vocal phenomenon and worthy character are all preſerved from the year 1747, to the laſt uſe which the poet made of a pen, in 1782. Nothing need be added here to his public profeſſional character; but in the letters of Metaſtaſio, publiſhed in the memoirs of his life, the numerous and impreſſive eulogies of that excellent and refined moraliſt, and judge of the human heart, exalt his private virtues and conduct through life to an uncommon pitch of excellence. During his reſidence in Spain, we were curious to obtain information concerning the life of this portentous performer: we had accounts from the higheſt authority of his modeſty, humility, and benevolent propenſities, during his ſplendid reſidence at Madrid, while in the meridian of royal favour, inveſted with wealth, honours, and influence, ſufficient to excite every ſpecies of envy, hatred, and malice, in all the orders of ſociety. Yet ſo ſound were his intellects, ſo ſage and judicious his conduct, that he cannot ſo properly be ſaid to have eſcaped the ſhafts of envy, as to have prevented their being ſhot at him. Of almoſt all other great ſingers, we hear of their intoxication by praiſe and proſperity, and of their caprice, inſolence, and abſurdities, at ſome time or other; but of Farinelli, ſuperior to them all in talents, fame, and fortune, the records of folly among the ſpoilt children of Apollo furniſh not one diſgraceful anecdote. In one of Metaſtaſio's letters to his Caro Gemello, (his dear twin,) as he always called Farinelli, he ſays, "the Spaniſh miniſter plenipotentiary, don Antonio di Azlor from your court is arrived, and pleaſes extremely here; not only my auguſt patrons, but the nobility and the whole corps diplomatique. He has an agreeable ſeriouſneſs in his aſpect, an openneſs in ſpeaking, and ſo noble, courteous, and judicious an addreſs, that we hope he will worthily and uſefully ſuſtain the character with which he is honoured. He is interrogated by every one concerning yourſelf, as all are ſolicitous about what is moſt dear to them; and all are extremely pleaſed with his anſwers. He aſſures them that your proſperity has not in the leaſt altered the ſweetneſs and moderation of your character. A rock, according to ancient and modern examples, extremely difficult to avoid; and much more amidſt the favours, than the perſecutions of fortune. He has aſſured them that though elevated to ſuch an enviable ſituation, you have not an enemy. To obtain forgiveneſs, (Metaſtaſio adds,) for ſuch proſperity, I can eaſily conceive how wiſe, how diſintereſted, and how beneficent muſt be your conduct. I congratulate you on theſe ineſtimable characteriſtics, which are your own, and not the gifts of fortune; and I congratulate myſelf for having known and loved you, before you had given ſuch illuſtrious proofs of your eſtimable and amiable qualities."

In one of the poet's letters to Farinelli in 1752, when at the zenith of his favour and fortune, he ſays, "I have ſeen, for a ſhort time, count Eſterhaſi, after his return from Madrid, and have found him full of you. He regards you as a hero, and has deſired me to tell you ſo; which will oblige me likewiſe to love you more than ever. At this laſt aſſertion I cannot help laughing; but I own, that to hear you thus praiſed, affords me the ſame pleaſure as if it was myſelf: ſo much does our old, true, and reciprocal friendſhip ſeem to have united us together, and conſolidated our intereſts. God preſerve you, our dear Gemello, and inſpire others to think as you do."

"What I ſpeak and write to you, my dear friend, is what I think, not what I ſay; and I do not write all, leſt I ſhould be thought by thoſe who are not acquainted with me one of the common worſhippers of your fortune: which I only love in you, as an inſtrument by means of which you diſcover the good qualities of your heart: among which I muſt, for my own ſake, enumerate the admirable conſtancy of your friendſhip."

Again, in 1756, he ſays, "at length our noble and worthy Monſignor Migazzi, arch-biſhop of Vienna, is arrived here from Madrid. I have put his patience to extraordinary trials, with my numerous and minute queſtions concerning your health, way of life, friendſhip for me, and the public approbation which you have ſo well contrived to merit. He went ſo ar as to tell me, that, conſcious of your heroic conduct in circumſtances ſo ſeducing, he might venture to canonize you without the fear of oppoſition. Figure to yourſelf, if you can, how ſweet ſuch muſic muſt be to the ears of your moſt faithful and affectionate Gemello."

Theſe are inſtances of the ſtrength of his head during proſperity; we ſhall give two or three examples of his fortitude, when "fallen from his high eſtate." In 1758, he loſt his great patroneſs and judge of his worth and talents, the queen of Spain: and, in 1759, her conſort Ferdinand

VI. who being ſucceeded by Charles III. his brother, the late king of Spain, who hated muſic, and would not ſuffer the ſound of a voice or an inſtrument to be heard in his palace, ordered him to quit Madrid, and return to Italy; but not to his own country, Naples, whither it was his wiſh to retire; but from ſome caprice, never clearly explained, though his penſion was continued, he ordered him to ſpend the remainder of his days at Bologna. Upon his firſt loſs, Metaſtaſio in condolence ſays: "The death of ſo admirable a queen, and her royal conſort oppreſſed with grief for ſo irreparable a loſs, are objects for a diſintereſted ſervant, obliged, honoured, and full of affection and gratitude like yourſelf, that muſt inevitably plunge your mind in an abyſs of deſolation. I know not what to ſay *to* you, my dear friend, equal to what I feel *for* you. Yet I have no doubt but that you, who have ſhewn the world how capable you are of reſiſting the flattering ſmiles of fortune, will know how to ſupport adverſity; and that your prudence will not wait for the aſſiſtance of neceſſity, to manifeſt wiſdom and Chriſtian reſignation." And on the death of his royal patron Ferdinand, in 1759, he begins his ſecond letter of condolence in the following manner: "Yeſterday was delivered to me your letter of the ſecond of Auguſt, from Villavizioſa: and though tinctured with the gloomy colour reflected from your painful ſituation, it was great conſolation to me to find, that, with your feeble ſtate of health, you have had ſufficient vigour to reſiſt ſo tremendous a ſhock. The fatal news of your beneficent king having been delivered from his ſufferings, arrived at Vienna four days before your letter. It is to be hoped that the melancholy ſtate in which he long remained without the leaſt chance of recovery diminiſhed the violence of a blow which muſt have been expected, and which delivered a poor prince from the painful exiſtence in which he languiſhed. And yet, with all theſe ſolid reaſons, I judge, my dear Gemello, by the emotions of my own heart, what your's muſt be; but I promiſe myſelf much more from your virtue than mine; becauſe the examples of moderation with which you have ſo long furniſhed the world in the midſt of the moſt intoxicating ſmiles of fortune, give us aſſurances of your meeting her frowns with equal fortitude. Be of comfort, my dear Gemello: inconſtancy in human affairs is the univerſal condition on which we live, as every mortal knows by woeful experience. No misfortune, however, can rob you of the praiſe of not ſuffering yourſelf to be ſeduced or dazzled by the blaze with which you were ſo long ſurrounded."

The death of his partial patrons not only deprived him of his importance at that court, but ſeems to have bereaved him of all comfort during the reſt of his days. In a letter of Metaſtaſio to him in 1763, we find the following teſtimony of his reſignation to his fate. "I now begin to diſcover that my beloved Carluccio is as ſuperior to the frowns, as he has hitherto been to the ſmiles, of fortune. I promiſed myſelf this heroiſm from you: and was certain that your greateſt difficulty was knowing how to ſet bounds to the tender exceſſes of your good heart, and gratitude. Now time and reflection have rendered you maſter of yourſelf, it is fit, my dear friend, that you ſhould enjoy that ſweet tranquillity, which is ſo juſtly due to your toils and conduct."

In 1764, "his guide, philoſopher, and friend," ſays, "your laſt letter of the 5th inſt. really conſoled me. From the ſerenity and pleaſantry with which it is coloured from the beginning to the end, I conceive that you are at length arrived at the ſecret of wiping from your mind that curſed ſoot with which it has ſo long been diſcoloured. I congratulate you on your ſucceſs, in an enterpriſe which borders on a ſpecies of heroiſm of which ſo few are capable. We have an infinite number of great men, who are venerated as models of knowledge and prudence, who have ſunk under cataſtrophes much leſs violent than yours. Happineſs, therefore, attend my dear Gemello! who has proved himſelf as much ſuperior in adverſity as proſperity, and who knows how to eſtimate human felicity better than thoſe who call themſelves philoſophers; and is in no want of ſcholaſtic jargon to enable him to ſtand firm and motionleſs in every guſt of wind. Heaven bleſs and keep you in this wiſe and placid ſtate for at leaſt half a century."

In 1771, in a letter to a Bologneſe lady who had boaſted of her acquaintance with Farinelli, he ſays: "your partiality, madam, for my dear Gemello, the cavalier Broſchi, is a new motive for the increaſe of that eſteem which I have always had for you: as his excellent diſcernment aſſures me of the merit of thoſe perſons with whom he is in habits of intimacy. And I envy you both that mutual enjoyment of each other's company, at which I can never aſpire." And in 1779, in a letter to the ſame lady, the venerable bard ſays "you have obliged me extremely my dear ſignora Giacinta, by honouring me with the continuance of your correſpondence, and aſſuring me of the affectionate remembrance which my dear and reſpected friend ſig. Carlo Broſchi retains for me, which I return with a mutual and moſt conſtant reciprocation. I love and eſteem him as much as it is poſſible for a man to be loved and eſteemed, who has ſo far ſurpaſſed all his peers, not only by his excellence in the charming art which he profeſſed, but by the uncommon virtuous qualities of his mind, which have rendered him amiable, and admirable, in every ſituation into which fortune has thrown him.

We have dwelt with more pleaſure on the virtues of this extraordinary vocal performer; as we fear they are more rarely found in muſicians than great talents. Poſſeſſed of irreſiſtible powers of pleaſing, they muſt be regarded as ſpoiled children of nature and of the public; who in their vital voyage, "are not only ignorant how to ſail before the wind, but how to tack, without loſing their ſteerage." However, if ſuch ſplendid fortune as Farinelli's has happened to but very few mortals, there have not been wanting inſtances of great vocal powers being united with ſound intellects, prudence, and good conduct, of all which we may ſafely venture to ſay that Pachierotti was eminently poſſeſſed.

FARINOLA, in *Geography*, a town of Naples, in Abruzzo Ultra; 11 miles S. S. E. of Teramo.

FARIO, in *Zoology*, a term for ſalmon when about half grown, after it is paſt the ſtate in which it is called a ſalar, and before it is of the full growth.

FARIS, in *Geography*, a town of Perſia, in the province of Comis; 30 miles S. E. of Biſtam.

FARLEE, a town of Bengal; 8 miles N. of Rangamatty.

FARLES, a river of North Wales, which runs into the Iriſh ſea; 4 miles W. of Crickaeth.

FARLEU, in *Rural Economy*, is a term uſed formerly, in the weſt of England, to ſignify the money paid by tenants in lieu of heriots. It is frequently underſtood in ſome manors of Devonſhire to be the beſt goods, as heriot is the beſt beaſt, payable on the death of a tenant.

FARLOF, in *Geography*, a town of Sweden, in the province of Schonen; 6 miles N. of Chriſtianſtadt.

FARM, in *Agriculture*, a term which formerly ſignified a ſmall meſſuage or diſtrict in the country, compriſing a houſe, land, and other conveniencies, which was hired or taken by leaſe, either in word or writing, under a certain yearly rent or charge; but which at preſent may be defined a certain portion of ground cultivated by the proprietor or tenant in different methods, according to the nature of the land, for the purpoſe of deriving profit from it. Theſe leaſes were differently denominated in different diſtricts or places; hence, in the more northern parts of the kingdom they were frequently termed *tacks* and *fermehalts;* while in ſome parts of the ſouth they had the title of *wikes*.

The word *firma*, ferm, or farm, in corrupt Latin, ſignified a place which was incloſed or ſhut in; whence it has been aſſerted by Menage, that in ſome diſtricts or provinces they term *cloſerie*, or *cloſure*, what in others is called *ferm*, or *farm*.

By Skinner and Spelman the word *farm* is, however, derived from the Saxon term *fearme*, or *feorme*, which ſignifies *victus*, *food* or *proviſion*, as the tenants and country people anciently paid their rents in victuals, and other neceſſaries of life, but which was afterwards converted into the payment of certain ſums of money. Hence a *ferm* was originally a place which furniſhed or ſupplied its owner or lord with proviſions. The Normans likewiſe diſtinguiſhed between *farms* which paid in kind, as in proviſions, and thoſe which paid in money, denominating the former ſimply *ferme*, or farm, while the latter were called *blanche ferme*, or *white farm*. The latter of the above writers has likewiſe ſhewn that the word *firma* anciently ſignified, not only what is now called a *farm*, but alſo a feaſt or entertainment which was given by the farmer to the owner, proprietor, or landlord, for a certain number of days, and at a certain rate, in conſideration of the lands, &c. which he held of him. Thus in the laws of king Canute, the term *fearm* is by Lombard rendered *victus;* and we have likewiſe *reddere firmam unius noctis*, as well as *reddebat unam diem de firma*, which evidently denote proviſion for a night and day, the rents about the time of the conqueſt being all reſerved in proviſions. This cuſtom is aſſerted to have been firſt altered under the reign of the firſt Henry.

There is a ſtatute, the 21 Hen. VIII. cap. 18. in which it is enacted that no parſon or ſpiritual perſon ſhall take *farms* or leaſes of land, on pain of forfeiting ten pounds per month, &c.

And by the 25 Hen. VIII. cap. 13, and the 32 Hen. VIII. cap. 28. no perſon whatſoever ſhall take above two *farms* together, in the ſame pariſh, under the forfeiture of three ſhillings and four-pence a week.

In conſidering the nature of farms, it is evident that there muſt be different ſorts, from the different methods in which they are cultivated or employed. Where the principal part of the land is under the plough they are termed arable farms; but where the fattening of cattle or other ſorts of live ſtock is more immediately the object, they are diſtinguiſhed by the title of grazing farms; where the chief intention is the obtaining different ſorts of animal products, ſuch as milk, butter, and cheeſe, they are denominated milk, cheeſe, and butter, or dairy farms; and where the two ſyſtems of arable and graſs management can be combined, they are called mixed, or convertible farms. As manure muſt be had in order to render farms of any kind productive, the laſt ſort may probably, in general, be conſidered as the moſt advantageous. And in addition to theſe, where hay is the principal object, there are graſs or hay farms; and where live ſtock is chiefly reared, cattle or breeding farms.

Moſt of the ancient writers on huſbandry, who lived in warm climates, or countries where the heat and moiſture of the air had ſenſible, and frequently very dangerous effects on the health of the inhabitants, were very particular in their directions for the choice of farms or eſtates, and of the ſpots whereon houſes ſhould be built, ſo as to avoid the inconveniences ariſing from the climate, or from the quality or ſituation of the ground. But though the temperate air which we enjoy in this iſland renders ſuch directions leſs neceſſary, yet, as ſeveral places in it are ſickly, and as, even in the moſt healthy ſituations, many houſes and villages are built upon the leaſt healthy ſpots, it muſt be of conſiderable advantage to thoſe who can make their choice to know what ſoils and places ought to be avoided; and of ſuch as are already fixed to be acquainted with the means of correcting thoſe inconveniences which cannot be totally remedied. The Romans had generally pleaſure as well as profit in view, when they bought or ſtocked a farm, and therefore they laid it down as a rule, that no degree of fertility ſhould tempt a man to purchaſe in an unhealthy country, nor the pleaſanteſt ſituations in a barren one. "Buy not too haſtily," ſaid the wiſe Cato, "but view again and again the purchaſe you intend to make; for if it be a good one, the oftener you ſee it the better it will pleaſe you. Examine how the neighbouring inhabitants fare; let the country it lies in be a good one, the ways to and from it good, and the air temperate; let your land, if you can chooſe your ſituation, be at the foot of a hill, facing the ſouth, in a healthy place, where a ſufficiency of labourers, of cattle, and of water, may be had; let it be near a flouriſhing town, the ſea, or a navigable river, or bordering upon a good and well-frequented road; let the buildings upon your ground be ſtrong and ſubſtantial; do not raſhly condemn the methods of others." It is beſt to purchaſe from a good huſbandman, and a good improver, where it can be done.

But, beſides the healthfulneſs of the ſituation, three other things ſhould be particularly attended to in the choice of a farm or eſtate; theſe are, the air, the water, and the ſoil. The air ſhould be pure and temperate, the water wholeſome and eaſily come at, and the ſoil rich and fertile. The knowledge of the healthineſs of the air is, as lord Bacon obſerves, diſcoverable rather by experiment, than by reaſon or conjecture. To examine the moiſture of the air before a houſe is built, wool, or a ſponge, may be hung up in the place and afterwards compared with ſome of the ſame, expoſed in the ſame manner, and at the ſame time in another place. According as they gain more or leſs in weight, the air is more or leſs humid. The air is liable to greater alterations from heat and cold in ſome places than in others; and as that inequality in the air is an enemy to health, the moſt equal ſhould be choſen. This is eaſily determined by the thermometer, and by viewing the ſituation of the place; for the intermixture of hills and valleys, though pleaſing to the eye, may be held ſuſpected as to the lengthening of life, becauſe of the variations of heat and cold.

It may be added, that the ancients were likewiſe particularly attentive to the quality of their water, and to the eaſe of coming at it. They adviſed bringing into the farm-houſes the water of ſuch ſprings as never dried up; or, if there was no ſuch ſpring within the farm, to bring running water as near to it as may be; or to dig for well-water, not of a bitter or brackiſh taſte. If neither of theſe was to be found, they directed large ciſterns to be provided for men, and ponds for collecting and retaining rain-water for cattle. They eſteemed that running water to be the beſt for drinking which had its ſource in a hill; ſpring or well-water from a riſing ground was deemed the next beſt; well-water in the bottom of a valley was held to be ſuſpicious; and marſhy or fenny water, which creeps ſlowly on, was by them rightly looked upon as the worſt of all.

That water is known to be wholeſome which has no mineral in it, is perfectly clear, has no taſte or ſmell, depoſits no ſlimy ſediment, leaves no ſpots or incruſtation when boiled in copper or braſs veſſels, and which boils pulſe in a very little time. As ſpring and well-water paſs through beds of ſand, gravel, or ſmall ſtones, theſe clear it of all impurities, unleſs there be mixed with them ſubſtances which are ſoluble in water. If any mineral is mixed with the water, it is unfit for the farmer's uſe. If it be hard, it is thereby rendered unfit for waſhing, and ſome other culinary uſes. This is the kind of water which gives fleſh boiled in it a red colour. But even the hardeſt water may be eaſily rendered perfectly ſoft, and fit for any uſe by mixing with it a ſmall portion of pot-aſh, or fixed alkali, or, for want of theſe, the aſhes of any burnt freſh vegetables, ſuch as the boughs of the aſh-tree, fern, &c.

And in reſpect to the goodneſs of the ſoil, it ſhould be judged of from a minute examination and compariſon of different circumſtances, ſuch as the appearances of the trees, hedges, crops, and different plants that are produced upon it, as well as from its particular nature and colours.

On the Proper Size of Farms.—In regard to the conſideration of the proper ſize of farms, it may be remarked that it is not propoſed to decide as to the preciſe number of acres which conſtitute what is generally denominated a proper ſized farm. The perſon who attempts to do ſo will, it is ſuppoſed by a late writer, be involved in difficulties from which he will find it impoſſible to extricate himſelf; while his hypotheſis muſt be liable to ſo many objections, as to evince, in the cleareſt manner, that without conſidering the ſubject in various points of view, it is impoſſible to form even a general concluſion. This ſubject, which, though apparently ſimple, involves a great variety of particulars, may probably be beſt elucidated, by explaining how far large and ſmall farms are advantageous or otherwiſe to the proprietors, the occupiers, and the nation in general. There is probably no point within the range of huſbandry which has, however, cauſed more ſerious altercations and diſputes with theoretical agriculturiſts and ſpeculative political economiſts, than that of the ſize of farms. By ſome it has been ſtrenuouſly contended that they ſhould be altogether ſmall; while others have maintained, with equal pertinacity, that they ſhould be large, and others again have ſuppoſed that they ſhould be of various ſizes, reſtricting the largeſt to a certain number of acres. But all ſuch plans are obviouſly of an impracticable nature. In a country where the capital and means are ſo various, it muſt evidently be of great advantage to have farms of very different ſizes, both in reſpect to extent of land, and that of rent, or annual value; as, by this means, the honeſt and induſtrious labourer in huſbandry may be properly accommodated, and by degrees become wealthy and independent; while at the ſame time the expert, ingenious, and improving cultivator, who poſſeſſes extenſive capital and information, may not be diſappointed in embarking in ſuch undertakings of this kind, as may amply repay his ſuperior ſkill, capital, and induſtry. The nature of the management of a diſtrict, as well as that of the ſoil, ſhould likewiſe, in ſome meaſure, regulate the ſize of the farms. Thus, where ſheep-walks prevail, or the grazing ſyſtem is extenſively purſued, they ſhould be large; but where the plantation or orchard practices are followed, they ſhould be ſmall. Both in the ſtiff, wet, and hard dry clayey ſoils, the farms ſhould be large, that the farmers may have ſufficient ſtrength to work them at the proper ſeaſons, which is very ſeldom the caſe when they are ſmall. But the free, deep, medium ſoils, which are wrought with much leſs difficulty, may anſwer well in ſmall farms.

Large Farms.—It has been ſuggeſted by a late writer that if the introduction of improvements in cultivation, and the breeds of the different ſpecies of live ſtock, are objects of importance to the proprietors of the kingdom as individuals, large farms muſt be conſidered by them as beneficial. As individuals, alſo, they muſt experience other advantages from large farms. The extent of capital employed in ſtocking and cultivating theſe farms inſures a regular and prompt payment of the rents. Building and repairing farm-houſes on ſuch farms, although conſiderable at firſt, is not ſo heavy an annual charge as on ſmall farms; while the expence of incloſing and ſub-dividing does not amount to one-tenth part. It was fortunate, the writer thinks, for Britiſh farmers, as well as for Britiſh huſbandry, that proprietors adopted the reſolution of letting part of their eſtates in large farms. By that means men, poſſeſſing every requiſite for conſtituting them good farmers, turned their attention to the cultivation of the ſoil, and the introduction of every improvement connected therewith; and, in very many inſtances, have not only been ſo ſucceſsful as to maintain and educate their families in eaſe and comfort, but alſo to acquire ſuch fortunes, as to render them independent proprietors: a circumſtance that muſt give ſincere ſatisfaction to every liberal mind; as from the ſervice they have done in promoting the intereſts of agriculture, they are well entitled to enjoy the fruits of their induſtry. In regard to the community large farms, the writer ſays, muſt be conſidered as favourable in ſeveral reſpects. On what farms, he aſks, in Norfolk, have turnips been cultivated, and uſed to the greateſt advantage? On what farms in the Carſe of Gowrie in Scotland has the cultivation of grain been moſt ſucceſsfully carried on? In Leiceſterſhire, where have the greateſt improvements in the different breeds of live ſtock been effected? In the counties of Northumberland and Berwick, where have improved breeds of ſtock been moſt generally united with ſkilful culture? Every perſon who has travelled through theſe diſtricts, with a view of procuring agricultural information, muſt, he thinks, anſwer, On large farms.

It is from large farms alſo that the towns are principally ſupplied with the great articles of grain, fat cattle, and ſheep of the beſt quality. And as farms of this ſize are kept in the higheſt ſtate of cultivation, of which the lands are ſuſceptible, and managed with the feweſt number of hands; the greateſt quantity of produce that can be ſpared from the like extent of land neceſſarily goes to market. To the occupiers of large farms it is alſo chiefly owing that the ſupply of the towns in theſe indiſpenſible articles is ſo regularly kept up. If theſe farmers could not afford to keep their grain and fat ſtock on hand, till thoſe of the poorer tenants were diſpoſed of and conſumed, the markets would either be over-ſtocked at particular ſeaſons, and entirely empty in others; or, what is equally bad, the articles would get into the hands of a few dealers, who, by mutual conſent, might raiſe the price to any extent they pleaſed, notwithſtanding any acts of parliament againſt foreſtalling, that could poſſibly be framed.

There is one particular deſcription of farms which ought to be taken notice of here; theſe are in ſome places called *Led-farms*, in others, *Graſs-farms*. Many farmers rent one or more large farms in different parts of the country, which are managed by an overſeer. Theſe are, the writer conceives, for the intereſt of the proprietor, becauſe he generally receives a higher rent than could be afforded, were the farmer's family to be maintained from the profits of any of them alone: a great proportion being alſo allowed to remain in graſs, the lands muſt be in an improving ſtate. The farmer, after paying the extra rent, and the wages of an overſeer, ſtill retains that proportion of profits which renders the renting of ſuch farms an object to him; but, when it is conſidered that the farmer's cloſe attention to minute particulars in the management of a farm is abſolutely neceſſary to make it to the higheſt degree profitable, it is by no means clear, that the greateſt produce which ſuch farms are capable of yielding goes to market. The great, and indeed the only ſolid objection againſt large farms is, in his opinion, the conſequent depopulation of the country. This, it will be generally acknowledged, is a moſt ſerious evil, and ought to be guarded againſt as much as poſſible. The remedy, however, in Scotland, it is conceived, is eaſy, and in many places adopted; namely, by building cottages on the outſkirts of the farms, and hiring ploughmen who are married, and have families. Theſe men are allowed graſs for a cow, and a ſmall quantity of ground for cultivating grain, potatoes, and garden-ſtuff, in part of their wages. Were this plan generally introduced in both kingdoms, the grand objection againſt large farms would, the writer conceives, be in a great meaſure removed; the deſcription of inhabitants would, no doubt, be changed, but the population would ſuffer no material decreaſe, and, at the ſame time, nearly an equal quantity of free produce would find its way to market, as in any other caſe.

The intelligent author of the corrected Report of the County of Cheſter likewiſe contends for the ſuperior advantage of large farms on the following grounds. "Twenty or thirty acres of land cannot, ſays he, in the nature of things, furniſh full employment to a farmer; nor is the profit which they afford by any means adequate to the comfortable ſubſiſtence of a family: a man, therefore, who enters upon a farm of this deſcription, muſt either have ſome other occupation, to which he directs a great ſhare of his attention; or muſt unavoidably be ſubjected to poverty, and all its concomitant diſtreſs. In either of theſe caſes, the diſpoſition of the land cannot but be regarded as unfavourable to the general intereſts of agriculture; in the former, farming being made an object of ſecondary conſideration, and frequently being very imperfectly underſtood, the cultivation of the land is ſeldom carried to its practicable length, and, conſequently, a certain proportion of produce is virtually loſt to the community; in the latter caſe, the evils reſulting from a farm of this deſcription are ſtill more decided in their nature; ſince it will be generally admitted that no ſpecies of occupation can be beneficial in its conſequences to the country at large, which is not ſo to the individual immediately concerned in it. The ſame reaſoning will apply equally to farms of forty or fifty acres: whereever the extent of land is not ſufficient to furniſh full employment to the farmer, and a comfortable ſubſiſtence to his family, a certain portion of perſonal exertion muſt neceſſarily be loſt, and the conſequences muſt be unfavourable, whether conſidered individually, or in a national point of view.

"Another ſerious objection to ſmall farms may be grounded on the difficulties they oppoſe to general improvements in agriculture. A farmer, entering upon thirty or forty acres, very frequently with a high rent, and little or no capital, cannot be expected to make any material improvement on his land, or to attempt experiments in cultivation, which are probably, expenſive in the firſt inſtance, and uncertain in the reſults they may afford. All that he can do is to purſue the old-beaten track; to force out of the ground the payment of his rent, and a bare ſubſiſtence for his family, and fortunate may he eſteem himſelf if he ſucceeds ſo far as to do this. On the other hand, the man who farms a conſiderable extent of land can purſue with vigour any new modes of agriculture that appear likely to be attended with beneficial effects; the poſſeſſion of a competent capital enables him to undertake, and put into execution, any improvements of which his farm is ſuſceptible, till by theſe means his lands are brought to the higheſt ſtate of fertility. The opportunity which is afforded him, of making one department of his farming economy ſubſervient to another, is an additional advantage which the farmer on a ſmall ſcale cannot carry into effect to any great extent. The latter too muſt neceſſarily expend on his land a quantity of capital greater in proportion than is required in a farm of more conſiderable ſize; he muſt have his cart and horſes, his plough and his harrow, and every other agricultural implement, as well as his neighbour, though he has only thirty acres, and his neighbour eighty or a hundred. Reverting then to the well-eſtabliſhed, and, indeed, ſelf-evident axiom in political economy, that capital is moſt advantageouſly employed, when, with a given quantity, the largeſt proportion of produce is the reſult; it ſeems ſcarcely to admit of a doubt, that large farms are, in this point of view, greatly more beneficial to the nation at large, than thoſe of ſmall extent only.

"The principal objections to large farms are, he ſays, founded on the tendency, which, as already noticed, it is aſſerted, they have to diminiſh the population of the country, and to increaſe the price of proviſions. It is obvious, however, he thinks, that both theſe objections cannot ſtand their ground at the ſame time. If the population of the country be diminiſhed, while the produce of the ground is increaſed, or even while it remains the ſame in point of quantity, it is clear, that no increaſe in the price of proviſions can take place; on the contrary, it would be natural to expect a very conſiderable reduction in this reſpect. As theſe objections againſt large farms may, however, be urged individually, it is proper that a diſtinct anſwer ſhould be given to each of them. With reſpect to its influence on population, it cannot be denied that the conſolidation of ſeveral ſmall farms into one of larger extent might have the immediate effect of throwing a number of individuals out of employ; many of whom, from the inadequate demand for labour of other kinds in the country, would be neceſſitated to have recourſe to emigration. But this effect could be of only temporary duration. If, in conſequence of the diminiſhed number and increaſed ſize of farms the improvements in agriculture became more extended, and its general ſtate more flouriſhing, it can ſcarcely be doubted but that the ultimate effect in this change in the diſpoſition of the land muſt be favourable to the population as well as to the proſperity of the country. The immediate effects of the adoption of improved modes of cultivation, and of the increaſed quantity of produce from a given proportion of capital, muſt be a diminution in the price of proviſions. As a neceſſary conſequence of this the price of labour muſt likewiſe be diminiſhed; or, to ſpeak in more general terms, an increaſed value would be given to the circulating medium; a circumſtance highly favourable to a country, as it regards its commercial and manufacturing connections with other nations. The equalizing nature of commerce would, indeed, in proceſs of time, reſtore this value to its accuſtomed level; but the impulſe which had been given, meanwhile, to induſtry of every kind, could not fail to inſure internal proſperity, and, conſequently, an increaſe of population to the country. If this reaſoning be accurate, there appears, ſays the writer, no grounds for doubting that the enlargement of farms, to a certain extent, at leaſt, would be productive of eſſential benefit to the real intereſts of the nation; a trifling diminution in population might, perhaps, indeed be the immediate reſult of the meaſure in queſtion ; but that the ultimate conſequences of its operations would be injurious in this reſpect does not appear probable.

“ The objection which has been urged againſt large farms, as tending to enhance the prices of proviſion, ſeems equally void of validity. The grounds of this objection are, that, by the enlargement of farms, the competition which exiſts between ſmall farmers would be in a great meaſure loſt, and a ſpirit of monopoly introduced in its ſtead. In anſwer to this, it may be ſufficient to aſk the ſimple queſtion, why may not this competition, eſteemed ſo advangeous to the country, take place among farmers who hold two, three, or four hundred acres of land, as well as among thoſe who hold thirty or forty ? That this is contrary to experience the writer can by no means allow. Wherever monopoly has been the immediate cauſe of an unuſual high price of corn, or other neceſſaries of life, it muſt, he conceives, have been practiſed on a much larger ſcale than could be done by any combination of farmers in the country. In fact, a very ſlight conſideration muſt prove the futility of any objections to large farms veſted on theſe grounds. Suppoſing, for the ſake of argument, that the farmers in one county or diſtrict ſhould combine to keep their ſtocks out of the market, and thus to raiſe the price of proviſions ; is it at all conſiſtent with probability to ſuppoſe that the farmers, in the neighbouring diſtricts, would favour this ſcheme, by retaining their individual ſtocks ; on the contrary, is it not more likely that they would immediately come forward to ſupply the deficiency in the market, and thus counteract the deſigns of their more avaricious neighbours ? Indeed it appears a point ſo clear, that the ſame competition of intereſts muſt exiſt among large as well as among ſmall farmers, that the writer apprehends no concluſion can be deduced from this circumſtance which will not apply with equal force to both caſes. If then this competition renders proviſions cheaper where the farms are ſmall, will it not have preciſely the ſame effect where they are of large extent ? And does it not appear highly probable, that a very conſiderable diminution of the price of proviſions would be the conſequence of the general enlargements of farms in the kingdom ? This, as was ſtated before, muſt, in the natural courſe of things, be the immediate effect of improved modes of cultivation, and of an increaſed quantity of produce from a certain given expence of capital.” The able writer does not here by any means contend for an indefinite extenſion of the ſize of farms ; but merely ſuggeſts that thoſe of three or four hundred acres are ſuperior, in point of advantage, to individuals and the country, to thoſe of from thirty to ſixty acres.

Small Farms.—It is contended by the firſt of the above writers that theſe are, no doubt, advantageous to the proprietors, in ſo far as the greateſt number of Britiſh farmers are poſſeſſed only of ſlender capitals ; and therefore, when ſmall farms fall out of leaſe, ſeveral candidates immediately appear. The operations on the farm being for the moſt part conducted by the farmer's own family, the expence of hired ſervants is ſaved, and he is thereby enabled to give a higher rent than could otherwiſe be done, without changing the imperfect ſyſtems of agriculture, too commonly practiſed on farms of this deſcription. The advantages in favour of the proprietors are, however, probably fully counterbalanced by the imperfect modes of cultivation above alluded to : the additional expence to which they are ſubjected by upholding farm-houſes on an eſtate let in ſmall farms ; to which may be added, the very great extra charge which muſt unavoidably be incurred in incloſing and ſub-dividing an extenſive tract of land into ſmall fields. It is, no doubt, for the intereſt of ſuch tenants, that there ſhould be a great number of ſmall farms. The limited extent of their funds, and their knowledge and influence in the ſcale of ſociety, would put it totally out of their power to embark in large undertakings of this nature ; and if all proprietors were to adopt the reſolution of letting no farms under a certain ſize, then people, as often happens, would be forced to turn their attention to ſome other employment, by which they could maintain their families. In a national point of view, ſmall farms are, the writer thinks, undoubtedly advantageous. Large cities and towns are confeſſedly inimical to the increaſe of population, and would, in time, be in a great meaſure without inhabitants, but for the conſtant and regular ſupply which the country furniſhes. Small farms are not only in favour of population, but of the moſt valuable ſort of population ; as, in conſequence of the ſhare of education which many of them obtain, the children of ſuch farmers become valuable acquiſitions to the artiſt and manufactures. If, ſays the writer, ſmall farms were entirely aboliſhed, a great part of the occupiers muſt retire to towns, and engage in ſome branch of manufactures. At the commencement of every war our manufactures receive a ſhock, from numbers of hands being called off to ſerve their country in our fleets and armies. Were this ſupply to be drawn chiefly from the towns, which in this caſe would certainly happen, what then would be the ſtate of our manufactures, that great prop of national proſperity ? In a word, it is owing, in no ſmall degree, to the diſtribution of ſo large a ſhare of the country into ſmall farms, that the proper equilibrium of population between the towns and the country ſo neceſſary to be preſerved, is maintained. It is true, that owing to the number of perſons of which the families of this claſs of farmers are generally compoſed, and the imperfect manner in which the lands are too frequently cultivated, a very ſmall proportion of the great article of bread-corn goes to market. But the no leſs neceſſary articles of milk, poultry, eggs, and, in many caſes, fuel, are furniſhed to the inhabitants of the towns and villages in much greater quantities from half a dozen of ſmall farms, than from one of ſix times the extent. To this liſt may alſo, the writer thinks, be added butter and cheeſe, with a few exceptions only, where dairy-huſbandry is practiſed on a large ſcale. It would, the writer conceives, be extremely difficult to determine which of the ſizes of farms before mentioned are in every point of view moſt beneficial. There is, however, as has been already noticed, no occaſion to heſitate in deciding, that a variety in the ſize of farms is not only for the intereſt of all concerned, but abſolutely neceſſary for the proſperity of the ſtate. Were the farms all ſmall, the population of the country would exceed the due proportion of the towns, and the quantity of proviſions which it would be neceſſary to import would be immenſe. If the country was wholly divided into large farms, and unmarried ploughmen principally employed, as is the caſe at preſent, the towns would be overſtocked with people ; and unleſs the prices of cheeſe, butter, milk, eggs, poultry, fuel, &c. were advanced, ſo as to make it an object to that deſcription of farmers to ſend them to market, a very ſcanty ſupply would be furniſhed. The diverſity in the ſize of farms in the iſland is, ſays the writer, no doubt in favour of, and muſt be agreeable to, the farmers ; for, as they differ in knowledge and enterpriſe as much as in the extent of their capitals, they will naturally conſider that farm as of the moſt proper ſize which is upon the whole beſt ſuited to their particular circumſtances and ſituations. Farms of the largeſt extent, the management of which a farmer is able himſelf minutely to ſuperintend, muſt neceſſarily prove the moſt profitable ; therefore, were the knowledge, enterpriſe, and capitals of farmers all alike, large farms would be conſidered by them as of the moſt proper ſize. There is, however, no view of the ſubject, by which it will be found that any one ſize of farms would be generally advantageous. On the contrary, it is clear, the writer thinks, that the greater variety there is in the extent of farms, provided that variety is general over every diſtrict in Great Britain, the more extenſively will the general intereſts of the nation at large be promoted and brought forward.

In conſidering the controverſy reſpecting large and ſmall farms, Mr. Marſhall remarks, that thoſe who are in favour of the firſt are chiefly men of public ſpirit, who have turned their attention to agriculture; and having found, or perceived, that farms of magnitude, conducted by men of judgment, ſpirit, and capital, abound in corn and cattle of the higheſt qualities, have concluded, he thinks, without any further examination, that all farms ſhould be large. Thoſe ſupporting the latter poſition, with equal pretenſions for the public good, conſiſt, he ſuppoſes, of minor gentlemen, the clergy and other profeſſional men, tradeſmen, and others in middle life, who live in towns; and who, finding the prices of poultry, eggs, and other good things, greatly enhanced of late years, imagine that the modern enlargement of farms muſt be the cauſe, conſequently call out loudly for a diviſion of large farms; in order, it may be inferred, that articles of luxury may become plentiful; not regarding, or perhaps not knowing, what an expenditure of poor men's food is occaſioned by the rearing and fattening of poultry. The ſame barley, or other grain, which has been uſed in rearing and fattening a fowl, to ſupply one diſh of an epicure's dinner, would have furniſhed a labourer's cupboard with bread for ſeveral days. But admitting what is obvious, that farms of magnitude, cultivated by wealthy and ſkilful men, furniſh the markets with a greater proportion of the common neceſſaries of life, than ſmall ones in the hands of poverty and ignorance, it is but common prudence to examine into the effects which would follow a general enlargement of farms, to be managed by wealthy men; and to conceive how the markets would be ſupplied, under ſuch a regulation, before it be carried into effect. If at preſent (1801), when the country contains farms of all magnitudes, and cultivators of all deſcriptions, there is a general cry againſt farmers, for keeping back their corn from market, what evil and outrage might not be expected were all the lands of the kingdom in the hands of the wealthy? If the prices of grain after harveſt ſhould not meet their expectations, they would, in conſequence, defer to threſh out more than for their own uſes. And although they might have cauſe of repentance the enſuing ſummer, this would not relieve the diſtreſſes of the famiſhed poor in the mean time; while, on the contrary, were all the farm lands of the country in the hands of the needy, the reverſe would be the conſequence. Preſently after harveſt, the produce would be hurried to market too faſt for the conſumption, and the ſurplus would neceſſarily fall into the hands of dealers, who, beſides reſerving on all occaſions an allowable profit, would have it in their power to fix their own prices during the ſummer months. Of courſe either of theſe extremes would be productive of ſerious evil. What the community require, with reſpect to farm produce, is to have the markets regularly ſupplied by the growers, the immediate producers, whether of vegetable or of animal food; without its paſſing through the hands of middle men unneceſſarily. Hence it is evident, that to obtain a regular ſupply of the corn market by the growers themſelves throughout the year, cultivators of different deſcriptions are requiſite; needy men, who want an immediate ſupply of money, after harveſt, to pay ſervants' wages and Michaelmas rents; men without affluence, who threſh out their corn in the winter months; and opulent, purſe-proud, ſpeculative men, to ſupply the markets during ſummer and early autumn. And this moſt deſireable order of things the country happily enjoys at preſent in a conſiderable degree. Nay, even admitting that the higher claſſes, who reſide in towns, are entitled to the indulgence of luxuries out of the produce of lands, we ſtill perceive the propriety of a gradation of farms; inaſmuch as it furniſhes large farms to feed the poor, and ſmall ones to pamper the rich. Though, in a general view of the country in this point, no great alterations are requiſite; yet, when examined in detail, it admits of ſome improvement. There are diſtricts which abound too much in ſmall farms, others in large ones, and ſome in farms much too large for accurate management in any way. And if the ſubject be viewed in the light of good government, and the permanent welfare of the country, a ſimilar gradation in the ſizes of farms appears to conform with right reaſon. The tenantry of a country may be ſaid to occupy the wide ſpace in ſociety which intervenes between labourers and men of landed property; and ſurely they ought to form a regular chain between them. But make the farms of the country either uniformly large, or uniformly ſmall, and a number of links would be wanting. In the former caſe, particularly, a wide breach or chaſm would be formed, a void ſpace between a numerous peaſantry and their petty lords; a ſtate of civilized ſociety this, which has no foundation either in reaſon or ſound politics, which require a regular gradation from the peaſant to the prince, and from the higheſt to the loweſt in ſociety; ſuch a one as we fortunately find in this country at this time. And viewing the ſubject in a moral light, the preſent order of things appears to be nearly right. If farms were either uniformly large, or uniformly ſmall, induſtry, frugality, and emulation (the ſinews and nerves of ſociety,) would, among the lower claſſes in agriculture, loſe their ſtimulus. If a farm ſervant or a labourer ſaved a few pounds, or had fifty or a hundred pounds left him, he could not employ them in his own line of life. He would either diſſipate them, live on them as an idler, or carry them into ſome other line of buſineſs. Whereas at preſent, at leaſt in diſtricts in which farms of the ſmaller ſizes ſtill abound, there are many inſtances of ſervants of the loweſt order riſing to affluence, merely by the help of their own induſtry, frugality, and a natural ſpirit of emulation, cheriſhed and led on by the gradation of farms.

But as *large* and *ſmall* are merely comparative terms, "the extent of largeneſs, or greateſt ſize, is the chief conſideration; and this depends, in ſome meaſure, on the nature of the lands to be occupied, and the particular plan of management to which they are ſubjected. For it may be ſafely aſſumed, that no man ought to occupy more land than he can perſonally ſuperintend. But in a diſtrict applied to ſheep-walks farms of ſize are required; eſpecially in a bleak or open country, where they require a conſtant attendance. A ſhepherd will take care of two or three hundred ſheep as well as of a ſmaller flock. And an active ſheep farmer, who knows his buſineſs, may well ſuperintend ſeveral ſhepherds. Hence, in a paſſage of country applied wholly or principally to ſheep-farming, individual holdings of more than five hundred pounds a-year (eſtimated according to the preſent value of money) appear to be politically admiſſible. Alſo in marſh land diſtricts, applied to grazing, farms of magnitude may be admitted. The occupier in this, as in the former caſe, has only one object; and like a manufacturer of a particular article, or a man conducting one particular branch of trade, he may extend his buſineſs to almoſt any limits. But, that in diſtricts and ſituations in which the arable and graſs-land management mix, or ought to intermix, the caſe is very different. For here not only markets, and the management of ſtock of various kinds require attention, but the ſeaſons, or even a ſhower, may fruſtrate the beſt laid plan, and render the maſter's preſence neceſſary to accurate management. Here ſervants, and workmen of various employments, working animals, and implements, call for hourly attendance in the field; while the different departments of the home-ſtall demand almoſt conſtant ſuperintendance, equally to guard againſt negligence and diſhoneſty; in the winter ſeaſon more eſpecially; to ſee that every grain of corn, and every handful of fodder, is applied to its proper uſe; and that no waſte, even of manure, is ſuffered to take place. During the ſpring and ſummer months the corn farmer's time and attention are more required in the field; to ſee that every perch of ground he occupies is applied to ſome profitable purpoſe, or is put under a courſe of preparation for future crops; as well as to defend exiſting crops from enemies, whether animal or vegetable; to protect them equally from domeſtic ſtock, vermin, and weeds. In harveſt his conſtant and active exertions are called for; not only to preſerve his ripened crops, as much as in him lies, from injury by the weather, but from ſpoil and waſte, by the careleſſneſs of work-people in the various operations which they muſt neceſſarily undergo. And in autumn his moſt ſerious thoughts are wanted to look forward to the general management of the enſuing year. All theſe attentions, and innumerable others, the public have a right to expect from the occupiers of lands, in a country whoſe appropriated lands have been found by many years experience to be inſufficient, under the preſent imperfect ſtate of agriculture, to ſupply its inhabitants with the common neceſſaries of life. Thus, ſeeing the weight of care and forethought which every ſufficient huſbandman has to ſuſtain, we may venture to conclude that there are few men who have attention and activity enough to manage politically more than five hundred acres of land, in a ſtate of mixed cultivation, and worth, according to the preſent rental value of lands, five hundred pounds a-year; even though they lie compactly round one central farmery. It is not here meant that there are few men who are able to manage more than 500*l.* a-year with profit to themſelves. Many a man gets rich with three times the property under his care; and lying perhaps in three diſtinct farms. But no wonder, for he may be ſaid to be receiving three men's incomes, with only one family to maintain. If, through the inaccuracies and inattentions of management, he loſe even half what two other occupiers would have gained, ſtill he is doubling his own income, by holding three inſtead of one farm. He gets two profits, and the community loſe the third."

It is further ſuppoſed that a farm of 500*l.* a-year, which is compoſed of inferior lands, as thoſe which are worth ten ſhillings an acre, is too large for one man to manage politically. A thouſand acres lie too wide for one ſet of farm offices. The great length of carriage of crops and manure, and the travelling of plough-teams and workmen of every deſcription to diſtant grounds, occaſion a waſte of labour, beſide the waſte of ground by lengthened roads and drift ways, and the injury done to ſtock by a length of drift. And no man can ſuperintend two home-ſteads with political accuracy. But to excite emulation, and to encourage men of capital, education, and ſpirit, to enter into, and perſevere in the profeſſion; to ſtudy its higher departments, and take the lead in practical improvements, a ſmall proportion of corn farms of five hundred pounds a-year may be politically eligible. It may be added that the lower extremity terminates in the cottage and its cow ground; which may be ſet down at five pounds a-year. This, however, is a ſort of farm which, like that of five hundred pounds a-year, ought to be kept within bounds as to number, this being of the two the leaſt political; unleſs as the loweſt ſtep of the ladder of emulation. Thus, in a public light, it appears that the ſizes of farms on lands of good quality, and adapted to *mixed* cultivation, ought to extend from thoſe of five pounds to thoſe of five hundred pounds rental value. But that the proportional number towards each extremity ought to be ſmall. For to the writer's mind it appears evidently, that it is from farms of the middle ſizes, as thoſe of one to three hundred pounds a-year, the community receive the greateſt proportion of the common neceſſaries of life. It is chiefly among the cultivators of farms of theſe ſizes that we find the three principal requiſites of good huſbandry, namely, capital, ſkill, and induſtry. On farms below theſe ſizes, the firſt, and frequently the ſecond, is wanting; and on thoſe of higher magnitude the laſt is apt to be deficient.

On Laying out Farms.— In this buſineſs there is conſiderably more difficulty than is generally ſuppoſed. But it has been ſtated by a late able writer on landed property, that much depends on the natural and acquired circumſtances of the different lands or eſtates. The ſituation, the ſoils, the preſent ſtate of occupation or ſyſtem of management, and the preſent ſize of the farms, require to be maturely ſtudied, and duely weighed, before any effective ſteps can be ſafely taken. It is an arduous taſk to alter the arrangement or general economy of an eſtate with profit and credit to its proprietor; even when the whole is rented at will, or from year to year. Where leaſes exiſt, difficulties are increaſed; and the day of improvement is placed at a greater or leſs diſtance. Nevertheleſs, a man who has at his heart the permanent good of the eſtate which he poſſeſſes will look forward, and concert plans for its future improvement and welfare. And as an eſtate which is judiciouſly laid out into compact farms, of ſuitable ſizes, is worth conſiderably more by the year than one of the ſame intrinſic value whoſe lands lie ſcattered and intermixed in farms of improper ſizes, he will not fail to ſet on foot a plan of reform, which requires nothing but attention and perſeverance to be accompliſhed. The firſt attention required is to ſtudy its natural characters, to view it as in a ſtate of nature, and without inhabitants; marking the elevation and turn of its ſurface, whether it conſiſts of mountain, upland, vale, or water-formed lands, and aſcertaining at the ſame time its ſoils, ſub-ſtrata with regard to their abſorbency or retentiveneſs; thus determining to what uſes its ſeveral parts are adapted, whether to ſheep-walk, or grazing grounds, meadow lands, or mixed cultivation. Having ſurveyed the ſheep-walk and grazing ground, he ſhould trace the natural and fortuitous lines of the culturable lands; as the feet of ſteep hills, the ridges of uplands, large rivers, public roads, &c. &c. theſe being data which cannot well be diſregarded. Where a blank is given, ſuch as an extent of newly appropriated lands, to lay them out into what may be termed natural farms, of ſuch ſizes as will bring the moſt permanent rent at the leaſt expence of buildings, yards, private roads, drift ways, and fences. And to this end the moſt natural, or eligible ſites for farm-ſteads, are to be ſought for with attention; laying to thoſe which are the moſt eligible ſuch lands as by natural ſituation, and natural quality, belong to them. Thus laying out the lands to the beſt advantage; and producing farms of different ſizes; thereby inviting good farmers, with different capitals, to ſettle upon the eſtate. The principal requiſites of a home-ſtall, for a farm in mixed cultivation, are ſhelter and water, for domeſtic purpoſes as well as for the uſe of yard ſtock; with ſome permanent graſs ground below the yards, to receive the overflowings of the dung baſons, that nothing of manure may eſcape or be loſt from the premiſes. Where lands lie in a ſhelving ſituation, it is generally deſirable to have the home-ſtead near the midway of the ſlope. Thus gaining a centrical ſituation, and having lands above as well as below the yards; ſo that neither the whole of the crops, nor the whole of the dung, may require to be drawn againſt the hill at a buſy ſeaſon. A dip or ſhallow valley, with a natural ſtream falling down it, and with lands in the lower part of it, which are capable of being converted into watered mowing ground, is in general a deſirable ſite for a home-ſtead.

However, when an eſtate is already inhabited, and laid out into farms, with the farm-ſteads fixed, and the buildings ſubſtantial, it requires much thought and ſome time to make great alterations, either with credit or profit to its proprietor. Where the lands of different farms lie ſcattered and intermixed with each other, as they too frequently do, either through circumſtances that were unavoidable perhaps at the time they took place, or through improper indulgencies to favourite tenants; or through the ignorance or negligence of managers; or the leſs pardonable deſign of thoſe who have had an intereſt in the diſſentions which the intermixture of lands ſeldom fails to create; ſomething may generally be done towards leſſening or remedying the evil; even where parts of an eſtate are under the temporary alienation of leaſes; through the means of amicable exchanges between tenants. This is a ſpecies of improvement which ought to be ſedulouſly attended to by the managers of eſtates, as lands which lie compact and convenient to the home-ſtall are worth conſiderably more to an occupier than thoſe of the ſame intrinſic value, which are ſcattered at a diſtance, ſo that by this ſort of exchange a two-fold advantage comes home (or will come at the expiration of the leaſe or leaſes) a clear income to the proprietor; beſide rendering the management of the eſtate more eaſy and pleaſurable. And in caſes where the entire eſtate is rented from year to year, the conſolidation of farms may be effected with leſs difficulty, and the two-fold advantage be immediately enjoyed.

It is adviſed, in order to conduct the buſineſs of a general arrangement, regulation, or reform of an eſtate which is already laid out into farms, with full effect, to ſtudy it as a blank, in the manner as if it were in a wild or unappropriated ſtate; to aſcertain its natural or moſt eligible home-ſteads, and the lands which, by ſituation, belong to them; then to examine the exiſting farm-ſteads, buildings, roads, drift ways, and incloſures, and by duly conſidering the aggregate of facts thus adduced, to endeavour to make out ſuch a plan of improvement as will ſecure the greateſt clear and permanent rent, at the leaſt expence, without driving from the eſtate the deſerving part of the exiſting tenantry. And a plan of reform being fixed, let the intended farms be outlined and coloured on a general map of the eſtate; and this done, let each be ſeparately delineated on a ſmall map ſuited to the pocket, that the propoſed arrangement may be continually under the manager's eye, whether in the buſineſs-room or upon the eſtate. This method of conducting a plan of reform, which has been repeatedly experienced, is equally applicable to an eſtate which is wholly at will, and to one which is partly under leaſe; every favourable opportunity being taken as the leaſes fall in, to carry the plan into execution, always keeping it in view from the time it is formed; and, in conſequence, letting down buildings, or repairing them in a temporary way, where they will not be wanted, and keeping them up, in a ſubſtantial manner, where they will be eventually required. And where the farms are too large, or the farm-ſteads very improperly placed, but where the exiſting buildings are yet in a ſubſtantial ſtate, it requires to be calculated whether the increaſe of rent by the propoſed alteration will pay ſix per cent. for the money required to be laid out in making it, taking, however, into the account, the ſuperiority of new buildings. The erecting of an entire range of farm-buildings, with the requiſite appendages, is an undertaking which, in private economics, demands mature conſideration. There are caſes, however, in which it may be effected with profit, and many in which it may be done with credit and reſpectability to thoſe employed.

Where the farms are too ſmall, ſuitable aggregations ſhould be made, and each of theſe be coloured on the maps as one farm, the alterations being afterwards made as circumſtances may direct; preference being ever given to the moſt deſerving managers, and every fair opportunity taken to diſmiſs the undeſerving. By this eaſy means, giving the moſt impreſſive leſſon on good management to the tenantry of the eſtate, the beſt effects are produced in this way.

But it is to be further remarked, on the ſubject of laying out farm-lands into ſuitable tenements, that although compactneſs of form and centrality of home-ſtall are always deſirable, they are not the only objects to be attended to. The ſpecific qualities of the lands of the eſtate are another ſubject of conſideration. If the lands of an eſtate are naturally adapted to different purpoſes, as cool ſtrong lands, fit for perennial mowing-grounds, eſpecially if they can be profitably watered, and dry uplands that are ſuitable for mixed cultivation only; a portion of each ought, according to long-eſtabliſhed ideas, to be included in every farm: a principle this, however, which is generally deſtructive of the compactneſs of form. And a more modern opinion is, that perennial graſs-lands are not at all neceſſary to profitable farming, cultivated herbage and roots being equal to all the wants of modern huſbandry. Nevertheleſs, where a ſuit of meadow and paſture grounds can be properly united with arable lands, it will generally be for their mutual benefit to unite them. This, however, is to be done by a general arrangement, not by making up disjointed farms with lands lying in diſtinct and perhaps diſtant parts of a pariſh, as we not unfrequently ſee. For the extra carriage of crops and manure, or the unneceſſary and injurious drift of ſtock, and the waſte of manure thereby incurred, together with the miſchiefs ariſing from ſtock being left at a diſtance from the eye, and the time loſt in paſſing, on every occaſion, between diſtinct parts of a ſcattered farm, eventually fall on the proprietor. In fact, where an eſtate conſiſts of arable lands of different ſub-ſtrata, ſo that ſome parts are retentive of moiſture and others not, it ought to be the aim of the planner to include portions of each in every farm, in order that each occupier may have a regular ſucceſſion of employment for his teams in a moiſt ſeaſon, and in order that, whether the ſummer proves wet or dry, he may not be deſtitute either of graſs or herbage. And in diſtricts of a mixed nature or ſtrata, where a variety of lands are found, this, by due attention, may not unfrequently be done, without much deranging the compactneſs of the farms, or the central ſituation of the home-ſteads.

In laying out the particular fields of a farm, it muſt depend greatly on the ſituation, ſoils, and the ſyſtem of huſbandry to which they are the moſt ſuited. There are, however, certain points or principles that deſerve attention in the buſineſs. The great benefit of having a water-meadow below the farm-ſtead has been already ſeen. But where a ſufficient breadth of land cannot be commanded in that ſituation, to become an object as a mowing-ground, to be watered ſuperficially, the yard liquor may be expended with profit on a ſmaller plot, converted to a farm garden ground, to be watered by means of parallel trenches, formed acroſs the ſlope or deſcent of the ground to receive it, in the manner deſcribed below, thus conveying the nutritious particles which have eſcaped from the dung-yards immediately to the fibrils of the plants while growing, or to the baſe of the ſoil into which they are required to ſtrike. And on every farm in which there is not a ſufficiency of watered garden ground, a garden field of ſome acres for the culture of green herbage and roots with the plough, for horſes, cattle, and ſwine, as well as for culinary purpoſes, ought to be laid out near the farm-yard. A paſturing paddock or two near the houſe is likewiſe a requiſite appendage to a home-ſtead; as a ſaddle-horſe paſture, and as a hoſpital ground for ſick or ailing ſtock.

And dairy-grounds, where the dairy is a principal object, ought, in like manner, to be laid out near the houſe, and open into the lobby, green, or milking-yard. But the meadows or perennial mowing-grounds may be laid out at a diſtance with better effect, as it is always convenient to ſtack hay in the field of its growth; and if not wanted near the ſpot, it may generally be brought home, with leſs inconvenience and expence, at almoſt any other time than amid the buſtle and hazard of hay-harveſt.

Arable lands, on the contrary, cannot lie at a diſtance with propriety; as, in this caſe, not only the crops and manure require a length of draught, but the time taken up by the plough-teams in paſſing to and fro, is a further inconvenience. Nor ſhould the paſture grounds for working ſtock, whether oxen or horſes (where theſe are paſtured), be far from the home-ſtall. But thoſe for ſtore cattle and ſheep may lie at a diſtance with leſs impropriety. Woodlands, ſuch as coppice-grounds, may alſo lie at a diſtance. The writer thinks it clear, from this ſort of diſtribution requiring much of the land contiguous to the farm-ſtead, that there is an impropriety in very large farms, and an advantage in farmeries being centrically ſituated.

In the buſineſs of laying out arable lands, the number of fields muſt conſtantly be regulated by the plan of management proper to be purſued, and by the ſize as well as the nature of the lands of the farm to be laid out. Where, as juſt noticed, lands of oppoſite qualities, as thoſe which are retentive of moiſture, and thoſe that are abſorbent and open, are contained within it in ſufficient quantity, two ſets of arable fields ſhould be laid out, that the works of tillage and ſemination may not be liable to be interrupted by a ſhower, and that the ſtock of the farm, be the ſeaſon wet or dry, may not be diſtreſſed for paſturage. Likewiſe on a large farm, the lands of which are uniformly abſorbent, and conſequently adapted to the turnip huſbandry, it is proper to have more than one ſet of arable fields, in order that a ſufficient choice of contiguous or near fields may be had, over which to diſtribute the turnip crop (where this mode of huſbandry is practiſed) and thereby prevent an unneceſſary length of carriage. But on rich retentive lands, in ſituations where an ample ſupply of extraneous manure can be procured, or where ſuch lands are united with marſh and meadow grounds, to furniſh a ſufficiency of hay and paſturage, without the aſſiſtance of the arable lands, one ſet of arable fields may be ſufficient; four or five fields or diviſions being all that are neceſſary, at leaſt on a ſmall farm. But that on the generality of Engliſh farms, on which a number of manure-making ſtock are neceſſary to be ſupported by the arable lands, a greater diverſity of fields is required; as in this caſe it is neceſſary that the lands ſhould lie ſome years in a ſtate of cultivated herbage, between each courſe of arable crops, according to its nature, and the time it will lie profitably in a ſtate of graſs, as two, three, four, or five years. Conſequently, if the arable rotation occupy the land four years (taking three crops of corn with a fallow-crop, or fallow intervening), the number of arable fields required for one ſet will be ſix, ſeven, eight, or nine. However, much depends in all caſes not only on the nature of the land, but on the calcareous and other extraneous manure, which may be procured, in greater or leſs quantity, in almoſt every ſituation of a farm.

It may be obſerved, that the ſizes of arable fields may ſeem to be given in the number. But on a large farm, in a bleak ſituation, and on which it is proper to keep a numerous ſtock, it may often be found requiſite to ſub-divide the arable diviſions, not only for the ſake of ſhelter, while the lands lie in the ſtate of herbage, but for the convenience of ſeparating and ſhifting ſtock. Hence it is incumbent on the planner of a farm to weigh well the various circumſtances that belong to it, as on theſe only the true ſize and number of arable fields can be calculated. Even the ſhape of an arable field is not a thing of arbitrary choice. It ought to be regulated by the ſhape of the farm, and by the roads and water-courſes running through it, as well as by the nature of its lands, the turn of its ſurface, and its aſpect or expoſure. A perfect ſquare, or long ſquare, is a deſirable ſhape, where circumſtances will admit of it. Crooked lines and irregular figures are inconvenient in the operations of tillage, and ſhould of courſe be avoided. Two ſides at leaſt ought to run parallel to each other. And it is equally, or more deſirable, that each field ſhould have a uniformity of ſoil and ſub-ſoil, as on theſe depend the uſes to which it is applicable; and it is at once unpleaſant and unprofitable to have different parts of the ſame field under ſeparate courſes of management. Yet where the natural line of diviſion is very irregular, it is improper to follow implicitly all its windings. The planner ought rather to draw a judicious line between the two, and the cultivator to alter the qualities of the lands, which happen to be unnaturally ſevered, by draining, manuring, and other neceſſary means.

And the direction of the fields ſhould be the ſame as that in which the land ought to be ploughed for a crop, provided it be compatible with the given lines of the farm. On a level ſurface, or on one which is gently inclining, the direction of the beds of retentive lands that require to be laid up in round ridges ought to be nearly north and ſouth; in order that the crops on either ſide of them may receive equal ſun, and ripen evenly. Conſequently, in this caſe, the fences which form the two longer ſides of the quadrangle ſhould take that direction. But where the ſurface is ſteep, this principle of direction muſt give way to another of greater utility. If the land is retentive, and the ſoil requires to be laid up into round beds, acroſs the ſlope, the direction of the ridges muſt be guided by the face of the ſlope; and the fences, on the general principle, ought to take the ſame direction; obſerving, in this caſe, where circumſtances will admit, to let the fences wind to the right of a perſon ſtanding on the brink of the ſlope, and facing towards it; as the beds ought to take that direction for the greater eaſe in ploughing them. And where the face of a hill is ſteep, and the land abſorbent, the ſoil requires to be turned downwards of the ſlope with turnwreſt or Kentiſh plough; and the fences to be directed by the natural lines of the hill as much as poſſible.

In laying out cow grounds, grazing grounds, or other perennial paſture grounds, regard ſhould be particularly had to water. And wherever good water is naturally found, or can be conveniently brought by art, to that point, a paſture ground ought to tend, in order to enjoy the neceſſary ſupply as much as poſſible.

And in laying out water-meadows, where they are ſituated on ſloping grounds, or the higher ſides of which adjoin to upper lands, the main conductor (where a proper fall from the ſource of the water will admit of it) ought to define the outline of the meadow on that ſide; and the fence which ſeparates the meadow lands from the dry grounds ought to run immediately along the upper ſide of the water-courſe; the two thus becoming natural guards to each other. But within an extended flat, or an extent of gently ſhelving meadow-grounds belonging to different proprietors, and where deep ditches are required to be ſunk on the upper ſides of the fences, to drain the lands that lie above them, the plan here recommended would be improper. But in the ſituations deſcribed above it is perfectly eligible, and ought not, in ordinary caſes, to be departed from. And in concluding his obſervations on this intereſting branch of rural economy, the intelligent writer ſuggeſts, that in regard to drift ways and private roads, where a public road runs through a farm, the more diſtant fields ought, under ordinary circumſtances, to run into it, to prevent the interior of the farm from being cut up unneceſſarily by carriages, or poached by ſtock, or laid waſte by unneceſſary private roads and drift ways, which increaſe the number of fences, and are made and kept up at conſiderable expence. And where public roads do not preſent themſelves, private lanes are highly requiſite, eſpecially within large farms. It is obvious that all theſe circumſtances require to be carefully conſidered by thoſe employed in this ſort of buſineſs. And it is ſuggeſted by the writer, that whether in laying out an eſtate or a farm, it is prudent to go repeatedly over the ground, with a map of unalterable data in one hand, and a liſt of deſiderata in the other; and with the leading principles of the art in the mind, but without any pre conceived general plan in view; ever letting the particular circumſtances of the lands to be laid out determine the true points to be fixed, and the proper lines to be drawn; acquiring correct ideas of outline by enlarged ſurveys; and by more minute examinations, adjuſting particular points. In this way farm lands may be laid out in the moſt eaſy and convenient methods for the purpoſes of their occupiers.

The nature of the fences, which may be moſt advantageouſly had recourſe to under particular circumſtances, will be more fully conſidered and explained in ſpeaking of fences and incloſing. See FENCE, and INCLOSING *of Land*.

On hiring and ſtocking Farms.—Whatever the nature of the farm may be, there are a variety of circumſtances which require to be particularly weighed and conſidered before it be finally engaged by a tenant. The author of "Modern Huſbandry" has remarked, that when a farmer has occaſion to hire a farm, he ſhould be equally careful to examine, on the one hand, all the advantages which it enjoys, and on the other, all the diſadvantages to which it is ſubjected. By making a juſt eſtimate of both, and by comparing the reſult with the rent demanded, can he only be able to form a correct opinion reſpecting the equity of that demand. In making this eſtimate, he ſhould diſcard equally from his mind that over-cautious prudence which is diſpoſed to doubt of every probable advantage that may inſure ſucceſs, and that too adventurous temerity which is apt to overlook, or at leaſt to leſſen, real diſadvantages, ſuch as no future exertion of his can poſſibly overcome. The value of land, ſays he, depends no leſs on its fertility, whether occupied in tillage or paſture, than on its ſituation in regard to markets. For this reaſon, an arable farm, in the vicinity of a large town, is worth a higher rent than one of an equal ſize and quality in a remote part of the country. For the ſame reaſon, namely, a ſuperior advantage in regard to markets, a ſheep or ſtore-farm in the north of England yields a higher rent to the proprietor than one (but for the difference of ſituation) of ſimilar value in the north-weſt of Scotland. In renting a farm, one general rule ought, he thinks, always to be attended to, namely, fixing on good lands. Over the kingdom at large, the rents paid for farms of this deſcription are in general reaſonable, when compared with what is commonly paid for thoſe of more indifferent ſoils. The author of the "New Farmer's Calendar," however, well remarks, that it can obviouſly very ſeldom happen that a tenant, in want of a farm, can have the opportunity of chooſing preciſely that kind of ſoil and ſituation which may be deemed the moſt advantageous; in general, he muſt content himſelf with ſuch as chance to be unoccupied; and theſe chances, in fruitful parts of the country, have never been of late years, and ſince the vaſt enhancement in price of all the fruits of the earth, very numerous. But the ſuperior advantages of natural fertility and facility of cultivation are too plain to admit of queſtion or argument: and nothing is more clear than the preference which ought to be given to good land at the advanced price, ſince the culture of barren land is infinitely more expenſive, and the riſk of crop nearly double: and what is of great force, from the influence of cuſtom and local circumſtances, the price of land in the moſt fruitful counties is frequently as low as of that in diſtricts of far inferior fertility. An attentive obſerver, although not very converſant in the principles or practice of huſbandry, can ſcarcely, he thinks, be deceived as to the general nature and degree of goodneſs of ſoil upon a farm; a compariſon with the neighbouring farms, and their average products, will be a ſufficient guide. Wherever, ſays he, is found conſiderable depth of mixed ſoil, even if natural fertility be deficient, art and culture will remedy the defect, and fully reward the labours of the huſbandman. On the other hand, the moſt ſhallow and ſtony lands, from a natural richneſs in their light moulds, may be wonderfully productive. The luxuriance and deep verdure of the graſs, the ſpontaneous growth of white clover, the tallneſs and fruitfulneſs of the hedge-wood, particularly hazel, the large ſize of the timber, and the height and ſubſtance of the ſtraw, are all common indications of a ſtrong and fertile ſoil: plenty of weeds, particularly thiſtles, although a popular, he fears, is but an equivocal ſign, ſince the moſt barren land will alſo produce ſpontaneouſly abundant crops of thoſe. It is much more prudent for a farmer, he thinks, to wait and look forward, than to engage himſelf upon a miſerable barren tract, where the certainty or promiſe can be of nothing but everlaſting labour and expence: ſuch muſt be the caſe upon ſoils which are naturally poor; at the ſame time of inſufficient depth, and abounding with flint or ſhingles upon ſandy waſtes, parched gravels, cold, acid, iron clays, boggy or poachy lands, to or from which there is ſcarcely acceſs or paſſage during the winter months. Some ſuch tracts we have in England; and of thoſe held in hand an opulent and well-ſkilled proprietor can make a far greater annual profit than can be drawn from the labour of a needy and miſerable tenant. The moſt profitable purpoſes to which theſe eſtates can be devoted are, he conceives, the growth of wood and of live-ſtock. A farmer who aims at obtaining his profits with the leaſt poſſible trouble and riſk, and without the burden of much live ſtock, muſt procure a rich light land-farm, with a ſandy loam; on ſuch a ſituation, without a moderate capital, and the example of his neighbours before his eyes, he may, he thinks, ſet himſelf down in contented indolence, and yet grow rich. The caſe is widely different with him who engages with a ſtrong clay, or, in the improvement of an exhauſted or infertile ſoil; this will find an ample field for the moſt ſtrenuous exertions, directed by a fair portion of agricultural ſkill, and ought to entertain no hope of very conſiderable ſucceſs without the aid of a full ſtock of cattle. Theſe obſervations are, he ſays, by no means intended to damp the ardour of aſpiring huſbandmen, who aim at raiſing a fortune and a name by the improvements of low priced land; for although, from the irregularity of rate *per* acre above hinted, the rent of land is ſeldom the prime cauſe of good or ill ſucceſs, yet cheapneſs is a material conſideration, when money is to be expended in gradual improvement. A farm at four or five ſhillings *per* acre, poſſeſſing within itſelf, or its vicinity, the permanent means of amelioration, will turn out a mine of wealth in the hands of an able cultivator, who, in the courſe of half his leaſe, will bring it to a level of fertility with the high-priced kinds of land.

There is, the ſame writer remarks, another point which merits attention, which is, the manner in which the farm was formerly cultivated. If it has been exhauſted and run out by over-cropping, and requires fencing, draining, repairs of houſes, lime, marle, &c. all which are to be effected at the tenant's expence, the rent payable to the landlord in ſuch a caſe ought, he juſtly obſerves, to be very moderate, in compariſon to what the tenant could, with equal propriety, afford to give, were he to enter on the leaſe when the farm was in a high ſtate of cultivation and improvement. The difference here is, he ſays, much more conſiderable than the generality of proprietors or farmers are diſpoſed to allow. For inſtance, a farmer who enters to the poſſeſſion of a farm in a high ſtate of cultivation, enters immediately to the greateſt returns which that farm is capable of producing; while he who enters to a farm which had been previouſly exhauſted by improper management, finds himſelf under the neceſſity of expending large ſums on the improvement of it; when, at the ſame time, his returns for the firſt few years are probably inadequate to the expence incurred in carrying on even the ordinary operations. In the one caſe, the farmer enters, from the beginning of his leaſe, on the receipt of his annual profits, moderate as they may be; and in the other, he is ſinking a large ſhare of his capital, for which his returns muſt at beſt be ſlow. If this loſs of capital and intereſt, the additional expence of cultivation, and the inferiority of crops for the firſt ſeven or eight years are fairly calculated, it will, he thinks, be found that the farmer who, under theſe circumſtances, pays twenty ſhillings the acre for a leaſe of nineteen years, has as high a rent upon the farm, during the whole leaſe, as the other who pays nearly double the ſum.

One other particular of great importance ought, he ſays, to be mentioned, namely, the impropriety of renting a larger farm than the capital which the farmer poſſeſſes will properly ſtock and improve. When this happens, the tenant puts it out of his power to adopt the proper plans by which he could turn the farm to the greateſt poſſible account. He becomes cramped in carrying on the ordinary courſe of buſineſs, and is frequently obliged to diſpoſe of his crops at an under value for ready money; and therefore cannot purchaſe lime, marles, or other means of improvement, which are not to be had without the expenditure of conſiderable ſums. Although it will not hold in every caſe, yet it may be aſſerted as a good general rule that, in the improved parts of the kingdom, four pounds *per* ſtatute acre is a moderate ſum for ſtocking a farm, without including the expence of buildings, repairs, fences, drains, &c. If, therefore, a farmer ſhould be ſo imprudent as to rent a farm of one hundred acres when his capital does not exceed 200*l.* he muſt be fortunate indeed in times and ſeaſons if he has not occaſion to repent of his temerity.

And by the ſame author it is obſerved, that it is doubtleſs a ſound general maxim for a man to hire no more land than his capital is amply ſufficient to ſtock: the diſadvantages and dangers of a want of money, in all concerns, are too common and well known to be for a moment inſiſted on; the farmer had indeed better be ſomewhat ſhort than burdened with too large a tract of land; for in the latter caſe, if he be judicious and maſter of his profeſſion, he may well employ his ſurplus capital in a ſuperior and garden-ſtyle of cultivation, and as a dealer in live-ſtock. But it is yet a grating thing to an induſtrious man to refuſe a promiſing bargain, particularly of the low-rented kind, on account of its extent, the very conſideration which muſt animate his hopes; and when ſuch a one has made the leap, inſtead of the common method of aiming at the culture of the whole in a ſlovenly, inſufficient, and unprofitable manner, it would probably be much the ſafeſt plan to crop only ſuch a portion of the farm as his means would compaſs with good effect, ſeeking but to pay the rent and live, and, by dint of frugal and perſevering induſtry, to make an annual addition, until, in proceſs of time, the whole farm ſhould be in a flouriſhing ſtate of cultivation.

The writer cannot forbear, he ſays, in this place, copying an important remark from Mr. Young, which, in truth, he has repeatedly ſeen verified. Farmers frequently adopt no other rule reſpecting the rent they will give than mere cuſtom, nor attend to any other criterion of eſtimating the worth and qualities of land, than that of the good or ill ſucceſs of the laſt occupant; than which there can ſcarce be a more fallacious method of forming a judgment. He has known many farms, on which fortunes might have been obviouſly, and afterwards were really made, lie untenanted, and taken afterwards with the utmoſt apprehenſion, purely becauſe an ignorant, wretched, and needy tenant had failed therein. Many fine farms may now be pointed out, on which the old tenants ſtarved, and brought their families to the workhouſe, at ſeven ſhillings an acre; whilſt their ſucceſſors (times ſtill the ſame, or worſe) made their fortunes by being rented at eighteen. It is a cruel diſgrace, or rather a very laughable piece of burleſque, for a man, pretending to common diſcernment, to regulate his judgment and his conduct from motives like theſe. If fair land be offered at a fair rent, it is well; if an additional rent be demanded, and a man, after the niceſt ſcrutiny, both actual and probable, can diſcover money's-worth in the terms, he muſt be unwiſe to forego the occaſion. Some landlords, from a magnanimous and princely ſpirit, have ſuppoſed it beneath their dignity to raiſe their rents; and certain tenants, miſtaking the nature of this bounty and the queſtion in general, are extremely averſe to the very idea of any advance, not conſidering that it is a queſtion of property, and that landlords, as well as tenants, have all poſſible right and reaſon to make a fair advantage of the growing proſperity of the times. Thoſe men who are averſe to a diſtant removal, by which they might obtain a far ſuperior ſituation, from the ſingle conſideration of preſent loſs in the diſpoſal of their ſtock, do not, the author thinks, well underſtand their own intereſt. A preſent trifling loſs, which the farmer's circumſtances can well bear, ought not to weigh againſt a permanent and growing profit; this motive, however, confines many a farmer to a poor and barren ſpot; men are, abſolutely afraid of fair calculation, as they often are of their beſt friends.

In the examination of a bargain, he obſerves, the objections may be of a two-fold nature; ſuch as may be held inſuperable; or ſuch as may admit of compenſation, either in proportional abatement of price, or in the goodneſs of the proſpect. As to the firſt, on perceiving them, a man inſtantly turns his back on the buſineſs. In his ideas, tithes taken in kind; a number of common carriage-ways, or paths, and the lands interſected by other property; far diſtant markets, and roads impaſſable in winter, are objections of that claſs; and granting pecuniary compenſations can be made, there can be none found adequate to the anxiety of mind which muſt be inevitably ſuffered in ſuch a ſituation. Of theſe defects, with which a perſon is content to put up, he ought to have a very correct eſtimate, that he may really know when an offer is made deſerving of his acceptance; an important point, where many contracting parties fail. Every practical man knows that in bargaining, as in angling, there is a critical moment, a time to ſtrike, which may never return. The heads already enumerated will furniſh matter for an eſtimate in writing, taken on the actual ſurvey. Thence will appear the ſums neceſſary to be expended, and the deduction of rent, or other recompence, ſuch expenditure will fairly warrant. In this eſtimate, the ſtate or nature of the fences ſhould be well conſidered, and alſo the injuries done by game in ſome inſtances in particular ſituations.

It is on the whole concluded, that the farmer who intends to hire a farm, ſhould conſider whether the land be rich and fertile, and the climate favourable; as well as whether the farm be well ſituated in regard to markets; properly accommodated as to houſes; has eaſy acceſs to lime, marle, and other manures; and whether the price of proviſions be fully on a par with the rate of labour.

Having adverted to theſe different circumſtances, and fully pointed out the advantages of a perfect examination of the ſoils, ſo as to aſcertain their natures and qualities, as to ſtiffneſs, moiſture, expoſure, levelneſs, ſlope, ſtonyneſs; what draining, manuring, fencing, &c. may be wanted; and likewiſe the roads, diſtance of markets, prices of commodities, labour, the ſtate of tithes, and poor rates; Mr. Young adviſes that one general rule in hiring a farm ſhould not be overlooked by the farmer, which is, to fix on good land, and he can ſcarcely give too much for it; but that, for poor ſoils, the leaſt rent is ſometimes too high to be conſiſtent with profit. By poor ſoils, however, are not to be underſtood ſuch as have a command of laſting manures, that work great improvements; nor waſte-lands, which, under that falſe denomination, are often found the moſt profitable of all. It is ſuppoſed that the ſound, mellow, rich, putrid, crumbling, ſandy loams, are of all ſoils the moſt profitable; ſuch as will admit tillage ſoon after rain, and do not bake on hot gleams of ſun coming after heavy rains, when finely harrowed; ſuch land is better worth forty ſhillings an acre, than many ſoils deſerve five.

Next the ſtiff loam, which is neareſt allied to brick earth; this, till drained, is in general an unkindly ſoil, without plenty of manure.

It is known in winter by being very adheſive upon walking over it; is long in drying, even where little or no water is ſeen upon it; for which reaſon it is generally late in the ſpring before it can be ploughed. When quite dry, it breaks up neither ſo hard and cloddy as mere clay, nor near ſo crumbly and mellow as good loam. If it be in ſtubble, it is apt to be covered with a minute green moſs. There are many varieties of this ſoil, but all agree in moſt of theſe circumſtances, and in being what the farmers call poor, cold, hungry land. When hollow-ditched, and greatly manured, it yields any thing; but thoſe who hire it ſhould forget neither of theſe expences.

The gravelly ſoils are numerous in their kinds, and very difficult in their natures. Warm, dry, ſound gravelly loams, are eaſily diſtinguiſhed in winter. They admit ploughing all winter through, except in very wet times; always break up in a crumbly ſtate of running moulds; and if in a ſtubble, will dig, on trial by the ſpade, in the ſame manner. If under turnips, it may be perceived by walking through them, that it will bear their being fed off. But the wet cold ſpungy gravel is a very bad ſoil; it is known in winter by the wetneſs of it; and in ſpring, by its binding with haſty ſhowers. It rarely breaks up in a crumbly ſtate, or ſhews a mellowneſs under the ſpade. Very expenſive drains greatly correct its ill qualities; but it requires a prodigious quantity of manure to fertilize it. And other gravels are ſo ſharp and burning, that they produce nothing except in wet ſummers; but ſuch are known at any ſeaſon of the year.

And the ſand-ſoils are as various as the gravels, and are all eaſily diſcoverable in their natures. The rich red ſand is, it is believed, as profitable a ſoil as any in the world. It has at all ſeaſons a dry ſoundneſs, and at the ſame time a moiſture without wetneſs, which ſecures crops even in dry ſummers. The ſpade is ſufficient to try it at any ſeaſon of the year. The light ſandy loam is likewiſe an admirable ſoil; it will bear ploughing like the preceding, all winter long, and appears quite ſound and mellow when tried with the ſpade. If it lie under a winter fallow, the beſt way of judging of its richneſs is to remark the ſtate of the furrows, and the degree of adheſion in the ſoil. Stiff land, being dry and crumbly, is a great perfection; and ſand, being adheſive, is an equally good ſign. Conſequently when the farmer views a light ſandy loam, whoſe ſound dryneſs is acknowledged, he may preſume the ſoil is rich, in proportion to its adheſion. Where it falls flat in powder, and has no adheſion, it is a mere ſand. The white chalky *marm* is often cold and wet, will not bear ploughing in winter, unleſs the weather be very dry or froſty; runs exceſſively to mortar, with a heavy ſhower when in a pulverized ſtate. It is a cold ſoil of little profit, is is ſuppoſed, except with peculiar management. It is believed to anſwer beſt when laid down in a dry ſtate to ſaintfoin. The farmer is adviſed to lay it down as a maxim, that ſtrong, harſh, tenacious clay, though it will yield great crops of wheat, is yet managed at ſo heavy an expence, that it is uſually let for more than it is worth. Much money is not often made on ſuch land. The very contrary ſoil, a light, poor, dry ſand, is very often indeed in the occupation of men who have made fortunes. Some permanent manure is uſually below the ſurface, which anſwers well to carry on; and ſheep, the common ſtock of ſuch ſoils, is the moſt profitable ſort he can depend on.

All the ſtiff ſorts of ſoils are viewed to moſt advantage in winter; the general fault of them is wetneſs, which is in the greateſt exceſs at that ſeaſon of the year. If the fields be level, and the water ſtands in the land, notwithſtanding the furrows are well ploughed and open, it is a ſign that the clay is very ſtiff, and of ſo adheſive a nature, as to contain the water like a diſh. It is likewiſe probable, that draining may prove inſufficient to cure the natural evil of ſuch land. This kind of ſoil likewiſe ſhews itſelf in the breaking up of ſtubbles for a fallow; a very ſtrong draught of cattle is then neceſſary to work it. It breaks up in vaſt pieces, almoſt as hard as iron. When it is worked fine, it will run like mortar, with a heavy ſpring or ſummer ſhower. Theſe ſoils will yield very great crops of beans and wheat, &c. They muſt, like others, be cultivated by ſomebody; but it is adviſed to have nothing to do with them, where it can be avoided, nor ever to be captivated with ſeeing large crops upon the land, for the farmer does not ſee at the ſame time the expences at which they are raiſed. Peat, bog, moor, and fen, in many variations, are very profitable; but the expences of improvement demand a calculating head. The vicinity of lime or marle is here of great importance.

In graſs lands the marks for judgment are different. They are, in the writer's opinion, beſt examined by attending, firſt, to the circumſtances in which they are moſt deficient; and then to ſuch as are in their favour. The more ſeaſons graſs fields are viewed in the better, though any one is ſufficient for a tolerable judgment. One great evil attending theſe lands is, that of being too wet; the ſigns of which can never be miſtaken or overlooked in any ſeaſon of the year. In winter it is at once perceived by walking on them; at all times of the year by the herbage which generally abounds on them, ſuch as ruſhes, flags, and a great quantity of moſs; and alſo by the colour of the graſs, which is moſtly blue at the points; ſometimes of a dirty yellow hue, and always coarſe. If the ſoil be the firſt deſcribed, ſtiff clay, and the ſurface level, the evil will be very difficult of cure; if of the other ſort of clay, or ſtiff loams, draining will have great effects in improving it.

Graſs-fields on gravelly ſoils are, if the gravel be ſharp, very apt to burn in dry ſummers; but they give great and ſweet crops in wet ones, provided that the land be a gravelly loam. An *abſolute* gravel ſhould never be under graſs. A farmer ſhould not, however, regret having a paſture or two of this ſort in his farm, as they are of excellent uſe in winter for feeding ſheep and lambs on with turnips or other food of the ſame kind.

With regard to the low meadow lands, whatever the ſoil may be on the banks of the rivers and brooks, they are in general good, but often ſubject to the misfortune of being overflowed in ſummer, which not only ruins crops of hay before they are cut, but carries them away, perhaps when juſt made. And many graſs-fields on all ſoils conſiſt of ſo bad an herbage, as to be of little value. Made up of weeds, and the worſt and coarſeſt of graſſes, if a landlord will not allow ſuch to be ploughed, the farmer ſhould minute down the rent accordingly. This fault is viſible at all ſeaſons, and cannot be eaſily miſtaken. But a river that does not overflow, running through a farm, is a very favourable circumſtance, as it indicates a probability of all the graſs-fields being well ſupplied with water for cattle, and other animals.

Beſides the circumſtance of well proportioning the ſize of the farm to the extent of capital as already noticed, there are ſeveral others which ſhould be well conſidered in fixing upon farms, ſuch as their being compact and convenient in the fields, which are too often overlooked by farmers who are about to rent land. If they attended to it as much as their profit required, we ſhould, the writer thinks, ſee landlords reforming their eſtates, in this particular, more than many do at preſent. There is not, it is ſuppoſed, a more expenſive, perplexing circumſtance in a farm, than that of the fields being in a ſtraggling, diſconnected ſituation. The diſadvantages are obviouſly numerous and ſtriking.

The covenants of leaſes ſhould likewiſe be well attended to, as landlords are very often tenacious of thoſe which they have uſually inſerted in them; ſo that a farmer, when he approves of a farm, and agrees to the rent, may not find the conditions of tenure propoſed to him, ſuch as are compatible with his intereſt, his deſigns, and with good huſbandry. The merit or reaſonableneſs of covenants muſt always be conſidered in compariſon with the nature of the farm. It is for want of this conſideration that unreaſonable covenants are ever propoſed. And theſe prohibitions are often fooliſh, but ſometimes admiſſible: they muſt depend on local circumſtances, which ſhould be well weighed by the farmer before he makes his deciſion.

The aſcertainment of rent is a highly important part of the buſineſs of hiring a farm, though the circumſtances already noticed precede it, as the rent muſt in a great meaſure depend on them. The chief point neceſſary to be here conſidered is the combination of rent, tithe, and rates in one ſum. It is adviſed that the farmer, knowing the capital intended to be inveſted, ſhould eſtimate the intereſt of it at not leſs than 10 *per cent.* and then calculate the expences and produce; the former, being deducted from the latter, will leave that ſum which he can afford to pay in theſe three ſorts of rent. And further, deducting the tithes and rates, the remainder will be what he can afford to pay to the landlord. Where rent is calculated in any other way, it muſt be erroneous and deceitful, and not by any means to be depended on.

On the buſineſs of ſtocking farms, the ſame able writer has likewiſe ſuggeſted many uſeful hints and directions. He conſiders the advantage to be derived from the occupation of land to depend ſo much on the farmer commanding the requiſite capital, that it is extremely neceſſary for the young beginner to be well adviſed on ſo eſſential a point. If he be fixed in buſineſs by ſome experienced relation, he will not, of courſe, want the proper inſtruction; but as many adventurers, as they may be called, are every day making efforts to try their fortune in the culture of the earth, and many gentlemen taking farms into their hands, ſometimes without ſufficient conſideration of the neceſſary expences, it may not be improper to conſider a few points concerning this buſineſs. Thirty years ago, the ſum which was uſually appropriated to the ſtocking of a farm, varied from three to five pounds the acre; and it was a general idea, that the latter ſum was ſufficient for any farm, part arable, and part graſs, of no uncommon fertility. Rich marſhes were, of courſe, excluded in the calculation, and light ſtock farms were often ſtocked for three pounds the acre. But theſe matters are now greatly changed: rents are much increaſed; tithes are compounded at a higher rate of payment; poor rates are enormouſly riſen; all ſorts of implements comprehended in the article wear and tear are thirty or forty *per cent.* dearer; labour is in many diſtricts doubled; the prices of cattle and ſheep, as well as all other ſorts of live ſtock, are greatly advanced; ſo that at preſent, the ſame farm which at that period would have been very well ſtocked, and the firſt year's expences provided for, at the rate of five pounds the acre, would now demand nearly from ſeven to eight pounds the acre. But it is to be remembered, that in all ſuch eſtimates it is neceſſary to ſuppoſe that every tool bought in is new, and that the live ſtock be good of the ſort, as well as that the firſt year's expences be provided for, though a portion of the crop may come in before the whole payment is made. It is ſtated that a man cannot be at his eaſe if he do not provide in this manner; nor will he be able to make that profit by his buſineſs with a ſmall capital, which will attend the employment of a larger. By profit the writer would be underſtood to mean a per centage on his capital, which is the only ſatisfactory way of eſtimating it. If, by ſtocking a farm with five pounds the acre, he makes ſeven or eight *per cent.* profit; and by ſtocking in the proportion of eight pounds the acre, he makes ten *per cent.* (and this difference will, it is believed, often be found); it muſt be ſufficiently apparent that the loſs by the ſmaller ſtock is a very ſerious evil. It will depend much, it is ſuppoſed, on ſituation and local circumſtances: the benefit of procuring manures, or litter, to make dung, may, in ſome places, be very great, in others much leſs; but not to be able to profit by every favourable opportunity that may attend the ſpot on which a farmer is fixed, muſt be highly diſadvantageous to him. To irrigate land is an expenſive operation; but to omit or poſtpone it for want of money for the undertaking, is to loſe, perhaps, the capital advantage of a farm. Caſes of this ſort might be greatly multiplied; and there is not one that does not call on the farmer for an ample capital to obtain the greateſt poſſible benefit.

It is hinted, that of all the different ſorts of farms thoſe of the warren kinds are hired and ſtocked with the ſmalleſt capitals; but there are marſh lands in different diſtricts, and eſpecially in Lincolnſhire, which are ſtocked at the vaſt rate of more than thirty pounds the acre. And the general annual expence of many hop plantations riſes to thirty pounds, and the capital to more than ſixty pounds the acre.

In general, for ſtocking, according to the modern principles of huſbandry, not leſs than from eight to ten, or fifteen, pounds the acre can be neceſſary; and in ſome caſes, where improvements are to be made, conſiderable more will be required.

It is ſuggeſted, that if the farmer is not capable of making ten *per cent.* on his capital, he muſt either have an indifferent farm, there muſt be bad management, or the times muſt be greatly againſt him. It is juſtly ſuppoſed that he ſhould make from twelve to fifteen *per cent.*, and that ſome farmers make more, even when the price of corn is not in any way extravagant.

Theſe directions ſhould be well weighed and conſidered by thoſe farmers who have had but little experience, before they enter upon the ſerious buſineſs of hiring and ſtocking farms.

It has been remarked, in reſpect to the advantages of different ſorts of farms, by the author of the "New Farmer's Calendar," that were it demanded of him generally, what is the moſt advantageous application of land? he ſhould be inclined to anſwer, that of dairying, or feeding a large number of cows for the produce of butter; but with the reſerve, that the buſineſs be conducted with great variation from the common modes. The dairy-man muſt himſelf be a perfect judge of the live ſtock which he entertains, and they be of the improved ſpecies: no bad milkers muſt be kept, nor indeed any kept too long; the profit of grazing muſt come into the account, and of pig-feeding to a much larger than the uſual extent. The winter proviſions for the cows, both green and dry, muſt be ſo ample as to equalize the produce of butter, in money, at leaſt, with that of the ſummer, and it will be clearly adviſeable to have a conſiderable breadth of land under the plough. If this, however, be the moſt profitable, it is, no doubt, he ſays, the moſt troubleſome ſcheme of huſbandry. The next in point of profit is, he thinks, two-thirds arable, and one-third graſs; the moſt adantageous winter feed provided, and cattle enough of the beſt kinds kept to furniſh annually from twelve to fifteen loads *per* acre of rich compoſt. This may prove more profitable than if all the land were grazed, ſince it is to divide the riſk of markets between corn and cattle; and large crops of the former may of right be expected where the quantity of manure ſhall have been ſo liberal. A family which cultivates a parcel of land, with the prudent view of increaſing its income and domeſtic comforts, ſhould keep, he ſays, a ſmall dairy, with two or three breeding ſows, a ſmall flock of ſheep, ſome tame rabbits, and a few hives of bees. It ſhould not be forgotten to ſtock a fiſh pond or two, if there be ſuch convenience. The plan will alſo, he thinks, admit of the fattening a few bullocks annually.

Hay-farms and grazing-farms are obviouſly, he ſays, attended with the leaſt trouble. Hay-farming is, however, by no means the moſt profitable branch of huſbandry, as it lies under the conſtant diſadvantage of incapacity to feed live ſtock to any good purpoſe; hence much after-graſs is annually waſted. Granting a hay farmer has fattened a lot of beaſts, they muſt, he obſerves, be late in the ſeaſon, when beef is uſually cheap, and he cannot keep them until after Chriſtmas, for fear of injuring his future crop of hay, which is his grand dependance. As to grazing, however profitable or void of trouble it may be, he would adviſe every perſon to be cautious how he enters into it to any great extent, unleſs he ſhall have previouſly acquired a conſiderable knowledge of live ſtock. Moſt bailiffs know much worſe than nothing at all of the matter. In the common advice given on the head of breeding animals, aptitude of ſituation and room have always been very properly inſiſted on; but the conſideration, the moſt important, perhaps, of all others, hath hitherto been neglected, which is, aptitude in the breeder himſelf for the undertaking, without which, we will venture to affirm, no adequate ſucceſs ought to be expected. A man ought to be poſſeſſed of much ſenſibility for the brute creation, with a conſiderable ſpice of the mania of improvement, who ſets up for a breeder. In his daily or weekly bible-excurſions, he muſt be ſure never to forget the book of Job. He muſt enter fully into the ſpirit of a thouſand little niceties, both of judgment and practice, which it would take a good volume to deſcribe. He muſt find a pleaſure in never-ending care and ſolicitude, and keep a perpetual watch. On ſuch conditions a breeder, he thinks, will acquire wealth and fame. The generality of cultivators, whatever may be their ſituation, had, perhaps, better purchaſe their live ſtock ready made. With reſpect to fattening animals for market, the greateſt difficulty, in his opinion, occurs with pigs, as is ſufficiently manifeſt from the accounts of our numerous experiments. The Engliſh of the matter is, he thinks, that the buſineſs requires a correct judgment both of that ſpecies of ſtock and of the markets.

But whatever be the nature of the farm, it is obvious that it can never be cultivated to the greateſt poſſible advantage without having the ſecurity of a fair equitable leaſe. See LEASE.

And on the conducting or management of farms, it is obſerved by the ſame author, that it has always been the faſhion to lay much ſtreſs on the difference between the gentleman and the labouring farmer, and to allow a decided ſuperiority to the latter, nay, even to deny all poſſibility of the former deriving profit from the practice of huſbandry. The matter has, he thinks, been improperly ſtated. Nothing can be more true than that the man, whether gentleman or farmer, who determines to remain ignorant of his buſineſs, and who indolently ſuffers himſelf to be cheated through the noſe, will have a fair chance to be everlaſtingly unſucceſsful. But grant the gentleman a moderate portion of the ſcience of agriculture, and a decent competency of activity and reſolution, and he conceives the balance will preponderate even heavily on his ſide, whatever may be the quantity of lands, from a cabbage-garden to a farm of a thouſand acres. The perſonal labour and ſuperintendance of the mere common farmer, in the old beaten track, can never, he thinks, ſtand in competition with the advantages of the new huſbandry, of the moſt productive kinds of live ſtock, of an ample portion of manure, and of the garden cleanneſs of the hoe-culture. Agriculture, viewed in a trading light, perhaps makes as ample a return for the uſe of money as any domeſtic concern whatever; and although ſuch be not the general cuſtom, it is eaſy enough of proof, that very great capitals, to the amount of twenty, thirty, or forty thouſand pounds, and upwards, might be ſafely and proſperouſly employed upon an extenſive farm. The cultivator of two thouſand acres, who ſhould fully ſtock according to the principles of the new huſbandry, breed and fatten his own cattle, conſuming all his ſpring-corn at home, bacon his hogs, and meal his own wheat, would find occaſion, he ſays, for ſums of very high account. His articles being all thoſe of the firſt neceſſity, and being without the obligation of allowing credit, the profits would be more certain, and the riſk leſs, than in any mercantile concern. In what, he aſks, conſiſts the new huſbandry, ſo often quoted by agricultural writers without a definition? In alloting certain portions of an arable farm to the purpoſe of ſummer and winter feeding a ſtock of cattle, ſufficient, with their dung, to manure and fertilize the whole of the land; in eradicating, as far as poſſible, all uſeleſs vegetation with the hoe; in the uſe of the various improved or newly-invented implements, for the purpoſe of expediting or abridging labour; and in the judicious ſelection of domeſtic animals. The uſage of the old huſbandry (too generally prevalent indeed, he ſays, at this hour) is to place very little dependance on the profit of live ſtock, to feed very few, excepting thoſe animals abſolutely neceſſary for labour, to reject the hoe-culture, perhaps altogether, to foul the land by repeated corn-crops, and to clean it partially and inſufficiently by ſummer-fallows, or feed in its foul ſtate for a temporary ley.

There is, ſays the ſame writer, a falſe pride amongſt farmers of inferior property, which demands examination, if not correction. A man will make any ſhift, even to the neglect of the important advantage of purchaſing cattle in the autumn, rather than ſell his oats during harveſt, or his wheat at Michaelmas. His importance is much diminiſhed, unleſs he can make a capital diſplay of ſtacks: but fair and impartial calculation alone muſt be his guide in this caſe, who purſues his real intereſt.

FARM *Buildings*, in *Rural Economy*, are ſuch buildings and offices as are neceſſary for carrying on with convenience the various concerns and purpoſes of a farm. It is evident that the nature and extent of ſuch erections, as well as their peculiarity of conſtruction, muſt be very different, according to the difference of farm management which is required to be carried on with them. However, in general, a much greater extent of ſuch buildings will be neceſſary where the farms are of the arable or corn kind, than where they are ſimply of the dairy, grazing, and hay or graſs kind. Though the extent of buildings, even for thoſe of the firſt of theſe ſorts, may be greatly retrenched by having recourſe to the threſhing-machine, and the beneficial practice of ſtacking the grain in proper yards, with ſuitable ſtaddles for the purpoſe, and at the ſame time the expence of ſuch erections be conſiderably reduced by having ſimply ſhed-buildings inſtead of thoſe of a more finiſhed kind, which are moſtly in uſe, while the convenience to the farmer will be nearly the ſame. There is, however, one circumſtance to be here particularly regarded, which is, that whatever the deſcription of the farm may be, the extent of the buildings ſhould conſtantly be amply ſufficient for the various uſes of it.

The moſt uſual deſcriptions of buildings which are wanted on farms, are thoſe of *farm houſes*, *barns*, *ſtables*, *granaries*, *cow-houſes*, *cattle-ſheds*, *calf-pens*, *dairy houſes*, *hog-ſtyes*, *root-houſes*, *ſtraw-ſheds*, *chaff-houſes and bins*, *cart-lodges*, *harneſs-rooms*, *tool-houſes*, *work-ſhops*, *poultry-houſes*, *pigeon-houſes*, and *bee-ſtands*. See theſe ſeveral heads.

There has been conſiderable diverſity of opinion among writers on rural economy concerning the moſt proper diſtribution of buildings of this ſort, and the point is yet far from being decided. It is, however, obvious that it muſt be different in ſome degree, according to the peculiar nature of the farm, and the way in which the buſineſs of it is to be managed.

In *arable farms*, or thoſe which are chiefly under the plough, the principal things wanted, in regard to diſtribution, are that the farm-ſtead and buildings ſhould have a central ſituation, in reſpect to the ground, being a little elevated if poſſible, and near the principal market-road. If contiguous to a brook or ſmall river, it may be an advantage in the ſupplying of water, as well as turning different ſorts of machinery.

On *paſture farms*, eſpecially thoſe of the ſheep kind, but very few buildings are requiſite; nor where they are of the dairying, grazing, or breeding ſorts, is there any neceſſity for their being numerous. In their diſtribution the convenience of roads and water ſhould be particularly attended to.

In *mixed farms*, or thoſe which are partly of the arable and partly of the graſs kinds, the diſtribution of the buildings ſhould be pretty much the ſame as on thoſe of the perfectly arable ſort, only perhaps ſomewhat fewer in number.

On *family*, or *reſidence farms*, which are another kind of mixed farms, calculated for the convenience of perſonal reſidence, uniting the paſture for breeding, rearing, and occaſionally fattening animals, as well as the keeping of milch cows, and growing meadow-hay, with the arable land for the ſupplying of artificial fodder, grain, roots, different kinds of vegetables, green-food for ſoiling, &c. The variety of buildings ſhould here be conſiderable, ſo as to ſuit the different purpoſes of the farm, having the principal of them, or what may be called the farmery, conveniently contiguous to the family offices, but at the ſame time effectually ſcreened from the reſidence, being likewiſe well connected with all the different parts of the farm, and, if poſſible, placed ſo as to have the advantages of wind and water. This ſort of farm has been well deſigned by Mr. Loudon in his "Treatiſe on Country Reſidences."

The ſubject of the proper diſtribution of farm-buildings is fully entered into in an able paper in the firſt volume of Agricultural Communications to the Board. The writer there conſiders the conſtruction, arrangement, and ſituation of theſe buildings as ſo important to the practical farmer, as to merit the fulleſt attention of the rural economiſt. It is ſtated, that on a judicious combination of theſe points the convenience and facility of carrying on his different operations in a great meaſure depend. Yet the examples of farm-offices being erected either on a commodious plan or with any thing of judgment in the ſituation, are extremely rare. Indeed, ſays the writer, whether we view this ſubject as relating to the landlord, the tenant, or the public at large, it appears highly intereſting. To the landlord it is a matter of conſiderable moment, a part of his rents very often depending upon it; for it is natural to ſuppoſe that a tenant, eſpecially on a long leaſe, would give more for a farm if the houſe and offices were commodious, than if they are ſo miſerably deficient as moſt farm-offices are. He would even be the more readily induced to take a farm on that very account; and thus the landlord may often loſe a good tenant, merely by not having proper accommodation for him. He has heard farmers declare, that they would willingly agree to pay five *per cent.* or more on the expences laid out on commodious buildings, over and above the rent of the farm, rather than occupy for nothing thoſe they at preſent poſſeſs, and that they would, beſides, undertake to be at the expence of every ordinary repair during the continuance of their leaſe. How then, ſays he, can a landlord lay out a few hundred pounds to better purpoſe than to accommodate his tenants, if he gets not only five *per cent.* on the money thus laid out, (but provided his buildings are very complete) perhaps as much additional rent as will amount to five *per cent.* more. He is well convinced that the great expence of erecting new farm buildings in the uſual way is a very material obſtacle to altering the preſent form; for there are few landlords, he ſuppoſes, who would chooſe to lay out five or ſix times the rent of a farm in new accommodations for that farm, if by propping and patching they can at a ſmall expence make the old buildings anſwer. When, ſays he, we hear of 500*l.* being expended in building a barn on a ſmall farm of about 100*l.* rent, as is the caſe in ſome parts of England, and 1000*l.* laid out on a farm-houſe, it is no wonder that landlords are cautious of engaging in ſuch buildings, and it cannot be ſuppoſed that tenants would be mad enough to do ſo. Hence, perhaps, is the principal reaſon why the generality of farm-houſes and offices are in ſo ruinous a condition. But when farmers can be perſuaded that ſuch enormous barns are unneceſſary; that their corn can be kept much more ſecure and leſs liable to injury in a well-aired rick-yard, and that if they have juſt room enough in their buildings for all the common purpoſes of the farm, no more is requiſite; alſo, that a neat, ſmall commodious dwelling-houſe is fully more comfortable than a large diſmal one; then we ſhall find, he thinks, that landlords will more readily agree to accommodate their tenants; and that inſtead of thoſe gloomy, prepoſterous, ruinous buildings, now a diſgrace to almoſt every part of the kingdom, we ſhall behold neatneſs and uniformity combined with every neceſſary accommodation, which will afford not only pleaſure and comfort to the occupiers, but a beauty and an ornament to the country at large. That this may be accompliſhed at a very moderate expence, he hopes to be able to prove. So far as any general rule can be given upon this ſubject, and allowing for circumſtances and the variation of prices, he is fully perſuaded by the obſervations he has made in different parts of the kingdom, that, in general, one year's rent of the farm, if not under 70*l.* (or at moſt two) is amply ſufficient for building every accommodation neceſſary upon that farm, excluſive of the dwelling-houſe; and that one year's rent is enough to build a dwelling-houſe on all farms not exceeding 400*l.* a year (in many ſituations leſs may do); and, laſtly, that 500*l.* are ſufficient for a dwelling-houſe, and 1000*l.* for offices on a farm of any extent. It is likewiſe obſerved, that in building new farm-houſes and offices, a great ſaving of expence will accrue, by making uſe of all the ſerviceable materials in the old buildings, where ſuch buildings are, and it will aſtoniſh many (provided they are fairly dealt with) who have been accuſtomed to thoſe large, unneceſſary, and expenſive buildings commonly uſed, at how ſmall an expence, comparatively ſpeaking, a new ſet of offices, or houſe may be built, having the advantages of ſuch materials near the ſpot. Workmen, in general, are much averſe to uſing old materials, eſpecially carpenters, who, rather than run the riſk of touching a ruſty-nail with a hatchet or ſaw, will put their employer to the expence of ſome hundreds of ſuch tools, by condemning the old, and adviſing him to purchaſe new timber.

To a tenant, the conſtruction and arrangement of his farm-buildings is a matter, he ſays, perhaps of more importance than even to a landlord. After all his toils and labours, and the many anxious and ſleepleſs hours he has paſſed before his crop has come to maturity, if his offices are inſufficient, or improperly conſtructed, he ſtill runs the riſk of many inconveniences, and even real loſs. The ſecurity of his grain, the labour, and the value of his horſes, and other cattle, the ſafety and duration of his implements, are all dependent on the perfection or imperfection of his offices. By arranging them judiciouſly (a matter very little attended to), a great deal more labour may be obtained from his ſervants, and every operation on the farm will be carried on with more facility and diſpatch; for, if a barn is ſet down here, a ſtable there, a cow-houſe or feeding-houſe in another place, all without rule or order, and as if chance had ſet them down, much unneceſſary labour will be occaſioned, and a great deal of time loſt in carrying provender to the cattle, and in keeping them ſo clean and dry as is neceſſary towards their health and preſervation.

Farm-buildings, as has been already remarked, ſhould always, he ſays, be proportioned and conſtructed according to the ſize and produce of the farm; which, in ſettling their dimenſions and arrangement muſt be particularly taken into conſideration. If, for example, the farm is adapted entirely to grazing, very few buildings will be neceſſary, except ſome ſheds, and theſe will be in uſe chiefly during the winter ſeaſon, temporary ones being often erected in the fields for the ſummer. On farms where cattle are houſed only in winter, or in ſuch farms where more buildings are uſed in winter than in ſummer, a great expence in roofing may be ſaved in cattle-ſheds by erecting walls only, or having pillars or poſts placed and framed in ſuch a manner as to ſupport peaſe, hay-ricks, or any other ſort of ricks that are not intended to be taken down till the ſpring or ſummer. This will not only anſwer the purpoſe of an excellent warm roof, but will be a very good ſituation for building ſuch ricks. If, however, the farm is entirely for grazing, as before ſuppoſed, there may not be a ſufficiency of ricks, unleſs of the fodder for the cattle, to make ſuch temporary roofs. In that caſe the ſheds muſt of courſe have permanent ones, which may be of the cheapeſt conſtruction. Or, if there ſhould be a ſufficient number of boards about the farm, as is ſometimes the caſe, they may be laid looſely on, to ſerve as a roof to the ſheds, till wanted for other purpoſes.

But a dairy farm will require a different ſort of accommodation, being in general compoſed partly of the grazing and partly of the arable kind. The cow-houſes muſt be proportioned to the number of cows uſually kept, with every other accommodation for carrying on the dairy buſineſs, whether as a cheeſe or butter farm. Small ſtables, and a ſmall barn, are ſufficient for ſuch a farm.

But in an arable or corn farm, which generally partakes of both the other ſorts, the buildings muſt be more numerous, and ſuited, in ſome reſpect, to all theſe different purpoſes; the ſtables in proportion to the number of horſes or cattle requiſite for labouring the farm; the cow-houſes, and feeding houſes, according to the number of cows generally kept, and cattle fed; the barn and granary according to the extent of arable land, together with all the other uſual accommodations for breeding young horſes or cattle, for hogs, poultry, &c. all which muſt be particularly conſidered of, while planning the farm offices and buildings.

However, ſince the invention of threſhing-mills, a moſt material alteration may, he conceives, be made in the conſtruction of farm-buildings, particularly in barns. The tedious and laborious operation of threſhing with the flail made it neceſſary to have the barn large enough to hold a great quantity of corn in the ſtraw, or at leaſt to contain a whole ſtack at once; and, beſides, to have it ſo lofty as to give ſufficient height for raiſing the flail. This is by no means neceſſary where there is a threſhing-mill, for as the mill, if properly conſtructed, will threſh the corn as faſt as taken in, it is unneceſſary to throw in the whole ſtack at once, or what remains of it in the rick-yard, if any, may be covered with a tarpawling, or painted canvas for that purpoſe, a thing that every farmer ought to have, being of eſſential uſe either in caſe of a ſudden ſhower in harveſt, when building a ſtack, or hay-rick, or of leaving one unfiniſhed at night, or any other time. A threſhing-mill not requiring ſo lofty a barn as a flail, a very convenient granary or ſtore-room may be obtained above the mill, which, in the common way, could not have been had. In ſhort, the advantages of a threſhing-mill are ſo numerous, that no farm producing 1000 or 1200 buſhels of grain annually ſhould, he thinks, be without one of them. See GRANARY, and THRESHING-*Machine*.

It is further obſerved, that when the plans of any farm-buildings are finally determined on, there are many preliminary conſiderations neceſſary to be attended to, previous to the commencement of the work. Such are the ſituation with reſpect to the quality of the air, the water, materials for buildings, acceſs and expoſure, the ſoil for laying the foundations upon, the beſt method of conducting the drains, together with the expence of completing the whole of them.

In ancient hiſtory we are told, the writer ſays, that the Romans were ſo very attentive and careful in the choice of a good and healthy ſituation, that they would not even encamp upon a ſpot of ground till they tried various experiments to aſcertain if it was ſufficiently healthy. How much more neceſſary then is it, ſays the author, to aſcertain the ſalubrity of a place deſtined for more permanent purpoſes. In general, where a choice of ſituation can be had, theſe four things ſhould, he thinks, be particularly attended to; a pure and temperate air, the water wholeſome, and eaſily come at, the ſoil dry, and the place centrical, and of eaſy acceſs. No buildings whatever require theſe qualifications more than farm-buildings: yet, in general, it would appear that they had been totally diſregarded. How often do we ſee farm-buildings and barn-yards placed in the very worſt ſituation in a whole farm; in low, marſhy, boggy ſpots, almoſt inacceſſible to man or beaſt, and fit only for a reſort for frogs and wild-ducks. Perhaps too, within a little diſtance, a fine dry wholeſome ſituation might have been obtained; for there are few farms of any conſiderable extent in which a tolerably good ſituation for building may not be found ſomewhere. If dryneſs and purity in the air are ſo deſirable and requiſite for the ſite of a dwelling-houſe, how much more (if poſſible) are they neceſſary for farm-offices and barn-yards. If theſe are placed in a damp and humid ſpot, the farmer's whole crop runs the riſk of being rendered uſeleſs and unſaleable, however dry and well conditioned he may have brought it from the field; for if the place to which he brings it is damp and unwholeſome, his grain will ſoon acquire a ſoftneſs, and perhaps muſtineſs, very injurious to its value. On the other hand, if the ſituation is dry, his grain will not only improve and keep in better order, but in general it will be of a better quality, and conſequently worth a better price at the market or other place of ſale.

In the buſineſs of fixing the arrangement of a new ſet of farm-buildings, the firſt thing to be taken into conſideration, after chooſing the ſituation, is the nature and produce of the farm. From theſe may be judged the different kinds of accommodation that will be neceſſary. For example, every farm muſt have, 1ſt, a dwelling-houſe; 2dly, a barn ſuitable to the extent of arable land on the farm, either with or without a threſhing-mill, but always with one, if poſſible; and it ſhould be endeavoured to place it ſo that it may go by water, if a ſupply can be had; 3dly, ſtables, the dimenſions of which muſt be determined according to the number of horſes neceſſary for the farm; 4thly, cow-houſes, or feeding-houſes, or both, according to the number of cows and cattle; and ſo on, till the whole accommodations neceſſary, and their dimenſions, are fixed upon. Having aſcertained theſe, and the ſituation for building on being alſo ſettled, the ground muſt be carefully and attentively viewed; and if not very even, the different levels muſt be obſerved, and the beſt way of conducting all the neceſſary drains, and carrying off all ſuperfluous moiſture. Alſo the beſt ſituation for dung and urine pits, or reſervoirs, which will, in a great degree, aſcertain at once where the cattle-houſes and ſtables ſhould be. Theſe being fixed on, the barn ſhould, he obſerves, be as near them as poſſible, for the convenience of carrying ſtraw to the cattle; and the barn-yard ſhould be contiguous to the barn. If a granary is reſolved on, that ſhould alſo be near the barn, or over it; as likewiſe the ſtraw-houſe, which ſhould be cloſe to the barn. Theſe main points being determined on, the others will eaſily be found; always obſerving this rule, to conſider what is the nature of the work to be done about each office, and then the eaſieſt and leaſt laborious way to perform that work ſo far as it is connected with other offices. In caſe this ſhould not be ſufficiently explicit, he ſhall ſuppoſe, by way of illuſtration, the ſituation of a feeding-houſe is to be conſidered of. The nature of the work to be performed here is, bringing food and litter to the cattle, and taking away their dung. The place from whence the greateſt part, perhaps, of their food and all their litter comes is the barn; therefore the feeding-houſe ſhould be as near the barn as poſſible. If turnips, or other roots, or cabbages, make a part of their food, the moſt commodious way of giving theſe muſt be determined on; whether by having a root-houſe adjoining the cattle-houſe, and that filled occaſionally, or by having a place to lay them down in, near the heads of the ſtall from whence they are thrown in at holes in the wall left for that purpoſe. The eaſieſt method of clearing away the dung muſt alſo be conſidered, according to the different plans mentioned when deſcribing cow-houſes, cattle-ſheds, &c. See COW-*houſe*, and CATTLE-*ſhed*.

And the ſame general rule being obſerved in determining on the ſite of all the other offices or accommodations, together with a careful examination of the ground to be occupied (upon which the arrangement of the offices in a great meaſure ſhould depend), any perſon converſant in rural affairs who attends to theſe particulars, and can lay down his ideas in a drawing, may, he thinks, eaſily direct the planning and building of a very commodious ſet of offices. With reſpect to the ſite of the dwelling-houſe, in addition to what has already been ſaid, it may be remarked, that, although a houſe, being ſituated in the middle of a regular front is, in ſome points of view, the moſt pleaſing way, and in many ſituations perhaps the beſt, yet, unleſs the ground and other circumſtances in every reſpect favour ſuch a diſpoſition, he would not invariably adhere to it; for it may often happen, he thinks, that a much better ſituation for the dwelling-houſe may be obtained at a little diſtance from the offices, and a pleaſing uniformity enough be obſerved in them at the ſame time.

In ſome caſes, and for ſome kinds of farms, it may be particularly neceſſary to have the houſe ſo placed in reſpect to the offices and farm-yard as to admit of their being conſtantly inſpected, and the labour which is to be performed in them to be perfectly attended to and ſuperintended.

A late writer on "Landed Property" has, however, well remarked, that the particular requiſites of a farm-ſtead are as various as the intentions of farms. A ſheep-farm; a grazing-farm; a hay-farm; a dairy-farm, and a farm under mixed cultivation, may require different ſituations and different arrangements of yards and buildings. On a farm of the laſt ſpecies, which may be conſidered as the ordinary farm of this kingdom, the principal requiſites are conceived to be ſhelter, water, an area or ſite ſufficiently flat for yards and buildings, with meadow land below it, to receive the waſhings of the yards, as well as ſound paſture grounds above it for a graſs yard and paddocks; with private roads, nearly on a level, to the principal arable lands; and with ſuitable out-lets to the neareſt markets. Where the firſt of theſe is wanting in the deſired ſituation, it may in time be ſupplied by plantations and mound fences. And where there is not a natural ſupply of water, a well, water cellar, or artificial rill may furniſh it. And graſs lands are eaſily produced in almoſt any ſituation; and by the help of enriching water, or by manure and paſturage may in moſt be rendered perennial.

From what has been advanced it is conceived evident that no general plan can prevail, even on what may be emphatically called an *Engliſh farm*, compoſed of arable meadow, paſture, and wood lands. The plan of the farmſtead muſt ever be moulded to the main object of the farm, whether it be corn, the dairy, rearing cattle, fattening cattle or ſheep; as well as to its ſize; for although the ſame or nearly the ſame ſpecies of conveniences are required on a ſmall as on a large farm of the ſame intention, the number may be leſs; and the arrangement be made on a more frugal plan. But in this, as in every other matter of arrangement, the firſt thing to be done is to aſcertain the particulars to be arranged, which for a farm of the mixed kind or under mixed huſbandry may be thus enumerated; 1ſt, a ſet of farm buildings adapted to the intended plan of management, as a dwelling-houſe, barns, ſtables, cattle ſheds, cart ſhed, &c.; 2dly, a ſpacious yard, common to the buildings, and containing a receptacle for ſtall manure, whether ariſing from ſtables, cattle-ſheds, hog-ſties, or other offices, together with ſeparate folds or ſtraw yards, furniſhed with appropriate ſheds for particular ſtock, in places where ſuch are required; 3dly, a reſervoir or catch-pool, ſituated on the lower ſide of the buildings and yards, to receive their waſhings, and collect them in a body, for the purpoſe of irrigating the lands below them; 4thly, a corn yard, convenient to the barns; and a hay yard, contiguous to the cow or fattening ſheds; 5thly, a garden, and fruit ground near the houſe; 6thly, a ſpacious graſs yard or green embracing the whole, or the principal part of the conveniences; as an occaſional receptacle of ſtock of every kind; as a common paſture for ſwine, and a range for poultry; as a ſecurity to the fields from ſtock, in ſtraying out of the inner yards, and as an anti-field, or lobby, out of which the home-grounds and drift-ways may be conveniently entered, for different purpoſes.

With regard to the diſtribution and arrangement of theſe objects, in order to make it with good effect, great caution, ſtudy, and patience are required; that the moſt may be made of given circumſtances. An accurate delineation of the ſite which is fixed on requires to be drawn out on a ſcale; the planner ſtudying the ſubject alternately upon the paper and on the ground to be laid out; continuing to ſketch and correct his plan, until he has not a doubt left upon his mind; and then to mark out the whole upon the ground, in a conſpicuous and permanent manner; before the foundation of any particular building be attempted to be laid. It may be eaſily conceived by a perſon who has not turned his attention to this ſubject, that there muſt be ſome ſimple, obvious, and fixed plan to proceed upon. But ſeeing the endleſs variety in the mere dwelling places of men, it is not to be wondered at, if a ſtill greater variety of plans ſhould take place where ſo many appurtenances are required; and theſe on ſites ſo infinitely various: nor that men's opinions and practices ſhould differ ſo much on the ſubject, that on a given ſite no two practical men, it is more than probable, would make the ſame arrangement. There are, however, certain principles which no artiſt ought to loſe ſight of in laying out buildings and conveniences of this deſcription. The barns, the ſtables, and the granary, ſhould be under the eye, ſhould be readily ſeen from the dwelling houſe. And the prevailing idea at preſent is, that the ſeveral buildings ſhould form a regular figure, and incloſe an area or farm-yard; either as a fold for looſe cattle, or where the ſtalling of animals is practiſed, as a receptacle for dung; and the moſt prevalent figure is the ſquare. But this form Mr. Marſhall ſuppoſes more defective than the oval or circle, the angles being too ſharp, and the corners too deep. Beſides, the road-way, neceſſary to be carried round a farm-yard, in order to have a free and eaſy paſſage between the different buildings, is inconveniently lengthened, or made at greater expence. The view of the whole yard and buildings, from the houſe on one ſide of it, is likewiſe more confined in ſome reſpects.

The able author of the work on "Landed Property" had formerly, he remarks, ſuggeſted the plan of a polygon, or many-ſided figure, or an irregular ſemi-octagon, with the dwelling houſe and the ſtables on the largeſt ſide, having ranges of cattle-ſtalls oppoſite. But he has ſince formed one on the complete octagon, the dwelling-houſe being on one ſide, and the entrance, gateway, and granary oppoſite, the remaining ſix ſides being occupied by ſtables and cattle-ſheds, with a broad-way dipping gently from the buildings, and ſurrounding a wide, ſhallow dung-diſh, which take up the reſt of the area of the yard. This is offered as a hint to thoſe engaged in laying out and directing buildings of this ſort, which they may adapt to the particular nature of the ſite or ſituation of ſuch as they are about to erect. But it is ſuppoſed not eſſentially neceſſary to follow any particular form or figure. The ſides may have a greater or ſhorter length, according to the nature of the ſite, and the intention of the builder. The ſite ſhould, if poſſible, be nearly, but not quite level; the principal yard being formed acroſs the deſcent; having the barn on the higher, and the ſtables on the lower ſides; as in this way the barn, ſtack-yard, ſtraw-yards, cow-ſtalls, and dwelling-houſe will have a dry ſituation; while the road that leads into the yard, and to the carriage-ſheds, will be on the level ground, which is the moſt ſuitable and proper.

In regard to the dwelling-houſe, the ſituation which is the moſt advantageous muſt in ſome meaſure be directed by the extent or ſize of the farm. Where it is ſmall, for the purpoſe of the labouring farmer, it may be placed at the north end of the yard, facing into it, and be approached through it. As the kitchen is the chief room in which he reſides when at home, and in which his wife performs moſt of her domeſtic buſineſs, the yard, the buildings, and the ſtock in the yard, will be conſtantly under the eye. But in an extenſive farm, where a yard-man is kept to attend the ſtock in winter, and where the houſe-work is moſtly done in the back-kitchen and dairy-room in the ſummer, and when the farmer is deſirous of entertaining his friends with a more agreeable proſpect than a farm-yard, the houſe may occupy the ſouth end of it, facing into the garden, and have a ſeparate approach in front. It is, however, ſuggeſted, that the firſt mode of diſtribution gives a deſirable ſhelter to the yard, while the latter leaves it expoſed to the north winds, which blow through the entrance and open carriage-ſheds. In either caſe, it is ſcreened from the eaſt winds by the barn and cattle-ſheds. It is alſo of advantage to have the houſe fronting to the ſouth, in order to give coolneſs to the dairy buildings. But ſince the introduction of threſhing machines, in the place of threſhing floors, the barn is become quite different, requiring another form, arrangement, and ſituation. One end of it ſhould, in theſe caſes, be placed towards the farm-yard, inſtead of the ſide, which is proper in the contrary circumſtances, the other end being towards the ſtack-yard, to which it ſhould be connected, with a rail-way for removing the corn upon to it, having a lean-to-ſhed and ſtraw-yard on the ſides where they may be requiſite. Theſe barns ſhould be large enough to contain a good quantity of grain at a time, for threſhing out in wet weather, when little elſe can be done. See Barn, Farm *Yard*, and Threshing *Machine*.

It is further ſuggeſted, that the ſmall angular roomſteads between the ranges of ſheds may be formed into convenient places for containing fodder, roots, &c. and for the keeping of calves, &c. &c. There ſhould likewiſe be a receptacle for the ſtall manure, which ſhould be properly formed and connected with the ſtalls by proper drains, and a reſervoir for the reception of the yard liquor, where it cannot be turned upon the land below, which in many caſes is of but little conſequence to its improvement.

But the arrangement and connection of buildings of this ſort, as relating to different deſcriptions of farms, may probably be better and more readily underſtood by an examination of the annexed plates.

In *Plate* XIII. (*Farm*) on *Agriculture*, is given a full repreſentation of the neceſſary farm buildings for carrying on graſs and dairy huſbandry on a middling ſcale. At *fig.* 1. is ſhewn the plan and elevation of a houſe where the graſs, hay, or other ſimilar ſyſtem of farming is purſued. *Fig.* 2. is the ground plan of the ſame; and *fig.* 3. diſplays the arrangement or diſtribution of the ſeveral out-buildings or offices.

The expence of completing a ſet of farm buildings on this plan would, at preſent, where materials are pretty much at hand, be from four to five hundred pounds.

At *fig.* 4. in the ſame plate, are exhibited the plan and elevation of a houſe of this nature, where the chief ſyſtem purſued is dairying: *fig.* 5. explains the ground plan; and at *fig.* 6. the diſtribution of different neceſſary offices is diſplayed.

On this plan, as there are fewer out-buildings than in the former caſe, a ſet of proper farm-offices, with the houſe, would probably coſt from three to four hundred pounds.

It muſt, however, be remarked, that the convenience or diſtance of materials, muſt render the difference of expence in the buildings very conſiderable in both theſe caſes.

And in *Plate* XIV. (*Farm*) on *Agriculture*, are ſhewn plans and elevations of farm-buildings, where the ſyſtem of huſbandry is of the corn, or of the mixed kind, and the farms of a middling extent.

Fig. 1. is the plan and elevation of the houſe; *fig.* 2. the ground-plan of the ſame; and *fig.* 3. the diſtribution of the various out-buildings.

This plan may, in moſt caſes, be finiſhed for the ſum of from ſix to ſeven hundred pounds.

At *fig.* 4. are the plan and elevation of a farm-houſe and buildings of the latter kind.

Fig. 4. is the elevation of the houſe; *fig.* 5. the ground plan; and *fig.* 6. affords a view of the ſituation and arrangement of the ſeveral neceſſary offices.

If finiſhed on this plan, the expence would be from ſeven to eight hundred pounds.

The materials, in conſtructing buildings of this nature, ſhould always be of the beſt kind, as durability is a principal object. See Farm *Yard*.

Farm *Houſe*, is that ſort of building which is attached to, and conſtructed for, the purpoſe of carrying on the different operations, and general buſineſs of a farm. It ſhould be ſo contrived as that the neceſſary work may be performed with the greateſt eaſe and convenience. The writer of a paper in the firſt volume of "Agricultural Communications to the Board," has ſuggeſted, that houſes of this ſort ſhould not only contain every conveniency for a family, but have a degree of neatneſs and uniformity, which, if properly managed, will coſt no more than a dull, irregular building. It was long ſince remarked by Columella, that "a farm houſe ſhould be ſomewhat elegant, to give pleaſure to its poſſeſſor, and to allure the wife to take delight in it. It ſhould be built on the moſt healthy ſpot of the farm, in a temperate air, ſuch as the middle of a hill commonly enjoys, where it is neither ſtifling in the ſummer, nor expoſed to the rage of winds and ſtorms in the winter." At preſent other circumſtances moſtly regulate its ſituation. See Farm *Buildings*.

The ſize of a farm-houſe ſhould be regulated by that of the farm, according to a late writer, although not ſo ſtrictly ſo as the other buildings; a parlour and kitchen, with dairy, cloſets, and other conveniences below ſtairs, and the upper ſtory divided into bed-chambers, are probably ſufficient accommodation for any farmer's family. Theſe may be conſtructed or enlarged according to circumſtances, or to the inclination of the proprietor: but it is better to give a little more room than neceſſary, than not to give enough. None of the buildings about a farm, he ſays, admit a greater latitude of conſtruction than the farm-houſe; for ſometimes a very ſmall houſe may do for a very large farm: at other times it would require a pretty large houſe in a ſmall farm, according to the ſize of the farmer's family, and, perhaps, to the ſituation in life he has been accuſtomed to; for there are many very reſpectable and worthy farmers whoſe manners and converſation entitle them to the beſt accommodation; and it ſometimes happens that a landlord will conſider this, and build a houſe for the farmer inſtead of the farm. There is ſomething, he remarks, ſo pleaſing in the appearance of neatneſs and cleanlineſs about a dwelling-houſe, that even a ſtranger, tranſiently paſſing by, cannot help being pre-poſſeſſed with a favourable opinion of thoſe within. He paſſes along with the idea fixed in his mind of proſperity and happineſs preſiding within the walls. How different, ſays he, the ſenſation felt on viewing a contrary ſcene; a houſe diſmal and dirty, the doors and walls ſurrounded and beſpattered with filth of all denominations, and fragments of broken diſhes, and dirty dairy utenſils ſcattered in all directions; a ſcene which muſt impreſs on the mind the idea of miſery and miſmanagement, and a contempt for thoſe ſlatterns who can ſuffer ſuch beaſtlineſs; for in ſuch caſes it is generally the female part of the family who has the merit or demerit of domeſtic appearances. And how eaſy a matter is it to conſtitute the difference; a little care and attention is the whole ſecret. It adds greatly, the writer thinks, to the beauty and neatneſs of a dwelling-houſe, to have a little plot of garden-ground or ſhrubbery before it: this not only contributes to keep every thing neat and clean in front, but is often eaſier managed than a garden behind. After feeling the pleaſure and ſatisfaction of keeping this plot in good order, every weed that appears viſible from the windows will be conſidered as a nuiſance, and pulled up accordingly. So great an antipathy to weeds may thus be raiſed in the farmer's breaſt, that his efforts for their deſtruction may even be extended to the fields; and by theſe ſimple means a ſlovenly farmer may, he conceives, be ſo completely reformed, as not to ſuffer a weed to be ſeen on his farm.

It is ſtated that large windows add greatly to the cheerfulneſs of a farm-houſe; the ſaſhes being placed as near the outſide of the wall as poſſible. The reverſe of this is, he ſays, a glaring deformity in moſt houſes in the northern parts of the kingdom. There the windows are ſo ſmall, and the ſaſhes placed ſo deep in the walls, that it gives the moſt diſagreeable gloomineſs to the whole building. This is ſaid to be done with an idea of preſerving the ſaſhes from the weather, a moſt egregious miſtake. The ſaſhes are, perhaps, more liable to injury by being deep in the walls, than by being placed near the outſide, for they receive full as much wet, and are not ſo ſoon dried again.

It is, the writer ſays, a common practice, and, with many, a general rule, to build the farm-houſe adjoining to the offices. Where the ſituation will not admit of a better arrangement, or in a ſmall farm, to ſave a few roods of building, this may be done; but in general it is better to build the dwelling-houſe, and any other buildings with chimnies in them, a little way detached from the farm offices, not only on account of the danger ariſing from fire, but of the diſagreeableneſs (perhaps unwholeſomeneſs) of living in a dung-hill, or in the midſt of cattle and ſwine. If, ſays he, a farm-houſe, for the ſake of uniformity, is to be built adjoining the farm-yard, there ſhould be a conſiderable length of wall at each end of it to unite it to the offices. But it is certainly better to make the houſe at a little diſtance from the wall of the yard; and whether that diſtance is ten feet, or fifty feet, there can be little or no difference with reſpect to convenience. At the ſame time it is by no means adviſeable that the farm-houſe ſhould much exceed fifty or ſixty yards from the offices, as there might unqueſtionably ſome inconvenience ariſe if beyond that diſtance. In the annexed plans of farm-houſes four things are particularly attended to in their conſtruction, ſimplicity, uniformity, convenience, and cheapneſs. In delineating ſuch buildings, therefore, there is not, the writer thinks, that latitude given for a diſplay of thoſe architectural ornaments, which in a higher ſphere of buildings are ſo pleaſing to the eye, and ſo truly beautiful when diſpoſed by the hand of a ſkilful architect. Such ornaments are unneceſſary in farm buildings, and are therefore entirely omitted. At the ſame time a ſtrict attention to uniformity is particularly obſerved; and although the windows are, in general, made ſomething wider in proportion to their height than is permitted by the rules of architecture, in order to anſwer the purpoſe of giving as much light as poſſible, (the chief uſe of windows,) it is, however, hoped, that no very great or offenſive deviations are made from theſe rules, even in that caſe. The accommodations are calculated to be as convenient as poſſible in the family way; and by making the ground-floors at leaſt ſixteen inches, or two ſteps, above the level of the ground, and taking proper care to lay thoſe floors, a great deal of that dampneſs, and conſequently unwholeſomeneſs, ſo often complained of, will, he conceives, be guarded againſt and prevented.

Many people, the writer ſays, prefer gable-ends, as in *fig.* 4. *Plate* XV. (*Farm*) on *Agriculture.* For his own part he is, however, of opinion, that hip-roofs, and the vents within the buildings, are generally preferable. The hip-roof requires no more materials; and the gable-ends not only occaſion more expence of building, but an unneceſſary addition of weight upon the end walls. Vents built within-ſide the houſe are leſs liable to ſmoke than when in an outſide wall; beſides, they contribute generally to keep the houſe warm, for they act as flues, and diffuſe their heat, in ſome degree, all over the building. It muſt be obſerved, that the principal walls are all delineated, of the thickneſs of two feet, that being conſidered as the beſt thickneſs for rough ſtone walls. Where the ſtones are good, and of a proper form for building, or where bricks are uſed, the walls may, no doubt, be thinner; but, when too thin, the heat of the ſun in ſummer, and the coldneſs of the external air in winter, have ſo diſagreeable an effect, by penetrating through, that it is beſt to err on the ſafe ſide, and to make them of a good thickneſs. This is one of the greateſt inconveniences, he obſerves, of brick buildings; for in general brick walls are ſo thin, that theſe effects are moſt ſenſibly felt both in the ſummer and winter ſeaſons.

And by making the different apartments and other diviſions and conveniences no larger than neceſſary, the leaſt poſſible expence will, the writer ſays, be incurred. The dimenſions of theſe ſhould be proportioned according to the ſum intended to be laid out. Very frequently a good plan is thrown aſide merely on account of the expence of putting it in execution; whereas, it ſhould be conſidered, that, by contracting the rooms, and the building in general, the ſame plan may be executed accordingly, whatever expence may be determined on. The plans given may therefore be varied in ſize, till of ſuch dimenſions as will coſt no more than the ſum allotted for that purpoſe. For theſe reaſons, eſtimates of buildings, in a general view, are, the writer conceives, really of leſs importance than moſt people imagine, there being hardly two counties in the kingdom where the ſame plan can be executed at the ſame expence. Even in the ſame county, and in the ſame pariſh, the expence will often vary conſiderably, according to circumſtances. The diſtance from materials, the quality and price of thoſe materials, the goodneſs or badneſs of the roads, the nature of the ſoil to be built on, and, conſequently, the expence of the foundations, the price of labour, the ſeaſon of the year, and even the ſtate of the weather, all tend to make a difference in the expence of building. It is, therefore, hardly poſſible to make a correct eſtimate, unleſs the ſpot intended for erecting the building is known and examined; and an incorrect eſtimate is much better to be omitted. Some people, the writer remarks, will pretend to make an eſtimate without even inquiring into thoſe circumſtances which muſt regulate the expence, knowing that when the ſum they mention is expended, their employer will not ſtop the building on that account. It is beſt, therefore, to be cautious in dealing with ſome people, unleſs they will contract for the ſum eſtimated.

But in ſome parts of the country, it is obſerved, a houſe built on the plan and of the dimenſions ſhewn at *fig.* 1. in *Plate* XV. (*Farm*) on *Agriculture*, may be completed for about 70*l.* or 80*l.*: while in other parts it may coſt 150*l.* or more; conſequently, it would tend only to miſlead, by ſtating either the one or the other as an eſtimate of ſuch a building.

At *fig.* 5. in the ſame plate, is the plan of a farm-houſe alſo on a larger ſcale. Yet to commence a building, without knowing previouſly the expence it will coſt, ſhould at all events be avoided, as being almoſt a certain opening for impoſition. The beſt way, therefore, to aſcertain this, is to chooſe a plan: if the propoſed building is not of that extent or importance to require the aid of an architect, employ any perſon converſant in thoſe matters, whoſe fidelity can be relied on, to examine the ground, and to conſult with different tradeſmen concerning the expence at which they would undertake to execute their reſpective parts; a pretty correct eſtimate may, the writer ſays, thus be obtained. Or the plan may be laid before different intelligent tradeſmen, and their eſtimates required, and afterwards examined into, not only as to the charge made, but the manner of executing the work; for it is not always the loweſt eſtimate that is to be preferred. If in either caſe the ſum ſhould amount to more than is propoſed to be laid out, the dimenſions of the plan, and the manner of finiſhing ſome of the parts, may be altered, till it is found that it may be executed for about the ſum propoſed by the perſon who intends to build.

And it has been remarked by the author of "Modern Agriculture," that, in regard to the ſhare of expence and trouble which proprietors and tenants in general ought to be ſubjected to, in erecting farm-houſes, all leaſes ſhould contain a clauſe, by which the proprietors become bound to be at the expence of materials and workmanſhip, to the extent of a ſtipulated ſum, rather above than below two years' rent. The tenants ſhould not only undertake the carriage of materials, without making any charge for ſo doing, but alſo become bound to keep the houſes in good order, and to relinquiſh them equal in value at the expiration of the leaſe, or to pay any deficiency, as the ſame may be determined by proper tradeſmen, mutually choſen for the purpoſe.

It is ſuggeſted that it has been a common practice in ſome parts of Scotland, (which ought to be introduced every where,) to bind tenants to inſure their houſes from any damage by fire. This clauſe in leaſes is attended with another good conſequence, the tenants generally inſuring their ſtock and houſe-furniture at the ſame time; ſo that when any accident happens, they are ſaved from the ruin which otherwiſe muſt neceſſarily enſue.

But the farmer's capital, it will readily be acknowledged, ought to be employed in ſtocking and improving the farm, rather than in erecting houſes; therefore, it is certainly bad policy in the landlord to divert that capital from thoſe channels in which it ought to flow freely, and without interruption. On the other hand, the circumſtance of the tenant being obliged to maintain the houſes in good condition during his leaſe, and to leave them of equal value at his removal, would induce him to pay proper attention that the houſes be ſubſtantially built, and that every neceſſary repair be completed in proper time, and in the moſt effectual manner. When repairs only are neceſſary on the entry, they ought to be promoted at the mutual expence of the parties. The proprietor ſhould advance the requiſite ſum for materials and workmanſhip, and the tenant perform all the carriages. A clauſe ſhould alſo be introduced into the leaſe, by which the landlord may have a right to execute repairs, provided they are deemed requiſite by proper tradeſmen, ſent to inſpect the houſes, intimation thereof being made a reaſonable time before to the other party. This, it is thought, would prevent that heavy load of expence which proprietors are frequently ſubjected to when tenants remove, and a mutual intereſt in the preſervation of the buildings would be formed between the proprietor and tenant. The tenant, although liable to pay for frequent partial repairs, would avoid the expenditure of large ſums; and, if bound to leave the houſes equal in value to what they were when he entered, as he certainly ought to be, the landlord would ſeldom be put to the expence of large ſums in the erection of new buildings of this nature.

The elevation, ground, and chamber plans of a farm-houſe upon a ſmall ſcale, calculated for a farmer where he lives with his ſervants, are repreſented at *figs.* 1, 2, and 3, in the plate mentioned above. It may be divided on the ground floor, as in *fig.* 2, where *a* is the entry; *b*, the kitchen which ſhould have an oven at *k*, when requiſite; *c*, a ſmall apartment off the kitchen, in which a bed may be placed, or it may ſerve the purpoſe of a ſtore-room, &c.; *d*, the farmer's private room, or parlour; *e*, the dairy, or it may be at *c*, if thought preferable; *f*, the hen-houſe, or which may ſerve for keeping or laying up ſmall tools, ſuch as ſpades, ſhovels, rakes, mattocks, &c.

And at *g g*, in *fig.* 3, is the chamber floor, which is only divided into two bed rooms in the plan, but may be further divided where neceſſary; *h*, is a pigeon-houſe over the neceſſary. The dimenſions are marked on the plan, but may be varied to ſuit particular circumſtances and ſituations.

The repreſentation of the elevation, and two ground plans of a farm houſe on a larger ſcale, which by ſuitable modification may be proper for a farm of any extent, is given at *figs.* 4, 5, and 6, in the ſame plate. In the plan 5, it is divided into *a*, the principal entry; *b*, the parlour; *c*, the family bed room; *d*, the kitchen; *e*, the dairy; *f*, the pantry and cellar; the three latter being attached to the back part of the houſe by a continuation of the ſame roof downwards. By only permitting the cielings to be ſeven and an half or eight feet in height, ſome ſmall bed-rooms may be provided above them, having a few ſteps down from the floor of the front rooms, or a few ſteps up from the firſt landing-place.

In many places farm-houſes are conſtructed on this plan. And the earl of Winchelſea, at Burleigh, has one erected in nearly a ſimilar method; but in it the back-door of the kitchen enters into a brew-houſe and waſh-houſe; the fire place and copper being behind the kitchen vent. Beyond this brew-houſe is a place for holding fire-wood, &c.; in the back wall of which are openings to feed the ſwine at. In the kitchen is an oven; and below the grate an excellent contrivance for baking occaſionally, but chiefly employed for the purpoſe of keeping the ſervants' meat warm. It conſiſts of a plate of caſt iron, with a door ſimilar to that of an oven.

The up-ſtairs part is divided in the front into two good rooms, and into two ſmall ones on the back part, but may be eaſily further ſub-divided where neceſſary.

And at *fig.* 6. is ſhewn another mode of dividing the ground floor of the elevation *fig.* 4, in which *a* is the parlour; *b*, the kitchen; *c*, the cloſet; *d*, the dairy; *e*, the pantry; *f*, the coal-houſe; *g*, the poultry-houſe; *h*, the pig ſtye, which has an opening to the kitchen; *i*, the back entry. The chamber-floor may be divided likewiſe, where it is requiſite, into two good bed rooms, and a light cloſet capable of holding a bed, or in any other way that may be thought more convenient. It would be eaſy to introduce a variety of other elevations and plans for conſtructing farm-houſes upon, with perhaps other conveniences than theſe, but in detached ſituations from the houſes: theſe examples may, however, be ſufficient for affording hints for erecting them ſo as to ſuit farms of all extents and deſcriptions.

FARM *Lands*, in *Agriculture*, ſuch lands as are in the occupation of tenants, or held in the ſtate of farms.

FARM-*Manager*, a perſon who has the overlooking and directing of the buſineſs of a farm: the ſame as bailiff, and land ſteward. See BAILIFF and LAND STEWARD.

The proper overlooking and managing of a farm is a buſineſs of much greater difficulty and importance than is generally ſuppoſed. It will demand the whole attention and time of the perſon who engages in it; and muſt, in fact, conſtitute his principal amuſement, as where he is apt to be drawn off by other purſuits, it ſeldom goes on well. In order to proceed in it with eaſe and convenience, it is proper that he ſhould keep a conſtant look out to the buſineſs which is to be performed, as unleſs this be well attended to, he will be frequently liable to error and miſtake; and much will often be left undone which ought to have been executed. It is eſſential that he look forward to the buſineſs of cropping for ſeveral years, to that of team labour for ſome months, and to hand labour for a few weeks, as the ſeaſon of the year may direct. In this he will be greatly aſſiſted by the keeping of a proper liſt of the ſeveral fields of the farm, with the crops they have ſeverally produced for different years paſt, and the manurings which they have each had.

From this liſt, the arrangement of crops which are to be cultivated the enſuing year ſhould annually be made out in the autumn, claſſing the fields according to the purpoſes for which they are deſigned; as by this means the quantity of each ſort of crop will be ſhewn, as well as the extent of paſture; conſequently the amount and ſtrength of team, and other labour, be fully pointed out, in order to be duly provided for; the different crops be put in in proper time; and the ſummer ſtock be apportioned with exactneſs.

In the ſame, or other liſt, memoranda ſhould likewiſe be kept of the works to be done directly and in ſucceſſion, in every department of the buſineſs, ſo that every thing may proceed in the moſt regular and proper manner, and nothing be overlooked.

In conducting the execution of the work, whatever the nature of it may be, caution and firmneſs are highly requiſite, as well as an invariable attention, never to attempt too much, or to begin any ſort of undertaking in the way of improvement, without the greateſt probability of finiſhing it in due time.

Beſides the above, there are ſeveral other points in which the good management and correct conduct of this ſort of farm-ſervant is ſhewn, as:

In keeping the farm-yards and buildings in neat order, and perfect repair, as well as free from all ſorts of obſtructions to the buſineſs which is going on in them.

In taking care of the various private roads of the farm.

In preſerving the fences in general good repair, and taking proper care of the young hedges, as well as of the timber raiſed in them.

In ſeeing that the gates faſten in a proper manner, and prevent the ſtraying of looſe ſtock.

In taking care that drains and water courſes are kept properly open, for the effectual diſcharge of ſuperfluous water.

During the ſummer ſeaſon the watering places of live ſtock ſhould be well attended to; as well as the ſtate of the paſtures, and the proper ſhifting of the paſturing ſtock.

The weeds in the graſs lands, as well as in the tillage grounds, ſhould alſo be carefully regarded, to ſee that not a thiſtle blows, or any other ſort of weed ripens its ſeed, either in the open parts, or the borders or banks of them.

In the winter ſeaſon live ſtock becomes the chief object of the manager's attention, not only to take care that they are properly ſupplied with ſuitable fodder and water; but that they have ſufficient ſhelter and convenient reſting places.

And the watering of graſs lands is another matter which deſerves particular regard from the farm manager at this period of the year. It is, however, a ſort of work which requires nice attention in its performance.

There are likewiſe various other points of farm management which may be equally deſerving of regard by the perſon employed in directing the buſineſs of a farm, though of much leſs importance than thoſe which have been noticed.

While the work of the farm is carrying on in the fields, it is the province of the manager to be frequently with the work people, to ſee that his directions are properly attended to, the different operations executed in a proper manner, and the neceſſary diſpatch obſerved in performing them. He muſt be frequently paſſing from one ſet of work people to another, keeping a ſteady eye upon the various kinds of work which are going on, and directing ſuch additional aid as may ſeem requiſite in particular caſes, eſpecially where team labour is performing, in order that the whole buſineſs may be conducted in the moſt profitable way.

In directing the work of teams, an even ſteady pace ſhould be inculcated, both in the view of the animals, and the labour which they are to perform, as hurrying them never anſwers any good purpoſe. On particular occaſions it may be requiſite to have recourſe to as much expedition as poſſible, in which caſes the example of the manager, and the holding out of ſuitable rewards, where neceſſary, may be the moſt proper incentives to exertion. Under all circumſtances, lazineſs and trifling ſhould conſtantly be held in the utmoſt deteſtation and contempt by the director of a farm, as being equally fraudulent with that of little pilfering And their ſtrong reprobation has not unfrequently an uſeful effect on the farm labourer.

The proper regulating and directing of farm ſervants, and thoſe work-people who are employed, form an extremely difficult part of the manager's duty. The beſt method is probably that of encouraging ſuch as are good by every proper means, and never ſuffering bad ones to continue. It is always the beſt policy to pay good wages, and have the beſt workmen that the ſituation affords, as theſe are often ſixpence or a ſhilling a day better than ordinary ones, though no diſtinction has been made by cuſtom in reſpect to the prices in theſe caſes. It is of great advantage for the manager of a farm to keep a proper diſtance between himſelf and the work-people under him, without deſtroying that freedom of opinion concerning the works carrying on, which is, in ſome inſtances, eſſential to their proper performance. In the directing of work-people, the rule with him ſhould be, in no caſe, to find fault, without occaſion, or to commend without reaſon; as good workmen cannot brook the former, or bad ones be mended by the latter. Real faults ſhould not, however, be overlooked, but the workmen be told of them in a proper way, according to their nature; and where the caſe demands it, let ſuch ſtrong language be made uſe of as may arouſe them to due exertion. A great deal, however, depends upon the orders of the manager being conveyed to the workmen in a proper way; as where they are given in a looſe, incorrect manner, it is not to be ſuppoſed that they can be perfectly executed. It is difficult to explain farm-works in words, ſo as to be fully comprehended by workmen, and where it is done by the medium of another perſon, inaccuracy is certain. It conſequently becomes eſſential for the manager to give his orders perſonally, and when it can be done, even upon the ſpot, to ſuch workmen as are to execute them, as he can there fully explain himſelf to them, and where neceſſary, aſſiſt them in ſetting out the works. The able manager, therefore, conſtantly attends in perſon, in beginning new works, and where they are out of the common line of huſbandry, remains with the workmen directing them, and returns occaſionally to them, until he finds them completely in their work, as, without ſuch attention, much time and labour would often be thrown away.

Theſe, and various other reaſons, render it neceſſary that a farm manager ſhould be perfectly converſant with every ſort of agricultural buſineſs and operation, as well as with the nature and management of all kinds of tools and machinery, as, where this is not the caſe, the work of the farm can never be properly directed. When he is deficient he muſt of courſe endeavour to perfect himſelf as ſpeedily as poſſible by inceſſant practice. Without ſome degree of perfection in this way he cannot be able either to detect or correct indifferent work-men, or know when to be ſatisfied with ſuch as are good, as they will not bear to be found fault with improperly. It is only by ſuch means that he can be enabled to diſcern when the buſineſs of the farm is executed in a proper manner.

In his dealings, and general intercourſe with other perſons, the farm manager ſhould be ſcrupulouſly attentive to punctuality and the keeping of clear accounts, as upon theſe his character will in a great meaſure depend.

Where the tranſmiſſion of the accounts of a farm are required at ſtated periods for the uſe of the proprietor, the following method may be adopted.

Firſt, A weekly account of labour, with a journal of the works which are going on, each day, and ſhort notices of ſuch tranſactions and occurrences as may have taken place during the above period, and are of uſe to be known.

A proper form for this purpoſe is neceſſary to be provided, which conſiſts of eight columns, ruled in a perpendicular manner on a large ſheet of paper. The firſt for containing the names of the teams and work-men, and the laſt for a money column.

The ſix intervening columns are for receiving the different works of the ſix days of the week.

Acroſs theſe columns are drawn horizontal lines, the uppermoſt being wide, to receive the works of the ſeveral teams, whether of oxen or horſes: the reſt, of ordinary ſize, for thoſe of each ſervant or workman; their ſeveral employments, each day, being entered on the lines which lead from their reſpective names; and the day's wages of labourers in the money column, at their terminations.

Secondly, A monthly account of receipts and diſburſements; including the weekly payments for labour; and ſhewing the balance of money in hand at the end of each month.

Thirdly, An annual account current, conſiſting of the ſeveral totals of the twelve monthly accounts; including the manager's ſalary; which ſhews the ſtate of the account at the end of the year.

Fourthly, A granary account, ſhewing the ſeveral quantities of grain of different kinds threſhed out, with the diſpoſal or expenditure of every part or parcel of the ſame. And a ſimilar account of every other ſort of marketable produce.

Laſtly, An inventory account, taken at the cloſe of each year by perſons appointed for the purpoſe by the proprietor; containing every thing of value on the farm, as live-ſtock, crops, manure, implements, &c. And a general report of the ſtate and condition of the farm, as well as a liſt of outſtanding debts and monies due on the day of ſettlement.

By ſtriking the balance of the whole, the profit or loſs of the farm will be ſatisfactorily ſhewn.

FARM *Offices*, a term frequently applied to the different out-buildings which become neceſſary in the management of a farm. They are of very different deſcriptions according to the nature of the management which is to be carried on; and it is a very eſſential point, as has been ſeen already, that they be diſtributed in a proper and convenient manner for the ſort of buſineſs which is to be performed in them; as by ſuch means much time and labour may be ſaved to the farmer in the preſerving of his produce, as well as in the foddering and taking care of his live-ſtock. See FARM-*Buildings* and FARM-*Yards*.

FARM-*Servant*, is that ſort of ſervant which is engaged in the performance of ſome part of the neceſſary buſineſs of a farm. Theſe ſervants are of various deſcriptions, as bailiffs, ploughmen, yard men, &c. There are likewiſe cowmen, dairy-maids, &c.

In the hiring, or engaging of all ſorts of ſervants for the purpoſe of farming, great care and circumſpection are neceſſary to aſcertain that they are fully competent to the execution of the ſort of work which they wiſh to undertake, as, where this is not the caſe, much injury may ariſe to the farmer from their improper conduct or example. And as much of the improvement of agriculture muſt neceſſarily depend upon them, they ſhould be kept in a regular manner, and with a proper degree of ſubordination, in order that they may be ready to perform whatever is properly required of them by the maſter or his bailiff. Without this the buſineſs of a farm cannot go on with propriety, or in a beneficial manner to the proprietor. The number ſhould likewiſe be well-proportioned to the nature and extent of the farm, as well as the work to be performed, as the loſs is conſiderable where this is not the caſe.

By the author of the "New Farmer's Calendar," it has been noticed that Old Michaelmas is the uſual time for hiring farm ſervants throughout the country; but he acknowledges himſelf entirely of Mr. Marſhall's opinion, that it is one of thoſe cuſtoms which ought by all means to be changed for a better. Michaelmas brings with it a great preſſure of buſineſs of every deſcription; and to be looking after ſervants at that time, or even to admit new ones, entirely unacquainted with your peculiar methods and management, is extremely inconvenient. Old Chriſtmas, as a ſeaſon of more leiſure, would ſurely, he ſays, be a more proper period for this affair. As to farming-ſervants, the beſt counſel he is able to give is, for an employer to receive no known thief or idler, to give the greateſt poſſible encouragement, to overlook trifles, and to truſt implicitly to no man's honeſty or induſtry, but to put both to the ſevereſt teſt; ſo ſhall he have a choice of the beſt labourers in the country, and enjoy the profitable reputation of the beſt maſter. In a ſmall concern a farmer may himſelf ſuperintend his whole buſineſs; but a gentleman-farmer, or the cultivator of an extenſive tract, particularly if managed in the more varied ſtyle of the new huſbandry, will, he contends, require a bailiff, and over-lookers, in proportion to the extent of the buſineſs. The bailiff of a gentleman who cultivates a hundred acres of land for his convenience or amuſement will have leiſure to work himſelf, which is impoſſible, or rather totally out of queſtion, with one who has extenſive buſineſs to ſuperintend, ſince that alone, if he be induſtrious, will take up his whole time, early and late. In very large buſineſs, a bailiff will need occaſional lookers-on under him. A bailiff ought to have had ſome years experience of at leaſt the common methods of huſbandry and gardening, of the management of all kinds of live ſtock, and of buying and ſelling; he ſhould be able to keep common accounts; in ſhort, he muſt be ſomething, either from nature or habit, above the common labourer. But then he muſt have a bailiff over him; and ſuch muſt be the proprietor of the buſineſs, unleſs he rather chooſe to riſk the conſequence. As to entruſting theſe upper ſervants with buying and ſelling corn and cattle, he would adviſe no perſon to do it, except, indeed, thoſe whoſe ſituation is ſo elevated that ſuch engagements might be thought inconvenient and improper: ſtill it is no derogation from the honour of a prince to be well-informed of market-prices, and to be able, by inſpection, to form a judgment of the worth of cattle. He dwells a little on this head, he ſays, becauſe he has ſeen too much both of the groſs ignorance and iniquitous colluſion of bailiffs and managers in bargaining. It is a common ſaying, "Oh! your maſter is a gentleman, he don't want to get money, but we muſt live!" Indeed it is no wonder that gentlemen ſo often farm their own eſtates to loſs, conſidering the ſottiſh, ignorant, and knaviſh inſtruments which they employ under the name of bailiffs. It is recommended by ſome, to veſt a bailiff with full power of diſcharging the ſervants and labourers; the propriety of which he is rather inclined to diſpute. Inveſted with ſuch a power there is no check upon his conduct; whereas, were this particular made matter of reference to the principal, all neceſſary information on both ſides would come out. One of the firſt qualifications of a bailiff is, the writer ſays, to have a mind perfectly indifferent to all prejudice in favour of the old ſyſtem of huſbandry; and where things are upon an extenſive or improving ſcale, it ought to be an invariable maxim to receive no ſervant or labourer who will not poſitively agree to follow directions; in default of which, he ought inſtantly to be taken before a juſtice of the peace. He has known ſeveral inſtances of a combination among the ploughmen not to work without their accuſtomed number of horſes, &c. See Bailiff and Labourer.

The author of the "Minutes of Agriculture" has, many years ago, on the moſt mature calculation, ſtated the annual expence of a man ſervant, maintained in the houſe, to be not leſs than thirty-five pounds, and that of a boy not lower than twenty-three pounds, ſuppoſing the yearly wages of the former to be ten pounds, and thoſe of the latter three pounds. Now, ſays he, the expence of a day-labouring man for the whole year, were he to work every day, would not be more than twenty-ſeven pounds ten ſhillings, which makes a difference of ſeven pounds ten ſhillings, againſt keeping a man in the houſe by the year, and that of hiring one by the day. And that of a boy is ſtill more in proportion, as the expence of a day-labouring boy for a whole year, allowing him to work every day, is only thirteen pounds; which makes a difference of ten pounds, or more than three-fourths of the boy's day-wages. In this account no deduction is made in the daily pay for rainy days; conſequently, the impropriety of keeping plough-boys in the houſe is conſidered very obvious; and though it may be convenient to have the carters about the houſe, the convenience is not conceived to be worth the annual ſum of ten pounds ſeven ſhillings. It is, therefore, adviſed to put a woman into a cottage within a ſmall diſtance of the farm-yard, to take ſuch ſervants as lodgers, and to keep in the houſe no more farming ſervants than a buſtler and a yard-man. It is abſolutely neceſſary to have ſomebody about a farm-yard in caſes of emergency; but the above two are quite ſufficient, as the carters in the adjoining cottage will be nearly as handy as if they were in the houſe. Such a meaſure can, however, only be local, though the hint may have a general tendency. It is probable that the farmer who keeps no accounts may imagine he ſaves money by boarding his ſervants in the houſe; but if he keep them in the luxurious manner in which ſervants of this ſort in general expect to be kept, he will be greatly miſtaken. The farmer who ſits at the head of his kitchen-table may, indeed, without doubt, feed his men much cheaper than a perſon who eats in a ſeparate room; yet the obſervation is juſt, that one fed by his maſter coſts the community as much as two who provide for themſelves; for diſcharge a grumbler, one who pretends to be diſſatisfied, though in fact only ſatiated, and he will return to his bread and cheeſe with, perhaps, equal health and equal happineſs. He ſits down to his maſter's table with a reſolution to eat voraciouſly of the beſt, to do himſelf juſtice; but at his own table eats ſparingly of the meaneſt, to ſave his money; ſelf intereſt being his motive in both caſes.

The riſe that has ſince taken place in the expence of ſervants, in every part of the country, has led to ſtill fewer being kept in the houſes of the farmers. But in this there is alſo conſiderable diſadvantage; they are leſs obedient to their maſters, leſs in need of characters when they change their ſituations, are leſs cheaply kept, conſequently raiſe the price of labour, and liable to the loſs of much time, from being out of employ. Beſides, they have more opportunities of drinking and aſſociating together, by which combinations are apt to be formed for preventing the introduction of new implements or new modes of huſbandry. And great inconvenience is often experienced from the irregular manner in which they come to work, or their not coming at all. The ſervant who lives on the farm is likewiſe much more intereſted in getting forward with the work which is neceſſary to be done than the mere day-labourer; and there is much leſs inducement for him to carry away different articles with which he is entruſted, as corn, hay, &c. from his not being able to keep any ſort of animals to conſume them.

It has been ſtrongly adviſed by an able writer on rural economy, to employ active young men as much as poſſible in performing farm work, eſpecially during the hay and harveſt ſeaſons, as a few ſuch as are idle and ſluggiſh ſoon ſpoil all the others. "Mix," ſays he, "two or three old women, or two or three boys, with a company of men, and the effect will be very ſoon viſible; for the men will ſoon conform to the ways of either the old women, or the playfulneſs of the boys. It is not prudent to employ many women with the men; and nothing but neceſſity can excuſe it. Two women, after the firſt or ſecond day, will do as much work as half a dozen alone. If it be neceſſary or convenient to employ a number of both men and women, it is but common good management to keep them ſeparate; with this exception, which may be laid down as a maxim, namely, one man among women, and one woman among men. A cruſty conceited old fellow will check the goſſipping of the women; and it has been remarked that raking after a young wench has animated as much as a gallon of ale. Two are dangerous; they breed contention, and rather retard than accelerate. The moſt valuable ſervant in harveſt is a good carter. It is neceſſary to common management, that he ſhould be able, willing, and careful. Every pitch of hay and corn, generally ſpeaking, paſſes twice through his hands: he loads and unloads, which are the two moſt laborious taſks of harveſt; he drives the team backwards and forwards; if he loiters by the way the field-men or ſtack-men muſt ſtand idle; if he ſpill or overturn his load, or if he break his waggon, or ſet his horſes, the arrangement of the day is broken; and, perhaps, the damage done by the loſs of time rendered irreparable by the next day's rain. A good carter will not ſuffer his waggon to be over-loaded. The field-men, too, that is, the pitchers and aſſiſtant loader, ſhould be young and active, and well matched with the carter."

It has likewiſe been ſuggeſted, that the managing ſervant of a farm ſhould be attentive to a variety of other points and circumſtances, in directing the buſineſs of it. Nothing, it is contended, contributes more to facility and ſatisfaction in it than a forecaſt toward works which are to be done. A miſcarriage is ever to be dreaded as a miſchief; and, when it is brought on by a want of forethought, it brings with it a degree of diſcredit, and a train of unpleaſant reflections, which ſour every enjoyment. This ſort of ſervant, it is hinted, ſhould have a forecaſt toward crops for three or four years, toward team labour for as many months, and ſhould look forward with the view of hand labour for ſome weeks, according to the ſeaſon of the year. And in order to bring the matter to a degree of certainty, it is highly requiſite to make out a liſt of the fields or parcels of land of which the farm conſiſts, with the crops which each has borne for ſome years back, together with the manurings which they have ſeverally received, in order that the future treatment of each may be decided upon with proper accuracy: and every autumn to form, by the aſſiſtance of ſuch liſts, an arrangement of the crops that are intended for the enſuing year, claſſing the fields or pieces of land according to the purpoſes for which they ſhall be intended; thus aſcertaining the quantity of each crop, whether arable or graſs, as well as the quantity of ground intended for paſture, in order that the quantity of team labour may be diſtinctly foreſeen, the required ſtrength be eſtimated from time to time, and the ſeveral crops be ſown in due ſeaſon; and, in order that the ſtock of the enſuing ſummer may, in due time, be properly apportioned to the intended quantity of paſture ground, as well as that the works of ſummer and harveſt may be conſtantly before the eye, and proper hands be engaged in time to perform them in ſeaſon. And a ſort of memorandum liſt is adviſed to be kept of the buſineſs to be done immediately or in immediate ſucceſſion, whether in relation to crops. or to any other concerns of the farm, that nothing may eſcape the memory; and that the moſt requiſite may be brought forward firſt, or another which is more ſuitable to the ſtate of the weather. In this, as in other buſineſs, the principal object to be aimed at is that of inſuring ſucceſs, which is not only profitable to an employer, but ſatisfactory to the perſon employed. Whereas, a miſcarriage injures at once the property of the one, and the character, as well as the peace of mind, of the other. Hence a farm manager ought to engage in a work, whether of improvement or ordinary practice, with caution, and to proceed in it with attention and firmneſs. A ſtanding rule reſpecting this main object of management is, not to attempt too much; and never to begin a work without a moral certainty of being able to finiſh it in due ſeaſon.

It may be obſerved, that, beſides the common work of a farm, as the culture and harveſting of crops, the rearing and fattening of live ſtock, and the buſineſs of markets, there are many other objects of attention which ought to be conſtantly kept in the mind, or the mind's way, of a manager, as on them the difference between good and bad, between correct and ſlovenly management very much depends; ſuch as keeping the home-ſtall in repair, and free from impediments, attending to private roads and drift-ways, keeping up fences every where in thorough repair, attending particularly to young hedges, and to the rearing of hedge row timber, the ſeeing the gates ſwing clear and catch with certainty, equally to preſerve them from injury and to prevent looſe ſtock from going aſtray, the attending to drains and water-courſes, to ſee that ſuperfluous waters have free paſſage to their proper outlets, and that they be readily diſcharged; and that in ſummer ſtrict attention be paid to drinking-pools and other watering places of ſtock, as well as to the ſtate of paſturage, and the ſhifting of paſturing-ſtock; likewiſe to weeds, as well in graſs grounds as in arable lands, to ſee that not a thiſtle blows, nor any other weed matures its ſeed, either in the areas or on the borders of fields. And in winter much care is neceſſary not only to ſee that the ſtock are regularly ſupplied with proper fodder, but that ſufficient ſhelter and comfortable reſting-places are aſſigned them. At this ſeaſon, too, the watering of graſs lands ſhould be attended to, as much as the nature of the ſituation will admit; and to the accumulation of manure an unremitted care ſhould be beſtowed the year round, as much depends upon it. On the whole, the performing theſe and other objects with propriety requires repeated examinations of every part and particular under his care, committing to his memory whatever demands his more immediate attention; ſo that whether he is on the ſpot, or arranging his plan of operation in the hour of leiſure, it may be preſent to his mind, and take its proper courſe.

The buſineſs of a managing ſervant, during the time of work, lies in the field, in executing the plans he has formed, in paſſing from one ſet of work-people to another, not more to ſee that the different operations are rightly performed with proper diſpatch than to order any required aſſiſtance (to the teams eſpecially) in order that every part of the machine may be kept in profitable motion. In the ordinary operations of huſbandry, and on common occaſions, a ſteady even pace ſhould be recommended, equally for the good of the working animals and the work which they are performing; yet there are times when quick diſpatch is neceſſary, and then it is his duty to encourage good ſpeed by his example, and by promiſes of reward, if the occaſion require it. At all times, and on every occaſion, idleneſs is a crime which ought not to be ſuffered to paſs with impunity. It is a direct fraud; and a manager ſhould guard againſt it with the ſame care and aſſiduity as againſt pilfering. A day labourer, who idles away an hour, robs his employer of an hour's wages; and thereby injures him as much as if he were to ſteal a faggot of equal value. This is a truth which requires to be deeply impreſſed on the minds of labourers, as the impreſſion has been known to have had a good effect. It is, however, juſtly obſerved, that the right ordering of ſervants and work-people is a difficult branch of moral duty, and which forms an important part of that of the manager of a farm. They require to be treated according to their reſpective merits; encouraging good ones by extra wages or other rewards. Some men are worth double the wages of others, as day-labourers; yet cuſtom makes no diſtinction between them in this reſpect! Hence the propriety of engaging the beſt workmen the country affords, and retaining them by civil treatment and ſuitable encouragements. The managing ſervant ſhould conſtantly keep his work-people at a proper diſtance, without deſtroying that free communication of opinion reſpecting the work in hand, which, on ordinary occaſions, every intelligent workman ſhould be allowed. A ſtanding rule of conduct in the ordering of workmen is, never to find fault without occaſion, nor to commend without reaſon. Good fellows will not brook the former, nor will bad ones be mended by the latter. But it is right to habituate workmen in general to be told of their real faults; firſt in the mildeſt terms the occaſion will admit of, reſerving the warmth of temper for extraordinary occaſions; and then it is prudent to ſting them with keen, rather than to load them with heavy words, to endeavour to ſtir up their pride rather than their malice or reſentment. Much of the ſmoothneſs and uniform ſucceſs of buſineſs depends on the manner of communicating orders to workmen. If orders be looſely or inaccurately given, it is unreaſonable to expect that the execution of them ſhould be faultleſs. It is difficult to explain buſineſs in words with ſufficient accuracy to ruſtic workmen; and if a third perſon is ſuffered to intervene, errors are inevitable. The managing ſervant ſhould therefore make a point of giving orders in perſon, and, if poſſible, on the ſpot, to the men who he means ſhall execute them. Then he can explain himſelf to them intelligibly and fully, or aſſiſt them in marking out their work. There is always danger in merely verbal orders, and in a meſſage certain miſchief. It ſhould be a conſtant rule with him to ſet his men to a freſh work in perſon; and if it be out of the common way of huſbandry, to ſtay by them or direct them with his own hands, and return to them again and again until he finds them completely in their work. In this view, as well as for other reaſons, this ſort of ſervant ſhould be maſter of every implement, tool, and operation belonging to his profeſſion; and if he ſhould find himſelf deficient in any particular, he ſhould practiſe it, day by day, until he make it familiar to him: or how is he to correct a bad workman, or to know when to be ſatisfied with a good one, who, knowing when he is right, will not bear the reproaches of ignorance? He has no other way of ſecuring the eſteem and attachment of good workmen, and of finiſhing in a workman-like manner every thing that he undertakes, than by making himſelf maſter of his buſineſs; without which little ſatisfaction will ariſe from it to himſelf, or profit to his employer. And in the general principles of conduct, in his dealings and intercourſe with other men, punctuality is one of the moſt eſſential. Method is the beſt aſſiſtant of punctuality; and clear accounts are ſome of the beſt reſults of method. Theſe ſhould invariably be kept with accuracy, and be ſent to the proprietor in weekly, monthly, and annual periods, ſo as to ſhew the daily ſtate of the work, the monthly ſtate of receipts and payments, and, laſtly, the whole ſtate of accounts and balances. In this way a variety of evils and errors are checked and guarded againſt.

There is a great variety in the methods of engaging and employing farm-ſervants. In moſt of the more northern counties it is the cuſtom to hire them by the year, in which caſe they commonly live in the houſe. But in many of the ſouthern diſtricts this is not the caſe, they being nearly, if not wholly, in the ſituation of day-labourers. And this method, though by no means to be commended, for the reaſons already noticed, ſeems on the increaſe, probably owing to there being ſomewhat leſs trouble in the family. There are likewiſe different cuſtoms in the manner of employing them. In Surrey it is moſtly an eſtabliſhed rule for every man in the harveſt ſeaſon to work by the acre, or the month, and not by the day. Where a labourer is conſtantly employed through the year, he expects in the harveſt to be conſtantly employed in mowing, reaping, and other works of this kind, by the acre; or to have his harveſt month; that is, an advance of wages certain, wet or dry, during that length of time, commencing when it is the moſt ſuitable to the farmer. This is a convenient practice, as they are always at command in caſes of emergency, and nothing but the continuance of rain till the barns are empty can render them burdenſome. In many other diſtricts, practices ſomewhat ſimilar are found to prevail, and have an equally beneficial tendency. In theſe caſes they are not allowed, in general, to regard any particular hours in the work, though in other caſes the hours of labour are moſtly in the ſummer from ſix in the morning to ſix at night, and in winter from the time that it becomes light until it is dark.

The rates of wages are ſo very different in different places, that it is almoſt impoſſible to reduce them to any order; but in moſt diſtricts they may ſtand ſomewhat as below.

Men.	*Wages.* *Former.*	*Preſent:*
Ploughman	10 to 16	15 to 25
Carter or waggoner . . .	8 to 15	15 to 20
Bailiff or yard-man	8 to 14	14 to 16
Boy	5 to 8	8 to 12
Women.		
Dairy-maid	6 to 8	10 to 14
Under dairy-maid	3 to 4	5 to 7

Theſe wages are excluſive of bed, board, and waſhing in the houſe. In moſt of the northern counties they have been nearly doubled in the courſe of the laſt twenty years. And in thoſe of the ſouth the riſe has been equal in moſt places, but in ſome conſiderably more.

Many ſuggeſtions have been offered by writers on rural economy, in regard to the means of regulating the rate of wages of farm-ſervants and labourers, but hitherto, perhaps, with little ſucceſs. In the "Agricultural Report of the Board, for the Weſt Riding of Yorkſhire," it is ſtated, that the only mode of making them proportional to the riſe or fall on the value of money and proviſions, is, to pay them in kind; that is, with a certain quantity of corn, as the parties may agree, which, at all hazards, inſures them a comfortable ſubſiſtence, and prevents them from a daily or weekly viſitation of the markets. Where they are paid in money, it is ſuppoſed to expoſe the thoughtleſs and inattentive to a variety of temptations, but that when paid in kind they cannot raiſe money to gratify the whims of the moment. It is hinted, that in thoſe counties where this mode of payment has been long eſtabliſhed, the ploughmen and labourers are on the whole better fed, live more comfortably, and rear healthier children, than in thoſe parts where, from being paid in money, the currency of the article facilitates the expenditure, and prevents them from laying by a ſtock of proviſions for their ſupport, when out of work, from accidents or diſtreſs. In the part of the country where the writer reſides nearly the whole of the farm-ſervants are paid in this manner. They have a certain quantity of grain; maintenance for a cow, ſummer and winter; a piece of ground for planting potatoes, and raiſing flax upon; and whatever fuel they require driven gratis. Theſe, with the privilege of keeping a hog and a few hens, enable them to live, and bring up their families in a comfortable manner; and while their income is conſiderably leſs than people of their ſtation in other parts, they are on the whole better fed, better dreſſed, and enabled to give a better education to their children. Placed under theſe circumſtances, they are a reſpectable ſet of men; and for frugality, faithfulneſs, and induſtry, they will bear a compariſon with their brethren in any quarter. It is conſequently adviſed to introduce a ſimilar method of paying farm-ſervants into this diſtrict, which, although it might at firſt be attended with ſome difficulties, would contribute to the public good, and to the advantage of the labouring peaſantry in various reſpects. The writer of the "Report for the County of Hereford," has likewiſe ſtated, that if a certain proportion between the price of labour, and the average price of wheat, could be fixed by law, ſo as to render the applications for parochial relief neceſſary only in caſes of very large families, of unuſual illneſs, of ſcanty ſeaſons, or any other real emergency; the meaſure, it is preſumed, would be honourable to the country, would ſtimulate induſtry and fidelity, check diſhoneſty, and endear to their native ſoil a numerous claſs of uſeful perſons.

In attempting any plan of this nature, various difficulties, both of a local and general kind, would preſent themſelves, which no ſcheme that has yet been brought forward, ſo far as we know, ſeems to have ſufficiently provided againſt.

Farm *Servant's Rooms*, the buildings or other places where ſervants of this kind ſleep and lodge. Theſe rooms, eſpecially where the farms are large, ſhould always, if poſſible, be quite diſtinct from the houſe. Where the farms are of much extent, and conſequently a great number of ſervants wanted, particularly where they are unmarried, ſuitable and convenient rooms for ſleeping in, and where they find their own proviſions, for preparing and dreſſing them in, are not merely requiſite, but of conſiderable advantage to the farmer, as well as the men, as they ſave much time, which would otherwiſe be loſt, in going to their meals; beſides keeping them together in a ſober, ſteady ſtate, ready for their different employments. In this way, too, the ſervants are a great deal more comfortable, and live far more cheaply than when they go to the public-houſes to eat their meals, as is much the caſe in the more ſouthern parts of the kingdom, and by which their manners too frequently become depraved, their conſtitutions enfeebled by intoxicating liquors, and much uſeful time often loſt to their employers as well as themſelves.

But inconveniences of this kind are probably the beſt guarded againſt by having ſuch ſervants, when it can be done, in the houſes of the farmers, in which caſes the eating-rooms for them ſhould be ſo placed as that a facility may be given of overlooking them. But the rooms for lodging in ſhould, at the ſame time, be quite detached and diſtinct, as being the ſafeſt and moſt proper when contrived in that way, as ſuch perſons are frequently careleſs and negligent of their candles and fires, beſides being irregular in other parts of their conduct. In whatever ſituation ſuch rooms may beerected, it is eſſential that the ground-floors ſhould be formed of ſtone, brick, or ſome other incombuſtible material, while the upper ones are laid with plaſter, as in ſome of the midland diſtricts. Or, as being more readily laid, brick in ſome caſes may be had recourſe to. See Floor.

Farm-*Yard*, in *Agriculture*, is the area or plot of ground, on the ſides of which the farm buildings are erected, and which for the moſt part adjoins, or is connected with, the houſe. It is the ſpace of ground that comprehends the live ſtock, and in which they are foddered, the dung prepared, the tools laid up, and the various neceſſary operations of the farm executed. It is a matter of the utmoſt importance to the farmer to have theſe yards conveniently formed and arranged, as, where this is the caſe, there is a conſiderable ſaving of both time and labour in performing the different kinds of work in them. Yards of this kind have very different ſizes, ſhapes, and diſtributions of their buildings, according to their ſituations and other circumſtances. One principal object ſhould conſtantly be, that of giving the fodder which is to be conſumed, of whatever ſort it may be, a progreſſive courſe from the barn-yard or ſtack-yard, through the cattle-houſes and ſheds to the dung-ſtead, without incurring unneceſſary labour in carrying it different ways. And another point that ſhould be particularly attended to is, that all the different materials which are converted to the uſe of animal food ſhould paſs from the kitchen and other places, to the hog-ſtyes or other convenient places of conſumption for them. By a nice attention to the diſtribution of the buildings, in forming ſuch yards, many other advantages and facilities may likewiſe be given to yards of this deſcription.

The author of "Modern Agriculture" has remarked, that a farm or foddering yard on a ſuitable plan is well known to be an highly requiſite appendage to all ſuch farms as are well regulated, and is conſidered as indiſpenſable by the moſt enlightened farmers. Where the farm buildings are erected in the ſquare form, the court yard ought to be paved to the extent of nine or ten feet from the bottom of the walls all round. The earth ſhould be excavated from the remainder, ſo as to form a hollow towards the centre. Then a thick coat of gravel, or, what is better, chalk, ſhould be laid over the whole, which would anſwer the double purpoſe of keeping the place dry, and facilitate the ſhovelling up the rotten dung. Care ſhould alſo be taken to have proper drains to carry off ſuperfluous water, in order that the yard be kept dry. It would be very advantageous to have a pond for the reception of this ſuperfluous water, which ſhould be ſo placed as to flood any of the adjoining fields at pleaſure, during the proper ſeaſon.

By the writer of the "New Farmer's Calendar," it is obſerved, that it would be nugatory to hold forth about aſpect, ſtraight lines, or right angles, in the formation of a farm-yard; ſuch conſiderations will ever be poſtponed to thoſe of local convenience; it will be ſufficient to inſiſt, that the ſpace be ample and properly divided, the offices ſufficiently numerous and commodious, and the whole ſheltered on every quarter. In the arrangement of the offices, namely, the dwelling, barns, ſtables, cattle-houſes, and ſheds, the material objects ought to be ſuch a poſition as may contribute to convenience, and the abridgment of labour, as already noticed, and at the ſame time afford the largeſt poſſible proportion of ſhelter; this laſt, however, muſt obviouſly, the writer thinks, gives way to the former conſideration; and, as a ſubſtitute, all the vacant places or expoſures may be well barricadoed with a lofty, warm, and ſubſtantial fence. Mr. Marſhall's idea, of an angle of the buildings preſenting to the north, by which poſition the two ſides would afford ſhelter in the moſt material points, from the north-weſt to the north-eaſt, is, he thinks, happily conceived. Reſpecting the number of yards, no preciſe rule can, he ſays, be expected any farther than to ſtate, that, in the ſmalleſt concern, a diviſion is neceſſary, and in thoſe of greater magnitude two main yards, with appendages for ſtacks and other purpoſes, conveniently ſituated, will properly deſcribe the home-ſtall. A barn ſeems the natural diviſion of two yards, ſince it will ſerve the common purpoſes of both.

The deſcription of the plan of a farm-yard is afterwards offered to the attention of the farmer. A circle of ſufficient extent being marked out, and the area properly levelled and hollowed in the centre, the whole of the needful farm-buildings of every deſcription, barns, granaries, milk houſe, ſtables, ox and cow-houſes, pig-ſtyes, ſtore-rooms, and ſheds, are to be erected around, in the moſt convenient order in point of uſeful contiguity, and with reference to ſhelter in the coldeſt expoſures. The area being ſo ſpacious that the buildings will not completely ſurround it, every vacancy is to be filled up with a good fence; with or without a lean-to and roof, as a ſhed. As many of theſe ſheds as are required may be run up againſt any of the buildings, that none of the cattle of the fold need be abroad, or feed in the rain or ſnow. Diviſions and ſub-diviſions may be made at will, with hurdles, faggots, or poſts and rails, for the purpoſe of every requiſite ſeparation of ſtock. The number and poſition of the entrances to be regulated by local convenience, the gates being boarded to render the ſecurity complete. The ſtack-yard muſt be formed without the circle, the corn-ſtacks being placed within the leaſt diſtance poſſible of the barn or threſhing machine; thoſe of hay and ſtraw in an equal degree of convenient proximity to the backſides of the ſtables and cattle-houſes. It is obvious that the back parts of the buildings will afford convenient walls for ſheds or erections of any kind, ſhould a very large ſtock or peculiar circumſtances render it neceſſary to fold a part without the circle; the communication, or rather the whole ſyſtem, may, it is aſſerted, be rendered complete, by furniſhing all the principal buildings with entrances for cattle backwards, as well as in front. In the inveſtigation of this ſcheme, however, it will eaſily be perceived, that a mere pedantic literal adherence to the figure of a circle, to which every other conſideration muſt yield, is not ſo much intended, as a generally round compact incloſure; nevertheleſs, it ſeems that the nearer the figure approaches to a true circle, the leſs will be the waſte of ground and expence in fencing. Although not abſolutely neceſſary, it would be a point of great convenience, it is ſuppoſed, for the backſide of the dwelling-houſe, conſiſting of the dairy and other out-offices, to form a part of the fold-yard circle. The waſh of every kind from the kitchen and dairy ſhould be ſaved, with the utmoſt care, and led by proper ſinks and pipes into a capacious under-ground ciſtern, from whence it may be pumped into the hog-troughs, the ſtyes being placed within a reaſonable diſtance for the ſake of that convenience. Adjoining the dairy ſhould be found the cow-houſes and fatting-houſes for oxen; the pig-ſtyes next; between the ſtyes and the ox-ſtalls is a handy ſituation for a boiling and waſhing-houſe, in which an oven alſo, or kiln, is an excellent convenience. The lofts above the different offices might, it is ſuggeſted, communicate by doors through their ſeveral partitions, with the granary, threſhing-mill, and barn, affording the convenience of wheeling ſacks of corn, or chaff, to every part. Room above or below muſt be afforded likewiſe for hay, potatoes, cabbages, and every other article of proviſion of that ſpecies. In feeding ſtalled oxen, to approach them at the head inſtead of the feet is much the beſt method; for which end a gang-way, ſufficient to admit a large barrow, may be left between the wall and their head-boards, theſe being made to ſlide. Such is the practice of ſeveral diſtill-houſes which feed oxen; and it has been recommended, where cattle feed at racks appending to the barn-ſide, to have ſliding boards, through which the threſhers may puſh the ſtraw, without having to quit the barn, in order to repleniſh the racks. A chaff-houſe ſhould be connected with the barn; and we will ſuppoſe the oppoſite range, whether ſtables, ſheds, ſtore or cattle-houſes, to have an appropriate ſhare of thoſe conveniences of connection already ſtated, that as little waſte as poſſible may be made of time, labour, and materials in executing the farm-yard buſineſs.

And it is farther ſuggeſted, that, in an extenſive farm, where it is ever inconvenient and expenſive to cart manure to the diſtant grounds, the great convenience of out-ſtalls appears very ſtriking. It is not meant to inſinuate that there are never any out-yards upon large farms, but that they are not in general enough attended to, ſo as to render them of ſufficient utility. A yard of this deſcription, well fenced in, might, it is ſuppoſed, contain a cottage for a labourer and his family, a ſtable for a plough-team, with ſheds for ſtraw, cattle, and ſheep; but threſhing in diſtant barns is imprudent; and of two evils it would be the leaſt to cart the ſtraw from home, ſtacking or houſing it at the out-ſtalls. Theſe different hints deſerve to be well conſidered by the proprietors of farms before they begin to erect farm conveniences of this kind.

There are likewiſe a few other objects that demand particular regard in forming new farm-yards. A great variety of opinions have been offered in regard to the nature of the ſituation for receiving the ſtall and yard manure, it being by ſome conſidered the beſt on a ſurface which is perfectly *level;* while by others it is conceived better where this is a little *raiſed;* and by others again, who are very numerous, the *hollow* is, on the contrary, decidedly ſupported as the beſt. And to this laſt the author of the treatiſe on "Landed Property," is, from long experience, inclined to afford his aſſent. But though he thinks it ſhould be hollow, it does not follow that it ſhould be *deep*. Its principal uſe, beſides that of holding the dung, being to bring the rain water falling within the yard into the ſtate of ſtagnation, and to let it paſs off ſuperficially, ſo as to prevent any thing of a ground current from carrying away the dung, either in a maſs, or thick fluid condition; merely ſuffering the more watery particles to run off into a reſervoir or receiver, conſtructed for the purpoſe of preparing or preſerving them for being made uſe of afterwards. It is ſuggeſted, that two feet on the lower ſide, or deepeſt part, may be a mean depth; the bottom of the waſte water channel being laid ſix or eight inches lower than the rim of the hollow or baſon; the depth of water that it can contain, when free from dung, cannot be more than ſixteen or eighteen inches, and as it is neceſſary to good farm yard management, that as ſoon as the dung collected during the winter ſeaſon has been removed, that ſome ſort of earthy materials ſhould be depoſited evenly over the bottom of the baſon, for the liquid matters to operate upon, and bring into a ſtate of manure, throwing upon them all the different ſubſtances that can be brought together in the courſe of the ſummer and autumn; by which means, from the baſon being nearly filled up at theſe periods, the dung collected during the winter will be raiſed and ſupported out of the way of water, which is ſuppoſed by ſome to prevent the converſion of the different ſubſtances into manure. It is evident that ſuitable drains muſt be formed from the ſtalls of the different large animals, as well as from the pig-ſtyes, and other buildings, where any ſort of ſtock is fed and kept, to the hollow or baſon, in order to convey the liquid matters; the mouth of the outlet channel being well ſecured from being choaked up, by piling the dung up to a great height above it; a ſuitable well or pit being provided and kept ready for the reception of the ſuper-abundant liquid to filtrate and diſcharge itſelf into. When the farm has land of the graſs kind lying in a ſuitable manner below the level of the yard, on which the overflowings of ſuch baſons may diſcharge themſelves, every part of the dung yard may have a ſhelving direction towards the receptacle. But, in other caſes, it ſhould not receive any more water than is ſupplied by the atmoſphere, which may eaſily be effected by elevating the rim a few inches above the ſurrounding ſurface of the yard, which muſt be occaſionally freed from the matters depoſited upon it, by removing them into the baſon. In theſe caſes the water falling on the ſurface of the yard ſhould be conducted to a catch pool to depoſit its uſeful materials, or to a drain made in a convenient manner for the purpoſe: and that falling upon the buildings be diſcharged, without paſſing through the baſon; except there ſhould be a greater want of liquid than ſolid manure.

From the very ſlow progreſs which yard manure is found to make towards the proper ſtate of maturation, in the open air, during the winter ſeaſon, even when piled up in the dryeſt ſituation, in conſequence of its being conſtantly ſaturated with moiſture and expoſed to a cool atmoſphere, the plan of having the receptacle for the dung of a long ſquare form, ſo as to be covered with a roof to wholly protect it from rain water, and defend it from cold, has been ſuggeſted, and long ſince ſtrongly enforced by the Board of Agriculture. It is ſuppoſed that by thus giving it the means of paſſing into the ſtate of fermentation during the winter months, its converſion into manure would be beneficially expedited for application to thoſe crops which are put in in the ſpring. But it has not yet been fully ſhewn whether the advantage would be adequate to the expence of ſuch buildings, and the additional trouble of depoſiting and removing the manure. It deſerves, however, to be aſcertained by careful trials, though it is a method that cannot be yet ſafely adviſed for the common farmer.

It is a very material object to prevent, as much as poſſible, the waſte of farm-yard manure, which takes place at preſent in moſt places; this may perhaps be the moſt effectually done by piling it up in the ſituation and manner which has been already noticed, and detaining the depoſitions of the liquid parts in ſuitable receivers, making collections of other proper matters where it can be done with propriety. It has been ſuggeſted that the having only a *reſervoir* for farm-yard liquor is of vaſt conſequence in theſe caſes, even where there are no lands proper for letting the contents upon; particularly where it is provided from time to time, as noticed above, with ſuitable floorings of good mould or other matters, for abſorbing the ſediment which is let fall from the liquor, when in this ſtagnant condition.

In a dry ſeaſon, when the liquid part is wholly removed by evaporation, the rich compoſt thus left ſhould be carried out and ſpread on the graſs lands which are under the ſcythe, as ſoon as poſſible after the crops have been removed from them. The benefit of a receiver of this ſort, whether formed for carrying on irrigation, or for collecting the muddy ſediment, will, it is ſuppoſed, be in proportion to its ſize, and the expence of making it in a given ſituation will be in a ſomewhat ſimilar ratio; and will moſtly pay in an ample manner for being made. For if one which coſts ten pounds increaſe the annual produce of hay only one load, a tenant may, it is ſuppoſed, well afford to pay ſix pounds *per cent.* for the uſe of it. It is further ſtated, that on a ſloping wavy ſurface, a reſervoir of this kind may be formed at a very trifling coſt in compariſon to its utility. And the form or ſhape of it is conſidered as of no conſequence, provided, when it is deſigned for irrigation, it be ſupplied with a valve, that when full, the water may be let off in a ſufficient body to be diſtributed evenly, and with proper effect over the ſurface of the land.

All theſe points ſhould be fully attended to in forming new farm-yards, in order that the greateſt poſſible ſaving of manure may be made.

It has been juſtly remarked by a late writer on modern huſbandry, that where the farm buildings are without order or connection with each other in the yards, as is too commonly the caſe in many parts of the kingdom, the dung is moſtly thrown on ſpaces of ground allotted for the purpoſe oppoſite to the doors of the ſtables, cow-houſes, ſheds, &c. where it is allowed careleſsly to remain; its more valuable particles, in the mean while, being exhaled by the influence of the weather till the return of the ſeaſon, when it is uſually laid on the lands. If the houſes happen to be ſituated on an eminence, the dung lying in ſmall quantities is drained of all its moiſture. If, on the other hand, they are placed in a hollow, the dung is for the moſt part allowed to remain ſoaked in water. In either caſe its quality muſt be greatly impaired, and its uſefulneſs in promoting vegetation much leſs than when, by proper attention, all the eſſence is retained. The advantages reſulting from well-conſtructed farm or foddering yards are, therefore, the writer conceives, various and important. By means of them the quantity of dung is much increaſed, and the quality rendered ſuperior: for theſe reaſons, he is of opinion, that the advantages of poſſeſſing proper accommodation for the cattle on the farm are more than ſufficient to counterbalance the expence incurred in creating them. He feels himſelf warranted to ſtate this opinion, not merely becauſe it is his own, but becauſe it is conſidered as well-founded by many intelligent farmers in both kingdoms, with whom he has converſed on the ſubject. The difference muſt indeed be obvious to every intelligent reader who is at all acquainted with theſe matters. Where proper houſes and other accommodations are erected, the dung is collected into one maſs, the various ſorts carefully mixed together, and the ſuperfluous water carried off by proper drains; by which means it retains its properties, and muſt conſequently become uſeful, and its effects conſpicuous, when applied for the purpoſe of invigorating the ſoil. Whereas, when the dung is allowed to remain in ſmall, detached looſe heaps, the moſt valuable parts are either drained off or evaporated; ſo that what remains is comparatively of little value. Although it will be readily admitted, that an active and induſtrious farmer who labours under the inconvenience of having too few farm-offices, and thoſe improperly ſituated, may, by his ſuperior attention, lay up as great a ſtore of dung, of a good quality, as his leſs aſſiduous neighbour, who is better accommodated as to houſes; yet, whoever makes this the ſubject of general inveſtigation will find reaſon to be ſatisfied, that on all occaſions where the proprietors, by liberal arrangements with their tenants, afford them the requiſite accommodation for their horſes and cattle, there the farm yard dung is in general in greater abundance, and of a richer quality.

There has been conſiderable diverſity of opinion concerning the form of a farm-yard, that affords the greateſt convenience, ſome contending for the ſquare, others for the circular, and not a few for the angular or many-ſided form. It is evident, however, that the ſhape muſt conſtantly materially depend on the nature of the ſituation and other circumſtances which are connected with it. The ſquare form was that formerly moſt in eſteem; but this has lately given way to thoſe of the circular and many-ſided forms, as affording a greater number of conveniences, and more room in the ſame extent of building.

The following two plans of farm-yards are of the ſquare form, and have been found highly uſeful and convenient in actual practice. The firſt is ſtated, by the author of the "Cheſhire Agricultural Report," as being on the farm of Broom-fields, belonging to ſir Peter Warburton. The buildings are conſtructed of ſtone, which was obtained from a quarry in the vicinity, and the whole of them covered with ſlate. The ground plan of all the various buildings and conveniencies are ſhewn at *fig.* 1. in *Plate* XVI. on *Agriculture.* Here Mr. Becket, the preſent occupier of the farm, has availed himſelf of the opportunity afforded him by a gentle deſcent in the ground from the front of the houſe, to convey a ſmall ſtream through the yard over the meadows below the buildings, by which an uncommon degree of verdure and luxuriance has been produced, which fully demonſtrates the benefit which has been derived from the practice.

The latter is deſcribed in the "Farmer's Magazine," as being

ing conſtructed by David Hunter, eſq. at Eſkmount, in the county of Forfar, in North Britain; and the plan of which is repreſented at *fig.* 2. in the ſame plate. In this A, A, are ſtone troughs for the fattening beaſts to eat out of; being formed of hewn pavement, as well as the diviſions which are arched below; by which contrivance they can all be rendered perfectly clean, by pouring water into the weſternmoſt, and making uſe of a broom as it is diſcharged at the contrary end. B B, is the groove or hollow behind the animals, which receives the dung and urine, and which laſt is diſcharged at the opening C, in the eaſt wall into a wooden ſpout D, which is moveable at pleaſure, ſo as to depoſit it on any earthy material that may have been previouſly laid down for the purpoſe, by which means a great increaſe of manure is made for future uſe. E, E, E, are three ſmall vents made in the north wall for letting off the moiſture produced by the breathing of the cattle, by which the timber is greatly preſerved, and the animals prevented from ſweating too much or being too hot; their breath being lighter than the atmoſpheric air requires this ſort of ventilation to expel it. F, a ſmall door in the eaſt corner, where there is a room and bed for a cattle man, that he may be at hand, in caſe of need. G, G, two doors to the ſouthward, through which is an eaſy conveyance for the dung and dirty litter into the dung court, in which H, H, are ſheds for containing your wintering ſtock. I I, the ſhed for holding turnips or other roots, as well as the ſtraw and hay that may be requiſite. K, the door, which is ſufficiently wide to back the carts in, and in which the roots are topped. L L, is a roomy dung-ſtead, for depoſiting earthy or other ſubſtances, for receiving the diſcharges of the farm-yard, ſtables, and different ſtalls and ſheds. M M, is a raiſed cauſeway, which ranges all along the feeding ſtalls and weſt ſide of the dung court.

The great advantages of this conſtruction of farm-yard and buildings are thoſe of keeping the cattle more clean, letting them have their food in a ſweeter ſtate; and thereby thriving better; and the preſerving of a much larger proportion of the dung and urine of the animals. Beſides, in this way there are other advantages in having the turnips or other roots brought from the field without waſte, while they can be topped and the tops conſumed green; in their being laid in with leſs labour and trouble; and in there being no neceſſity for uſing them in a froſted or improper condition.

This is an excellent plan where the practice of ſtall-feeding cattle is to be carried on.

The two farm yards which are repreſented in *Plate* XVII. on *Agriculture*, are formed on the angular or many-ſided, and the circular plans, and are calculated for farms of conſiderable extent, and under mixed cultivation. *Fig.* 1. is the repreſentation of an uſeful one of the former deſcription; and at *fig.* 2, is the delineation of one of the latter kind. They are either of them capable of being varied ſo as to ſuit particular intentions. See FARM-*Buildings*, and FARM-*Houſe*.

FARM-*Yard Dung*, is that ſort of manure which is collected and raiſed in the farm-yard from the diſcharge and treading of different ſorts of live ſtock. It conſequently conſiſts of the dung and urine of all kinds of cattle, horſes, hogs, and other animals, intermixed with litter of various deſcriptions, and ſometimes other ſorts of more earthy materials. It is the moſt abundant and uſeful manure that the farmer has the command of. From its nature, and the manner in which it is formed, it is evidently a compoſt or compound ſubſtance, though different in ſome reſpects from thoſe heaps of manure which are uſually denominated compoſts by farmers. Every opportunity ſhould be taken to increaſe, as much as poſſible, this highly uſeful material, by collecting and depoſiting different kinds of proper matters in the ſtalls and farm-yards, which ſhould be ſuitably formed for receiving them. See COMPOST, MANURE, and FARM-*Yard*.

FARM-*Yard Manure*, is a term frequently applied to the manure which is raiſed and provided in the farm-yards. See COMPOST, FARM-*Yard Dung*, and MANURE.

FARM-*Yard Management*, in *Rural Economy*, is that ſort of management which relates to the buſineſs and operations of the farm-yard. In order to augment and procure as much manure as poſſible, the farm-yard ſhould conſtantly be kept covered with ſome earthy material, on which the dung and urine of the cattle may act, and with which they may be combined, and thus increaſe the quantity of the manure heap. Good mould, peat earth, and the ſcrapings of roads and ditches, are highly proper for the purpoſe. Where there is a pit or reſervoir for the reception of the urine and other liquid matters from the yard, it may be ſo placed as to ſerve two yards, and may be bottomed with rammed clay, and its ſides plaſtered with ſome compoſition which will make it retentive. Into it may be ſhot as much ditch earth or other ſubſtances as it will properly hold, without cauſing an overflow; and, inſtead of pumping the liquor out in the end, as has been recommended, it is probably better to ſhoot in earth ſufficient to wholly abſorb it, afterwards carting the whole away to the compoſt-hill, which is believed to be the eaſier method of the two. Upon the bottom, in the yard, the layer of manure earth is to be ſpread to the thickneſs of a foot, if poſſible, throughout the whole area, the quantity in the centre, or drain, being increaſed two or three fold, as having the greater part of the moiſture to imbibe. The whole muſt be kept ſufficiently littered, that the cattle may not poach in the earth with their feet. The above, or ſome method of ſimilar effect, for the preſervation of articles ſo precious to the farmer as the dung and urine of his cattle, one would ſuppoſe, a late writer ſays, ſo ſimple and obvious, that common ſenſe could never miſs it. How ſtrange then is it, that we ſee ſuch beneficial meaſures generally neglected, and that by men who have it in their power to compaſs them, and who pretend to be ſenſible of the value of the meaſure? How many hundreds of farm-yards are there either mere bogs, or with bottoms which abſorb and devour the moſt valuable part of the manure, or with a deſcent towards a pond, a road, or a ditch, where it runs off, to be in part or totally diſſipated and loſt? But what is ſtill more ſingularly abſurd is, that a pond or drain ſhall fortunately ſtop the groſſer part of this waſte, and yet it ſhall be ſuffered to accumulate for years unobſerved and untouched! This is by much too frequently the caſe.

With the view of promoting ſtill more the purpoſe mentioned above, from every ſtable or cattle-houſe, a drain, it is obſerved, will be neceſſary, in order to conduct the urine to the proper receptacle; not a mere common gutter, in which the liquid ſinks or ſtagnates, keeping a conſtant puddle at the heels of the animals: there ought to be a grating, or ſink-plate, to every two ſtalls at leaſt, which, with the drain itſelf, ſhould always be kept free and pervious. The entrance to the chief cattle-houſe is uſually over a pavement of convenient width. The dung from the different houſes muſt, both for convenience and preſervation ſake, be ſtowed near at hand; for, ſhould it be wheeled into the area, it would be trodden to waſte, that is to ſay, either bound down too hard, or too much ſcattered, inſtead of which it may be at once placed in a ſtate proper for fermentation and putrefaction. Either ſlight pits may be made oppoſite to the ſtable door, and bottomed with marle or earth, or the dung may be made up in clumps or hills; in both which caſes the nice and ſcientific cultivator may, if he pleaſe, cover with ſtraw or ſtubble, in order to prevent exhalation, and to promote the putrefactive proceſs. The heaps growing to an inconvenient bulk, an auxiliary dung-hill muſt be pitched in the neareſt ſituation; thus, in a certain, perhaps ſufficient, degree, with attention and a little ingenious contrivance, the dung may be preſerved from expoſure to the external air. In caſe of its too great aridity or drought, in the hot ſeaſon, and with the view of re-producing fermentation, no method is better, the writer ſuppoſes, than to ſtir into the heap mud, weeds, ſlop of any kind, or foul water from ponds, ditches, and other ſimilar places. Others, however, adviſe that the manure raiſed in the fold-yards ſhould be wholly removed from them every ſix or eight weeks, and thrown up into heaps, in order that fermentation may be more fully carried on, in conſequence of the more free admiſſion of air and moiſture, as by ſuffering it to continue longer in ſuch places it is liable, from the exceſſive treading of the cattle and other ſorts of live ſtock, to become ſo hard, in particular parts, as to prevent the regular proceſs of converſion from going on; and in caſe of the ſeaſon becoming dry for ſome length of time, to undergo decay in a partial manner only, which is very diſadvantageous to the farmer. On this principle, therefore, the practice ſometimes had recourſe to, of turning over the manure in the farm-yards, in the vernal ſeaſon, when the weather is dry, and the dung ſo compact and deſtitute of moiſture as to require being cut and removed in large lumps, is evidently wrong, as by blending the dry parts with the more moiſt ones, the proceſs of decay is greatly checked and retarded, and the forming of good manure prevented. The lighter and more evenly the heaps of the materials can be thrown together, the more quickly they take on heat, decay, and become good manure. And if the manure of ſeveral different ſorts of animals be blended together, ſuch as that of hogs, neat cattle, and horſes, it is ſuppoſed by ſome to be ſo much the better, the fermentation proceeding more rapidly.

It is conſidered by many a very improper practice to have this ſort of manure, in a ſtate ready for application, any great length of time before it is wanted, as was formerly much the caſe; as the moſt rich parts of it are continually going off by evaporation and ſolution, and of courſe the ſtrength of the manure much leſſened.

Where this ſort of manure is to be formed from the roots of different kinds of weeds and other plants, and various coarſe vegetable productions, a much greater length of time will be required to bring it into the condition of good manure, than would otherwiſe be the caſe.

It has been the ſubject of diſpute, the writer noticed above ſays, whether or not it be preferable, in point of intereſt, to keep cattle enough to conſume all the ſtraw as meat, without any being allowed for bedding: the affirmative, he thinks, not improbable; but it is a length in cattle-feeding to which few will be diſpoſed to proceed. But to go upon the ſuppoſition of foddering abroad, nothing can be more plain than the benefit derived to cattle from warm littering and ſhelter; and it is equally obvious, that young and growing ſtock thrive much better in the range of a yard, than when confined in a ſtall, being alſo much more agreeable to their natural liking. This idea extends to ſtore-pigs, which are almoſt indiſpenſable in a yard, as gleaners of what would be waſte to every other deſcription of animals. Some are for confining all cattle to the houſe throughout the winter, and even recommend the expence of entirely covering in the yard with a roof of deal board, a greater premium, in his opinion, for the perfection of dung, than ſuch perfection, if attained, would ever repay. In caſe of a very large ſtock, it would be to incur no ſlight riſks of contagion. It would be to run into the extreme of the continental practice, where they exceedingly injure the health of their cattle by too cloſe houſing, ſtifling heat, and hot watery ſlops. Theirs and our common ſyſtem form, he thinks, two extremes. He has long alſo been decidedly of opinion, that ſheep are equally entitled to the benefit of the home-fold with any other deſcription of ſtock, and that they will repay it in an equal proportion: they muſt, however, be folded apart from the other cattle. By keeping yards properly formed for them, well littered down with ſtraw or other ſuitable matters, and having them put into them during the night, vaſt ſtores of excellent manure might be formed. Where deer are kept they might alſo be had recourſe to in the ſame way with great benefit in the view of manure.

Great care and attention are requiſite in the management of every kind of ſtock in the farm-yard, as well in reſpect to the proper foddering of them as the keeping of them clean. Each ſhould be performed with great regularity and exactneſs. The farmer ſhould himſelf make frequent examinations, and ſee that all the different deſcriptions of ſtock go on in a proper manner, and that nothing is neglected by the ſervants who are employed in the yard buſineſs.

The preſent mode of managing farm-yard manure, previous to its being laid on the land, is ſtated by a late writer to be in almoſt every part of the kingdom, where regular farm-buildings have not been erected, extremely negligent and improper, and ſuch as calls loudly for reform. This will appear more eſpecially neceſſary, he thinks, when we reflect on the ſmall number of farms that are properly accommodated with farm-offices, compared with thoſe that are deprived of neceſſary accommodations in this reſpect. We muſt, then, perceive that the evil, in regard to the miſmanagement of farm-yard dung in Great Britain, is as extenſive as it is ſerious. The loſs of manure in this way muſt be prodigious all through the country. Reform has, however, begun to take place in moſt of the improved diſtricts, and will, no doubt, be gradually introduced into the others, as the advantages of it become better underſtood. See Manure, and Farm-*Yard.*

Farms, *Letting of*, is the cuſtom, practice, or buſineſs of getting, or providing them with ſuch tenants as are proper and adequate to the cultivation and management of them. This is evidently a matter of great conſequence to the proprietors, as their advantage depends materially upon both, in ſo far as their rents and the improvement of their lands are concerned. It of courſe behoves them to act with conſiderable attention in the adjuſting of the buſineſs. There are ſeveral different methods of managing it, as by public auction, the higheſt bidder being the tenant; by ticket or written propoſals, the higheſt offer having the farm; and by the aſking of more rent than the farm is worth, ſo as to cloſe with the perſon promiſing the largeſt rent, without regarding his qualifications or fitneſs as a tenant.

The two firſt methods are eaſy and convenient for obtaining tenants for farms, where the owners or managers of them are not well acquainted with the value of the lands, or the qualifications of the tenants. And where the ſilly imprudent cuſtom prevails on eſtates of letting the manager have a profit on leaſes or agreements for farms, this manner of letting them becomes ſtill more agreeable, as it is three to one that either the farms are let too dear, or that the tenants are unequal to their management; conſequently there is a fair proſpect to the drawer of the leaſes of their being to be re-let in the courſe of a very few years. Further, if he have not only a handſome profit upon every pair of leaſes, but is allowed or accuſtomed to take fees of entry, the proſpects are ſtill more bright and promiſing. And where, in addition to theſe, there is a further profit on deeds of diſtreſs and ſurrender, how can a perſon be blamed who has probably a large family to ſupport, for letting farms by auction or by propoſals; or for agreeing with an adventurer, or with any man as ignorant as himſelf of their real value, for more money than they are worth; or for ſcrewing up the tenants in poſſeſſion to rents they can never poſſibly pay; when he knows, perhaps, that by ſo doing he ſhall not only enhance his income, but gratify his employer. It is juſtly ſuggeſted that it is the employer not the agent, who, under this falſe principle of management, is playing the loſing game! Exceſſive rents are only nominal. They look well on a rent-roll while they have a right to ſtand there. But if the arrears of rent be received through the diſtreſs and ruin of the tenant, the injury done to the eſtate, not to mention its loſs of character, is to be deducted from the nominal rent. At length, when the lands are completely exhauſted, the buildings let down, the gates and fences broken and deſtroyed, the water courſes choaked up, and the roads impaſſable, the tenant, ſays Mr. Marſhall, runs off, and the farm lies unoccupied, a very blank in the rent-roll. Such, he contends, is the impropriety of this method of proceeding in the tenanting of the eſtates. To the life tenant of an eſtate, who has no intereſt whatever in the remainder, and whoſe life is worth but a few years' purchaſe, ſuch a mode of proceeding might claim, he ſuppoſes, a ſort of juſtification. But that, in the poſſeſſor of an hereditary property, which is expected to deſcend to the ſon and ſon's ſon, ſuch an improvident practice becomes, he ſays, altogether irrational. It might be deemed an act of folly in a young man; and of cruelty as well as folly in one of riper years; whoſe ſucceſſor might thereby be involved in perpetual difficulty; and his own memory in conſequence be ſhrowded in diſgrace. The writer, in his various examinations and reviews of the different departments of the kingdom, has ſeen much miſchief and miſery reſulting from this improvident and impolitic plan of management in the letting of farms.

It is ſtrongly ſuggeſted, that if the intimate connection which ſubſiſts, which muſt ſubſiſt between owners and occupiers, be well conſidered, and how much the intereſt of the former depends upon the conduct of the latter, it is but common prudence to be ſcrupulouſly nice and attentive to the choice of tenants. And as in every ſituation there is at all times a fair rental value, or market price, of lands, as of their products, there appears to be only one rational and eventually profitable method of letting a farm, which is that by *fixing* the rent and *chooſing* the tenant. As in this mode there is the greateſt chance of ſecuring proper tenants, eſpecially in ſo far as the good cultivation of the land is concerned and the due payment of the rent.

FARMER, a term which ſignifies a perſon whoſe buſineſs is the cultivation and management of farm lands, and the ſeveral kinds of live ſtock neceſſarily connected with them, as well as the different products which are afforded from both. Farmers may be ſtill further diſtinguiſhed, according to the nature of the farms, and the ſorts of management under which they are conducted, into arable, grazing, dairying, and hay or graſs farmers.

The farmers of this country may now probably be divided into two claſſes, the large and the ſmall, which differ very materially in their habits and opinions. The views and notions of the latter are moſtly narrow and confined, in conſequence of the want of education, reſulting from their ſituation in ſociety, which does not permit them to improve themſelves in any high degree. It is perhaps on this account that farmers of this ſort are ſo backward in admitting any innovations on the methods of huſbandry to which they have been accuſtomed: incapable of perceiving the benefits that might be derived from propoſed alterations, they are too apt to adhere to the practices which they have received from their anceſtors, and to tranſmit them unchanged to their poſterity. Their habits having been formed to ſome particular ſyſtem or practice, they continue to purſue it with a blind unvarying attachment.

On the contrary, the large farmers, having their minds more enlarged by education, are much more intelligent, and actuated by a more judicious and rational ſpirit of improvement. It is to the influence and exertion of this valuable claſs of farmers that moſt of the improvements which have lately been made in huſbandry in this country are to be aſcribed. They have likewiſe contributed in a very material degree to the extenſion and ſpread of that ſpirit of inveſtigation and experiment which, while regulated by judgment, cannot fail of leading to the moſt important and uſeful reſults.

But a late writer on agriculture has arranged the farmers of this country under the following ſeveral claſſes or heads: 1ſt, the king; 2dly, the great proprietors and country gentlemen; 3dly, yeomen, and farmers properly ſo called; 4thly, poſſeſſors of ſmall farms; 5thly, cottagers, including different deſcriptions of people who cultivate ſmall farms, and a few acres adjoining towns and villages; and, 6thly, the unproductive claſs of huſbandmen.

It is ſuppoſed that in regard to the firſt, it will not be denied that the governments of modern Europe have hitherto encouraged the towns in preference to that of the country; and in ſome meaſure depreſſed agriculture in order to advance manufacturing and commercial induſtry. While, on the other hand, the government of the immenſe territory of China encourages agriculture more than all the other arts; inſomuch, that the condition of a farm labourer in that country is ſaid to be as ſuperior to that of an artificer, as with us it is inferior. It is not believed difficult to trace theſe different ſyſtems of policy to the ſame ſource, however apparently inconſiſtent they are in themſelves. The increaſe of commerce and manufactures in the different kingdoms of Europe has always been attended with an increaſe of revenue to the ſtate, and which, in conſequence of being brought more ſpeedily, and with leſs expence into the exchequer, than that ariſing from agriculture, becomes thereby more advantageous; while the ſovereigns of China derive the greateſt part, if not the whole, of their revenue from the produce of the ſoil. From theſe oppoſite ſyſtems of political economy, another might, it is imagined, be eſtabliſhed, infinitely better calculated to promote the intereſts of the nation, by affording the means of ſupporting a more numerous population than is poſſible to be done by adhering to either of the former. Were agriculture, manufactures, and commerce alike encouraged, they would all proſper in an equal degree; and though the revenues ariſing from the former might not be ſo well calculated to anſwer any ſudden exigence, yet experience has proved, that, in this kingdom, they form the moſt ſure and permanent reſources of the ſtate, as is evident from the land and malt taxes, exciſe on ale, beer, Britiſh ſpirits, cyder, perry, leather, candles, and almoſt every other article produced in the country.

If this propoſition be well founded (and it is preſumed it will not be controverted), it muſt give the moſt ſincere ſatisfaction to every lover of his country to ſee that the ſovereign of this great kingdom, which has riſen ſo high in fame among nations for the extent of its manufactures and commerce, has, like another Cato, turned his attention to the cultivation and improvement of his native ſoil, and thereby done more for the encouragement of agriculture than could probably have been effected by any other means. The example which his majeſty thus holds out for the imitation of the higher claſſes of his ſubjects cannot, the writer thinks, fail to be attended with conſequences highly beneficial, as has been eminently teſtified by the meritorious exertions of his grace the duke of Bedford and many others; while the attention of the other branches of the legiſlature will naturally be turned to the formation of ſuch laws and regulations in favour of thoſe who practiſe this moſt uſeful art, as will in all probability tend in a very great degree to the further improvement of the country.

It is ſtated, that on his majeſty's farm, and under his perſonal attention, farm-houſes have been built, ſwamps and moraſſes drained, plantations formed, and every means adopted that could contribute to improve the ſoil or embelliſh the landſcape. In carrying on theſe works, liberal expenditure has been combined with minute ſavings, which is indiſpenſably neceſſary in all the operations of huſbandry, either where the object is profit, or, as in this caſe, a deſire to promote the public good, by endeavouring to create a ſpirit in others for undertaking improvements of a ſimilar nature.

In conſidering the ſecond claſs, the writer remarks, that a conſiderable portion of the cultivated lands in Britain is poſſeſſed by the great proprietors, and ſuch as generally reſide on their eſtates, who may therefore very probably be denominated country-gentlemen. Excluſive of their domains, or lands around their manor-houſes, theſe proprietors commonly hold farms, which are kept under regular modes of cultivation. Many of theſe characters merit high commendation for their ſteady and unwearied attention to that great ſource of national wealth, the introduction of better ſyſtems of huſbandry; while others have gone farther, and not only endeavoured, both by precept and example, to induce their tenants to adopt ſuch ſyſtems as they from experience had found beneficial, but alſo granted leaſes of ſuch duration, and on terms ſo liberal, as induced men poſſeſſing knowledge, enterpriſe, and capital, to apply them to the art of huſbandry. It is to be regretted, however, that this cannot be ſaid of all the great proprietors and country-gentlemen of this iſland. Many there are who, with a cool indifference reſpecting either the improvement of the country or the ſituation of their tenants, ſeem to think the chief buſineſs of a landlord ought to be an unremitting attention to the extenſion of his rent-roll, without ever duly conſidering, that if additional rents are demanded, means ſhould be furniſhed by the introduction of better ſyſtems of huſbandry, improved breeds of live-ſtock, and the expenditure of money in the improvement of the property, by which tenants may be enabled to diſcharge ſuch farther obligations. But from the ſpirit of improvement which has of late evinced itſelf ſo conſpicuouſly, it may be hoped, that in a little time no inſtance of this kind will be found amongſt this highly reſpectable claſs of farmers and proprietors of land.

Regarding the third claſs, or the yeomen and farmers, properly ſo denominated, they may be conſidered the ſtrength of the ſtate. The yeoman and the farmer here alluded to differ only in one particular; the lands which the former cultivates are either in part or in whole his own property, while the latter rents his farm from another. In regard to induſtry, perſeverance, and attention to buſineſs, there is no difference. Happy in their ſituation, removed on the one hand from the vanities and ſuperfluities of high life, and, on the other, by their honeſt induſtry from the fear of poverty, the improvement of their farms conſtituting their chief ſtudy and delight, they ſpend their days in independence, enjoying health and all the rational comforts of life. It is ſuppoſed probable that near three-fourths of this kingdom are poſſeſſed by people of this deſcription. Fortunate it is for Britain that this is the caſe; for although many of the proprietors are entitled to much praiſe for introducing improvements into various parts of the country, it is to this claſs that the nation is indebted for theſe improvements having become ſo general and extenſive as they now are.

Concerning the fourth claſs it may be ſtated, that in all the beſt cultivated parts of Great Britain, as well as where improvements have not become general, there are many ſmall farms. Theſe, though not as yet in every caſe managed in ſuch a manner as to produce the greateſt crops which the ſoil is capable of yielding, are, however, much better cultivated than they were 30 or 40 years ago; and the ſpirit for improvements among tenants of this deſcription appears to be more general than at any former period, although, from the want of capital, and the little attention generally paid to them by their landlords, added to their own attachment to ancient prejudices, they are yet very far from having attained that degree of uſefulneſs, in an agricultural view, to which, by adopting proper means, they may be advanced. The poſſeſſors of ſmall farms are, however, very uſeful and valuable members of the community: honeſt, peaceable, and induſtrious, they breed up their children in the ſame principles, and to theſe are the manufacturers of our iſland moſt indebted for a never-failing ſupply of virtuous and uſeful artificers and labourers in various ways.

The fifth claſs, or cottagers, are thoſe who either reſide in the neighbourhood of large farms adjoining to moors or commons, or in ſmall hamlets. They generally poſſeſs a few acres of tillage-lands, from the cultivation of which, together with what they receive for labour performed to the farmers, or from carrying on the occupations to which they had been bred, as weavers, tailors, ſhoemakers, blackſmiths, thatchers, &c. they are enabled to maintain their families, and to be of great ſervice in the buſineſs of cultivation. Being for the moſt part induſtrious and inured to labour, they bring up their children not only without becoming burdens on the public, but in ſuch a manner as to render them extremely uſeful as members of ſociety. Theſe hamlets and cottages are alſo nurſeries whence the Britiſh farmer draws his conſtant ſupply of labourers for performing his work.

In regard to thoſe who cultivate ſmall farms, adjoining to towns or villages, they fall to be deſcribed under two characters. The firſt are ſuch as reſide in towns, and are engaged in commerce and manufactures; but who, for their amuſement, or the convenience of their families, poſſeſs ſmall farms in the neighbourhood. Theſe may be denominated good farmers only in a national point of view. Their farms are indeed in ſome caſes well cultivated, the crops luxuriant, and a full proportion, correſponding to the extent of the farms, comes to market; but, owing to their time and attention being occupied with other matters, in the ſucceſs of which they are more immediately intereſted, few of them derive much benefit from their farming operations. The reaſon is obvious; there is no buſineſs requires more unremitting care than that of huſbandry; and, though people ſo employed may have it in their power to pay attention to the great leading points, as that of ſeed-time and harveſt, it is not to be ſuppoſed they can ſpare time to ſuperintend the execution of many of thoſe more minute operations, on the proper attention to which the profits of a farm, particularly one ſo ſituated, principally depend. The ſecond are thoſe who reſide in or immediately adjoining to towns, and farm ſo many acres as enable them to keep a few milch-cows, or two or three horſes to hire, either for the ſaddle or the cart. It is only neceſſary to ſay, that as, on account of local ſituation, they commonly pay very high rents for their lands, they therefore find it for their intereſt to cultivate them in the beſt manner, ſo as to inſure the greateſt poſſible crops. The uſes to which theſe crops are applied, it will be readily admitted, tend in a material degree to the convenience and accommodation of the inhabitants, and therefore cultivators of this deſcription are to the inhabitants of theſe towns and villages what the Britiſh farmers are to the nation at large; namely, the means by which they are furniſhed with many of the neceſſaries and comforts of life. Without the aid of this induſtrious claſs of men, it is evident that manufactures cannot flouriſh, as thoſe engaged in them in the various towns would be obliged to diſperſe, and ſeek thoſe ſupplies in the country, without which their ſituation would be in a great meaſure unſupportable.

While ſumming up this account of the cultivators of the Britiſh ſoil, there yet remains a very numerous claſs to be taken notice of; and it is to be regretted, that the appellation of the unproductive claſs but too well applies to them. Thoſe are, the great body of the inhabitants in the remote parts of Scotland, who are without doubt the moſt uſeleſs inhabitants in the iſland. This, however, it is but juſtice to ſay, does not ariſe from any fault of theirs, but from the negligence of thoſe who ſhould be their natural guardians and protectors. They are well known to be capable of the moſt indefatigable exertion and perſeverance, when taught to look forward to any object, either of glory or of intereſt. But they are permitted to waſte their time in ſloth and indolence. Were the landholders to beſtow the proper attention, which an object of ſuch national importance merits, theſe people might, in a few years, be taught the firſt principles of improvement; namely, the value of time, and the beneficial effects of labour. Then, but not till then, will a knowledge of agriculture and other uſeful arts prevail amongſt them, and take the place of that gloomy melancholy which was introduced under the feudal ſyſtem, and has too long held its reign. The greateſt part of the cultivated lands in the highlands and iſlands of Scotland is poſſeſſed in townſhips; that is, a number of tenants reſide in the ſame town or hamlet, and rent ſmall lots adjoining. In almoſt every ſuch caſe the modes of cultivation, and the implements of huſbandry, are probably little improved from what they were five hundred years ago, at leaſt they are wretched in the extreme, the culture of potatoes being the only improvement of any conſequence that has taken place for ages. When to this it is added that few attempts have been hitherto made to introduce either commerce or manufactures, it will appear evident to every Britiſh reader, that this great body of his fellow-ſubjects may, with too much propriety, be termed an unproductive claſs, and in their preſent ſituation be conſidered as a burden, rather than an advantage to the ſtate. There are notwithſtanding many in thoſe diſtricts who, from the extent of land which they poſſeſs, their knowledge of agriculture, and the attention which they beſtow on the improvement of the different ſpecies of live ſtock, are juſtly entitled to be ranked among the number of Britiſh farmers; and if proper encouragement was given by the proprietors, and ſuch modes of improvement introduced as the country is moſt ſuſceptible of, that number would, it is ſuppoſed, naturally increaſe in a high degree.

It is of much conſequence to farmers in general, that they conſider the nature of their different ſituations with attention, as by ſuch means they may introduce the moſt advantageous ſyſtems of management on their farms. They ſhould likewiſe be particularly attentive to the raiſing of various ſorts of ſeeds, as well as to the practice of cropping; and above all to the keeping of regular accounts. See Farm.

Farmer, in *Law*, he that tenants a farm, or leſſee thereof. Alſo generally every leſſee for life, years, or at will, is called farmer. Farm, or feorme, being an old Saxon word, ſignifying proviſions (ſee Farm), came to be uſed inſtead of rent or render, becauſe anciently rents, or the greater part of them, were reſerved in proviſions, in corn, poultry, or the like, till the uſe of money became more frequent. Hence a farmer, *firmarius*, was one who held his lands upon payment of a rent or feorme; though at preſent, by a gradual departure from the original ſenſe, the word farm is brought to ſignify the very eſtate or lands ſo held upon farm or rent. See Lease.

As this word implies no myſtery, except it be that of huſbandry, huſbandman is the proper addition for a farmer.

Farmer, in *Mining*, is the lord of the field, or one that farms the lot and cope of the king.

Farmer, Hugh, in *Biography*, an eminent divine among the Proteſtant diſſenters, no leſs diſtinguiſhed by his popular talents as a preacher, than by his learning as a theologian, was a deſcendant from reſpectable anceſtors in North Wales, and born at Shrewſbury in the year 1714. Having laid a ſuitable foundation of claſſical literature at a ſchool near Towyn, in Merionethſhire, and afterwards under the tuition of Dr. Charles Owen, a learned diſſenting miniſter at Warrington, in Lancaſhire, he was initiated as a ſtudent for the miniſtry, in the year 1730, at the academy in Northampton, then under the ſuperintendance of Mr. (afterwards Dr.) Doddridge. After he had finiſhed his courſe of ſtudies, very much to his own honour, and to the ſatisfaction of his tutor, he ſettled at Walthamſtow near London, as chaplain to William Coward, eſq. and alſo as miniſter to the diſſenting congregation in that village. Mr. Coward, although he made liberal proviſion by benefactions and bequeſts for the education and relief of Proteſtant diſſenting miniſters, was a man of a peculiar temper, which obliged his chaplain ſuddenly to remove, and to take up an aſylum in the houſe of William Snell, eſq. an eminent ſolicitor of diſtinguiſhed probity and worth. Here he was hoſpitably received, and in this family he continued, on terms of the cloſeſt intimacy and friendſhip, for more than 30 years. The congregation at Walthamſtow flouriſhed under his paſtoral care, and became one of the moſt conſiderable, as to the number and opulence of its members, in the vicinity of the metropolis. Mr. Farmer, whilſt he regularly diſcharged the duties of his paſtoral office, devoted himſelf to thoſe ſtudies, that contributed to the high reputation which he afterwards acquired in the department of biblical literature. The firſt publication of this kind, which attracted notice, appeared in 1761, under the title of "An Enquiry into the Nature and Deſign of our Lord's temptation in the Wilderneſs," 8vo. The ſubſequent editions of this tract in 1765, and in 1776, afforded to the author an opportunity of eſtabliſhing his peculiar opinions concerning the nature and deſign of this event, and of replying to his opponents.

For an account of his ſentiments on the ſubject, we refer to the article Temptation.

In the year 1771, Mr. Farmer publiſhed his larger and more valuable work, entitled "A Diſſertation on Miracles, deſigned to ſhew that they are arguments of a divine interpoſition, and abſolute Proofs of the Miſſion and Doctrine of a Prophet," 8vo. This work, the ſubject and arguments of which will be more particularly detailed under the head of Miracles, is entitled, as one of his biographers ſays, "to pre-eminent diſtinction for extent of inquiry, profundity of erudition, maſterly criticiſm, accurate diſcrimination, and perſpicuity and fairneſs of reaſoning." By ably "refuting thoſe principles of demoniſm, which have done ſo much diſcredit to the argument drawn from miracles in favour of the Jewiſh and Chriſtian revelations," and by eſtabliſhing the belief "that the world is under the government of God alone, and that no created ſpirits, much leſs ſuch as oppoſe his wiſe and benevolent deſigns, can diſturb that courſe and order of things which he has eſtabliſhed," it leads to the proof of what is announced in the title, in a manner that will ever rank it, in the opinion of competent judges, among the moſt important productions in the cauſe of ſacred literature. A charge of plagiariſm having been unjuſtly alleged againſt the author, in conſequence of this "Diſſertation," he took occaſion to publiſh, in the year 1772, "An Examination of the Rev. Mr. Le Moine's Treatiſe on Miracles;" in which he evinces the contrariety of Mr. Le Moine's opinion to the ſentiments which he had advanced, and farther confirms them. Mr. Farmer's next publication appeared in the year 1775, under the title of "An Eſſay on the Dæmoniacs of the New Teſtament." In this treatiſe he purſues the reaſoning adopted in his "Diſſertation on Miracles," and diſtinguiſhes himſelf as the advocate of an hypotheſis, which had been previouſly adopted and ſupported by Mr. Joſeph Mede, Dr. Sykes, Dr. Mead, and Dr. Lardner. It is hardly neceſſary to mention in this place, that theſe writers have attempted to ſhew "that the diſorders imputed to ſupernatural poſſeſſions proceed from natural cauſes, and not from the agency of evil ſpirits." (See the articles Dæmon, Dæmoniac, and Dæmoniacal *Poſſeſſion*, and Dæmonomania.) Mr. Farmer's publication led to a freſh diſcuſſion of this intereſting ſubject: and drew upon him the attacks of Dr. Worthington, a learned clergyman of the church of England, and of Mr. Fell, an acute writer, and a Proteſtant diſſenting miniſter. To the former opponent Mr. Farmer thought proper to reply in a ſeries of "Letters, &c." publiſhed in 1778; but to the latter, whom our author has, perhaps too freely, cenſured for want of candour, he addreſſed no direct anſwer. However, Mr. Fell's work produced an elaborate treatiſe, which appeared in 1783, under the title of "The General Prevalence of the Worſhip of Human Spirits in the Ancient Heathen Nations, aſſerted and proved;" 8vo. (See Dæmon.) In this treatiſe the author has incidentally introduced ſeveral ſtrictures on Mr. Fell's performance, and ſome reflections, which have been thought, particularly by that gentleman's friends and the advocates of his opinion, too acrimonious and contemptuous. In this controverſy, which was again purſued by Mr. Fell in the year 1785, candid perſons, whatever may be their peculiar ſentiments with reſpect to the ſubject in diſpute, have regretted that they have been able to diſcover too great a degree of perſonality, and of invective that goes beyond the bounds of the "retort courteous." Mr. Farmer declined any further reply, and reſumed the proſecution of thoſe general inquiries, in which he excelled; and from which the literary world might have derived further advantage, if his health had continued; and if he had not enjoined on his executors the unpleaſant charge of committing all his ſermons and manuſcripts to the flames. Among the latter was "A Diſſertation on the Story of Balaam," which had been tranſcribed for the preſs, and a collection of papers, prepared for an improved edition of his Treatiſe on Miracles.

Having remained ſole miniſter of the congregation at Walthamſtow for ſeveral years, he was provided with an ingenious and able aſſociate, the Rev. Mr. Ebenezer Radcliffe; and, in 1761, he accepted the office of afternoon preacher to the reſpectable ſociety at Salters' Hall, in the city of London, where for ſeveral years he exerciſed his miniſtry to a numerous auditory. He was alſo ſoon after elected one of the Tueſday lecturers at the above-mentioned place, a truſtee of Dr. Williams's charities, and one of the truſtees of Mr. Coward's bequeſts. But as he advanced in years, he found it neceſſary to diſcontinue his public ſervices; not without the regret of the ſocieties with which he was connected. In the year 1785, the cloſe of his life was embittered by a total failure of ſight; for which, however, he obtained relief by a ſurgical operation, to ſuch a degree as to enable him to purſue his favourite ſtudies. But his infirmities gradually increaſed; and in 1787 he terminated his courſe of honourable labours, having attained the 73d year of his age. "Of Mr. Farmer's character as a ſcholar," ſays one of his biographers, "his learned labours afford ſufficient teſtimony. As a preacher, he was diſtinguiſhed by a happy variety of thought and expreſſion, judicious criticiſm, liberality of ſentiment, and energy and eloquence of language. His voice was uncommonly clear and harmonious, and his manner of delivery natural, manly, and impreſſive. He was a man of ardent but cheerful piety, who recommended the religion he taught by the exemplarineſs of his moral conduct, and adorned it by his beneficence and candour. In converſation he was lively, and often brilliant; and in his manner polite and complimentary, ſometimes to exceſs. On diſputable topics, it was no eaſy matter to draw from him a decided opinion. Upon the whole, Mr. Farmer is entitled to a high rank among the diſſenting miniſters of his time, and ſupported an honourable ſtation in the literature of the age." Biog. Brit. Gen. Biog.

Farmer, Richard, D. D. a celebrated ſcholar and critic, was the ſon of a hoſier at Leiceſter, where he was born in 1735. He received the elementary parts of his education at his native town, whence he removed to Cambridge, and was entered a penſioner of Emanuel college: here he took his degrees, and, in 1760, was appointed claſſical tutor of his college. In 1767, he became one of the preachers at Whitehall. In London he reſided very much with Dr. Aſkew, a phyſician, well known for his curious and very valuable library, of which Mr. Farmer did not fail to make a good uſe. He had already engaged in a courſe of reading which laid the foundation of a work to which he was indebted for the principal part of his literary reputation. This was entitled "An Eſſay on the Learning of Shakſpeare," firſt publiſhed in 1766. In this eſſay, Mr. Farmer undertook to ſhew that, in the time of our great poet, Engliſh tranſlations exiſted of moſt of the claſſical writers, and by tracing even the expreſſions and miſtakes of the tranſlators in thoſe paſſages of his plays which allude to the ſubjects treated by theſe writers, he proved that the untutored Shakſpeare had read the tranſlations inſtead of the originals. The eſſay, which went through ſeveral editions, was printed in the edition of Shakſpeare, by Stevens and Reed, in 1793.

The notice Mr. Farmer acquired by his performance was the means of his advancement in the church, and he obtained the chancellorſhip and prebendal ſtall in the cathedral of Litchfield; and, in 1775, he was choſen maſter of Emanuel college, on which occaſion he took his degree of D. D. He was afterwards made principal librarian to the univerſity, and ſerved in his turn the office of vice-chancellor. Being a zealous advocate for the exiſting order of things, and attached to the church in its preſent ſtate, he was ſingled out for preferment. Lord North conferred upon him a prebend of Canterbury, and he was twice offered a biſhopric by the late Mr. Pitt, but he preferred a reſidentiaryſhip of St. Paul's, which he exchanged for his prebend. He was now obliged to reſide three months in the year in the metropolis, which he ſpent very agreeably in the ſociety of his friends, and among the firſt literary characters, to whoſe eſteem his own learning and acquirements gave him high claims. He was hoſtile to certain academical reforms which were propoſed in his time, but was the chief promoter of improvements in the police of Cambridge, particularly thoſe of paving and lighting the ſtreets; and it was in a great meaſure owing to his exertions that the cathedral of St. Paul's was permitted to receive thoſe decorations of monumental ſculpture which, while they exhibit high merit and national gratitude, will gradually clothe, and highly adorn the preſent nakedneſs of the edifice. Dr. Farmer died in September, 1797, at Emanuel college, and to his memory an epitaph was inſcribed on a tomb by Dr. Parr. He publiſhed nothing but the eſſay referred to, though, while young, he iſſued propoſals for a hiſtory of Leiceſter; for this he collected only a few materials, which were afterwards put into the hands of Mr. John Nichols. Necrology.

Farmer, John, an Engliſh madrigaliſt of ſome merit, but not ſo much as he imagined. In 1599, he publiſhed his firſt ſet of Engliſh madrigals, to four voices, profeſſing in his preface to have "fully linked his muſic to *number*, as each gives to other their true effect, which is to move delight; a virtue," he adds, "ſo ſingular in the Italians, as under that enſign only they hazard their honour." This boaſt made us examine his accentuation of the words of his madrigals, with ſome expectation of finding greater accuracy in that particular than was general at the time; but, on the contrary, his aſſertion is ſo far from true, that there appears more falſe accent in his ſongs, than in thoſe of his contemporaries.

FARMERY, in *Agriculture*, the ſcite or place where the farm buildings are erected, and the general buſineſs of the farm principally carried on; the ſame as home-ſtead and home-ſtall. It is a matter of much importance to have it conveniently placed for performing the work of the farm.

FARMING, ſignifies the art of managing, or general detail of the buſineſs of a farm. It is an employment of conſiderable difficulty and trouble, as requiring conſtant care, united with great activity and judgment. In order to conduct it with propriety and advantage, it demands an intimate practical knowledge of the various ſorts of cultivation and management which are in uſe, as well as of the nature and value of every deſcription of live ſtock; likewiſe a perfect acquaintance with the various methods of buying and ſelling, and the conſtant ſtate of different markets and fairs. And, beſides theſe, there are other minutiæ which are of equal importance to the ſucceſs of the farmer. The advantages of farming differ materially according to the nature, ſituation, and circumſtances of farms, as well as the care and management that are beſtowed upon them. It is ſtated by the writer of the "Survey of the County of Middleſex," that the profits of farming, under the old courſe of two crops of corn and a fallow, have ſeldom afforded more than a mere ſubſiſtence to the farmer, and the means of eſtabliſhing his children to run the ſame courſe. But even this, he contends, is no proof againſt the profits of farming *per cent.* on the capital employed, which is generally ſo ſmall a ſum, that the foregoing produce may be a large *per centage*, and with ſedulous attention this has been the fact; as from the accounts of particular families which he has examined, a profit of thirty-two *per cent. per annum* on the ſum made uſe of has been demonſtrated for thirty-five years in ſucceſſion. Indeed it ſeems to be evident that a perſon who employs only 500*l.* and with it brings up a large family, and places them in a ſituation equal to his own, while himſelf retires with an eaſy fortune, could not have done it with a leſs return. But the great improvements which have for ſome time paſt been taking place in agriculture, aided by high prices for the produce of the ſoil, are occaſioning ſuch a rapid riſe in rents; the taxes alſo, and every expenditure are ſo greatly on the increaſe, as muſt, he ſuppoſes, at the lowering of the price of corn and cattle, put farmers of the old ſchool to conſiderable difficulties, and become one of the means of inducing them to adopt the new and better practice. Changes in this way, however, except under particular circumſtances, are very ſlow in their progreſs.

The profits of arable farming are, in general, tolerably well underſtood, therefore they need not be introduced here.

The following is a ſtatement of the produce and expence of 150 acres of good graſs-land, at the diſtance of eight miles from the London markets.

	Acres.
Hedge rows, and waſte of farm	20
Mowing ground	130
	150
Produce at one cutting for hay	200 loads.

Average ſale of ditto for five or ſix years, 5*l.* *per* load, is			£ 1,300
After-feed ſold for			65
Total produce *per annum*			£ 1,365
Expences.			
Four horſes 36*l.* each	£ 140	0	
Three men all the year, at 12*s.* *per* week	93	0	
Extra labour, of mowing, hay-making, ſtacking, ſtraw, thatching, and pulling, at 15*s.*	97	10	
Taxes, aſſeſſments, and tithes	130	0	
Marketing 260 loads of hay, at 4*s.*	52	0	
Paid for 300 loads of manure, at 2*s.* 6*d.*	37	10	
Tenants' repairs of buildings	10	0	
Inſurance of ſtock, and tax on	4	0	
Pilfering	10	0	
Frauds of hay-ſaleſmen	10	0	
Mole-catcher	1	0	
Intereſt of 700*l.* for one year	35	0	
Total expences			620
Remains for rent and attention			745

which is equivalent to 5*l.* the acre.

Suppoſe the farmer to pay 3*l.* the acre rent, it will leave

2*l.* which, on 150 acres, is 300*l.* a-year profit, or 40 *per cent.* upon the capital employed.

Theſe charges ſtand too low for the preſent period, and the produce is in ſome degree undervalued, but the profit is in ſome meaſure ſhewn.

FARMINGTON, in *Geography*, a large and flouriſhing townſhip of excellent land in Kennebeck county, in the ſtate of Maine, North America, ſituated on Sandy river, which, in the S.E. part, has falls, that furniſh good mill-ſeats, for ſaw-mills, a carding machine, griſt-mill, and fulling-mill, already erected. It has a poſt-office, and contains 942 inhabitants; 204 miles N.N.E. of Boſton.—Alſo, a large, pleaſant, and wealthy poſt-town in Hartford county, Connecticut; 10 miles S.W. of Hartford city. This town is beautified and enriched by a river of the ſame name. In the compact part of the town, the houſes ſtand chiefly in a ſtreet which runs N. and S. along the gentle declivity of a hill; and about the centre of the ſtreet is a large and handſome congregational church. This town was ſettled in 1645, and has 2809 inhabitants.—Alſo, a river of Connecticut, which riſes in the ſtate of Maſſachuſetts, and runs ſouth-eaſterly through Hartland, Bark-Hempſtead, and New Hartford. On the borders of Hartford county it receives a weſtern branch, which riſes from ſeveral ponds in Colebrook, and continuing this courſe to Farmington, it meets with mountains and turns northerly, ſeeking a paſſage to the Connecticut. After running 15 miles, it unites with Salmon river, and ruſhing through the mountains and down a cataract of 150 feet, is afterwards called Windſor river, and in a S.E. courſe mingles with Connecticut river, 4 miles above Hartford.

FARMSTEAD, in *Agriculture*, the place or ſituation where the farm offices are built, and the chief work of the farm conducted. It is of much conſequence to have it ſituated as centrical as poſſible in the farm.

FARMVILLE, in *Geography*, a ſmall poſt-town of America, in Prince Edward county, Virginia, ſituated on Appomatox river, 210 miles from Waſhington. The river is paſſable by boats from hence to Peterſburgh.

FARN Islands, two groups of ſmall iſlands and rocks, amounting to 17 in number, and ſituated in the German ſea, near the Engliſh coaſt, oppoſite to Bamborough caſtle, in Northumberland. They have all their reſpective names, and produce kelp, feathers and eggs of fowls, and ſome ſeals: ſome of them bear a little graſs, and feed a cow or two. The principal, called "Farn," is about a mile in compaſs, and has a fort, and a light-houſe, which being never furniſhed with fire is of no uſe. N. lat. 55° 29′. W. long. 1° 44′.

FARNABY, Thomas, in *Biography*, ſon of a carpenter in London, was born about the year 1575. Having a turn for learning he was well grounded in the elements of grammar, and laid a good foundation in claſſical knowledge. In 1590 he was admitted a ſervitor of Merton college, Oxford; but he ſoon quitted that univerſity, and went to Spain, where he ſtudied in a college of the Jeſuits. With this ſituation he was diſſatisfied, returned, and entered on board the fleet of Drake and Hawkins in their expedition of 1595. After this he ſerved in the Low Countries as a ſoldier, and having led an unſettled life for ſome years, he landed in Cornwall, ſo much depreſſed with poverty, that he was under the neceſſity of teaching children their letters for a very ſcanty ſubſiſtence. He next taught a grammar ſchool at Martock in Somerſetſhire, and from thence he removed to London, and opened a ſeminary near Cripplegate, where he attained to ſo high a reputation, that he is ſaid to have had ſometimes as many as three hundred ſcholars at a time. He now ſuſtained a conſiderable rank in the literary world, by his editions of Juvenal and Perſius; of the tragedies of Seneca, of Martial's Epigrams, and of Lucan's Pharſalia, and took his degree of M. A. at Cambridge in 1616.

At this period he ſought for a more retired reſidence, and removed to Seven-Oaks, in Kent, where he contrived to take boarders. His profeſſion was proſperous, and he became ſufficiently rich to purchaſe ſome conſiderable eſtates in Kent and in Suſſex. In the neighbourhood of Seven-Oaks it is preſumed the deſcendants of this induſtrious and learned man lived till within theſe few years, when ſir Charles Farnaby, if we miſtake not, removed to another part of Kent, or to the borders of Surrey. At the commencement of the civil wars, Mr. Farnaby incurred the ſuſpicion of being concerned in an inſurrection at Tunbridge in favour of the king. This ſuſpicion cauſed him to be impriſoned in Newgate; he had a narrow eſcape from being baniſhed to America, and was, after his releaſe from Newgate, confined at Ely Houſe. He died at Seven-Oaks in 1647, aged 72; highly reſpected as a benefactor to early claſſical education. Beſides the works already mentioned, he publiſhed notes on Virgil, Ovid, and Terence; and many ſmall pieces for ſchools. He drew up alſo, among other things, a "Syſtema Grammaticum," by order of king Charles, who intended to ſubſtitute a new Latin grammar for that taught in ſchools. Biog. Brit.

Farnaby, Giles, a great organ-player and able compoſer, was organiſt of Chriſt church, Oxford, and in 1592 admitted batchelor of muſic. There are extant of his compoſition "Canzonets to foure voices, with a ſong of eight parts," London, 1598. He aſſiſted Ravenſcroft in ſetting parts to ſome of the pſalm-tunes, publiſhed at the beginning of the next century. There are near twenty leſſons in queen Elizabeth's virginal book, by Giles Farnaby, little leſs difficult than thoſe of Bird and Bull. Theſe great muſicians, the wonder and delight of their times, ſeem to have had no conception of brilliancy or embelliſhment, but what aroſe from breaking common chords into arpeggio, or rapidly running up and down the ſcale in notes tied three, and often four times. They ſeem, however, to have been the greateſt players in Europe, till Freſcobaldi introduced a ſuperior ſtyle of treating the organ, diveſted of rapid and frivolous diviſions, which diſgrace that moſt noble and comprehenſive of all inſtruments.

At preſent, the pieces of Bird, Bull, and Farnaby, muſt doubtleſs appear dry and monotonous, for want of air, variety of movement, and modulation; yet before theſe qualities were cultivated, expected, or indeed exiſting, they fed the ear with pure and ſimple harmony, in a manner which none but keyed-inſtruments could effect; and perhaps their favour with profeſſional muſicians was not a little augmented, by the learning of their contexture, and difficulty of execution. For however the old maſters may be celebrated for their ſimplicity and ſobriety of ſtyle, and the moderns indiſcriminately cenſured for multiplied notes, rapidity of performance, tricks, whip-ſyllabub, froth, tumbling, and mere difficulties; it would not be very eaſy to find, among the moſt complicated pieces of modern times, difficulties equally inſurmountable with thoſe in which theſe old fancies and variations abound. Farnaby was of Truro, in Cornwall, and nearly related to Thomas Farnaby, the famous ſchoolmaſter in Kent.

FARNBACH, in *Geography*, a town of Germany, in the county of Henneberg; 6 miles E.S.E. of Salzungen.

FARNESE, Alexander, in *Biography*, duke of Parma, ſon of Octavio Farneſe, duke of Parma, and of

Margaret of Auſtria, was born in 1546. He was educated in the court of king Philip II., and early embraced the profeſſion of arms, and was preſent in his eighteenth year at the battle of Lepanto. From this period he intereſted himſelf in every thing that concerned the army; rejected all indulgences to which his rank might have laid claim, and was clad more like a ſoldier than a prince. He diſtinguiſhed himſelf in the Low Countries during the adminiſtration of Don John of Auſtria, and upon his death, in 1578, was appointed to ſucceed him. He now carried on his military projects with great ſucceſs, obliged Maeſtricht to ſurrender, recovered moſt of the towns in Brabant and Flanders, and laid ſiege to Antwerp. This laſt town afforded him ample opportunity for the diſplay of all his ſkill; at length he ſhut up the Scheldt by a vaſt bridge or mound, an enterpriſe which occupied him nearly a year, during which he took Bruſſels, Ghent, and other places, and then entered Antwerp in a moſt triumphant manner in 1585. He granted favourable terms to the town, and completed his conqueſt of the Low Countries, which have ever ſince, till the late war, remained under the Spaniſh or Auſtrian ſovereignty. He now extended his views to the Dutch provinces, openly aided by queen Elizabeth of England; and to carry his point he took the command of the army, under the title of duke of Parma, his father being dead, deſtined to the conqueſt of England. The diſaſters of the grand Armada rendered the deſign abortive. After this he made an attempt upon Bergen-op-Zoom, but was again foiled. Inceſſant toils and expoſure to an unhealthy climate had undermined a naturally ſtrong conſtitution, and ſome ſerious ſymptoms of dropſy began to appear in him; but he was too important a character to be allowed the repoſe which the nature of the caſe required. In 1590 he was obliged to march to France in ſuccour of the league which Philip II. was determined to ſupport in its reſiſtance to Henry IV. The duke performed all that was hoped for, and raiſed the ſiege of Paris, in which he diſplayed great military ſkill. Henry was ſo much hurt at the conduct of the duke, that he ſent him a challenge, to which he replied, "that he was accuſtomed to fight at his own pleaſure, and not at that of his adverſary, and that he ſhould not ſhun an engagement when he found ſuch a meaſure expedient." Two years afterwards he was again oppoſed to Henry, and again victorious. This was at Rouen, which was beſieged by the king of France, but being relieved by the duke, he immediately advanced to the ſiege of Caudebec, where he was wounded in the arm. The king now preſſed cloſely upon the duke, and reduced him to great ſtraits for want of proviſion. Henry anticipated the ſurrender of the whole army, when the duke, by unexpectedly croſſing the Seine in his rear, eſcaped the difficulty, and led back his troops ſafely to Flanders. This retreat excited the admiration of all military men, and ſealed the reputation of its conductor. The duke was at this period in extreme ill health, and demanded a ſucceſſor, but the king his maſter with much inhumanity refuſed to liſten to his requeſt, and ſent him new orders; but death, a ſtill greater tyrant than Philip, ſtopped his career in December 1592. A ſtatue of bronze was erected to his memory at Rome. Moreri.

FARNHAM, in *Geography*, a town in the hundred of Farnham and county of Surrey, England, is ſituated partly on a hill which riſes from the river Wye. A caſtle was built here by Henry, biſhop of Wincheſter, brother to king Stephen; and ſince that period has continued to belong to the biſhop of that ſee. At different times the building has been injured by ſieges. During the civil wars, in the time of king Charles I. it was nearly demoliſhed; being garriſoned for the monarch, it was inveſted by the parliamentary forces, who, after a long conflict, obtained poſſeſſion, and blew up and deſtroyed moſt of the walls and towers. Soon after the reſtoration, biſhop Morley repaired the greater part of the fortreſs, and fixed his reſidence within its walls; and ſince that period it has been rendered a handſome, commodious reſidence. The keep is called Jay's tower, the aſcent to which is by 63 ſtone ſteps. The area at the ſummit is now occupied as a kitchen-garden.

The town of Farnham is paved and lighted, and having ſeveral good houſes, has a reſpectable appearance. It contains 437 houſes, which are occupied by 2508 inhabitants. The civil government of the place is veſted in 12 burgeſſes, who act under the biſhop. In the reign of Edward II. it ſent members to parliament. In the vicinity of the town is More-park, which formerly belonged to ſir William Temple. Here is a curious cave, called Mother Ludlam's Hole, through which paſſes a continual ſtream of fine water. This grotto is formed and decorated by rocks, marble, troughs, &c. Near this park was Waverley abbey, ſome few fragments of which only now remain. Farnham is noted for its large market for oats, between Michaelmas and Chriſtmas; for wheat about Midſummer; and for hops. Many plantations of the latter are in the vicinity of the town; indeed, the Farnham hops have long been celebrated in the annals of commerce. Here are three fairs annually.

FARNHAM, a poſt town of America, in Richmond county, Virginia; 159 miles from Waſhington.

FARNI, a town of Africa, in Bambarra. N. lat. 13° 40′. W. long. 4° 8′.

FARNIA, or FARNIA *Italorum*, a name by which ſome authors have called the bitter oak; the *cerrus ægylops* and *aſpris* of other writers.

FARNOVIANS, in *Eccleſiaſtical Hiſtory*, a ſect of Socinians, ſo called from Staniſlaus Farnovius, or Farneſius, who ſeparated from the other Unitarians in the year 1568, and was followed by ſeveral perſons eminent for their learning and rank. This ſect did not laſt long; for having loſt their chief, who died in 1615, it was ſcattered abroad and reduced to nothing. Farnovius was engaged by Goneſius to prefer the Arian ſyſtem to that of the Socinians, and conſequently aſſerted that Chriſt had been produced out of nothing by the Supreme Being before the creation of this terreſtrial globe. His ſentiments concerning the Holy Ghoſt are not certainly known; however, it appears that he warned his diſciples againſt paying the tribute of religious worſhip to that Divine Spirit.

FARO, in *Geography*, an iſland of Sweden, about 30 miles in circumference, ſeparated from the N.E. part of the iſland of Gothland by a narrow channel. This iſland is populous and fertile. The principal town of the ſame name is ſituated on the S.E. coaſt. N. lat. 57° 50′. E. long. 19° 12′.

FARO, an open, regularly built trading town of Portugal, in the province of Algarva, or Algarvez, the ſee of a biſhop, ſuffragan of Evora. It is ſituated at the extremity of a ſmall bay, in a level and ſandy territory, is defended by a ſmall citadel, and contains two pariſh churches, four convents, and 5000 inhabitants. The harbour is 1½ league below the town. Another arm of the river, or of the ſea, forms an iſland, in which is the ſandy cape of Santa Maria, very near the land. The tract between the town and the ſea is marſhy; on the oppoſite ſide it is flat and ſandy; and at a diſtance appear the ſteep hills of San Miguel. The road to Tavira, 20 miles S.W. of it, is uncommonly pleaſant. Its environs produce good wine and fruits, particularly figs, which are chief articles of exportation. N. lat. 37° 2′. W. long. 7° 52′.

Faro, a town of the iſland of Siphanto. N. lat. 36° 58′. E. long. 24° 49′.

Faro *of Meſſina*, a ſtrait of the Mediterranean, between Sicily and Calabria, about 5 miles wide, remarkable for the tide's ebbing and flowing every ſix hours.

FAROE′, a ſmall iſland of Denmark, near the S. coaſt of Zealand. N. lat. 54° 57′. E. long. 12°.

FAROER Islands. See Feroe *Iſlands*.

FARON, a river of France, which runs into the Meuſe, 2 miles below Viſet.

FARONAGUR, a town of Hindooſtan, in the ſoubah of Delhi; 35 miles W.S.W. of Delhi. N. lat. 28° 30′. E. long. 77° 4′.

FAROUT, or Far-out, *Head*, a cape of Scotland, on the N. coaſt of the county of Sutherland; 30 miles E. of cape Wrath. N. lat. 58° 40′. W. long. 4° 38′.

FARQUHAR, George, in *Biography*, ſon of a clergyman in the north of Ireland, was born at Londonderry about the year 1678. He received his univerſity education at Trinity college, Dublin, where he was not diſtinguiſhed for ſuperior talents, and from which it is ſuppoſed he was expelled for want of moral conduct. He diſcovered an early taſte for poetry and dramatic exhibitions, which led him to try his powers as an actor; but in one of his early attempts he had the misfortune to wound a brother-player, by uſing his ſword in miſtake inſtead of a foil, which put an end to his hope in that profeſſion. In 1696 he came to London, obtained a lieutenant's commiſſion through lord Orrery, and ſuſtained the military character a conſiderable time. He brought out, in 1698, a play, entitled "Love and a Bottle;" this was his firſt effort as a writer for the ſtage, and it obtained for him much popularity. The "Conſtant Couple, or a Trip to the Jubilee," was his next play, which was acted with great applauſe, and which has maintained its reputation to the preſent day. At this period Mr. Farquhar was in Holland, probably in his profeſſion as a ſoldier; but his letters contain humorous deſcriptions of the manners and cuſtoms of that country. In 1702 he publiſhed a volume of miſcellanies, conſiſting of poems, letters, eſſays, &c.; and in the following year the "Inconſtant, or the way to win him," was acted. He now married a lady, whoſe violent attachment induced her to paſs herſelf upon him as one poſſeſſed of a large fortune. When he diſcovered the ſtratagem, he freely forgave her for the motive. He ſtill continued to bring out new pieces; and in 1706 the "Recruiting Officer" was acted. This has proved one of his moſt popular plays, and is now acted with much applauſe in all our country theatres; the humour of ſerjeant Kite, with the incidents of the captain in country quarters, being levelled particularly at thoſe auditors who are uſually found there. His laſt piece was entitled "The Beaux Stratagem," which, though compoſed in ſix weeks, is reckoned the author's maſter-piece. Notwithſtanding his ſucceſs as a writer, he was a neceſſitous man, and was obliged before his death to ſell his commiſſion to ſupply his need. He died in the ſpring of 1707, at the early age of 30, leaving behind him two daughters wholly unprovided for. His comedies, though not equal to thoſe of Congreve, are ſprightly, pleaſant, and natural, intereſting in their plots, and eaſy in their dialogue. They are, however, very licentious; a character which belonged to all the comedies of that period, and which has undoubtedly given a diſtaſte for theatrical amuſement to multitudes who would otherwiſe reſort to the theatre for inſtruction as well as pleaſure. Biog. Brit.

Farquhar's *Iſland*, in *Geography*, an iſland in the Mergui Archipelago, of an oval form, about 8 miles in circumference. N. lat. 11° 4′.

FARR, a ſmall ſea-port of Scotland, in the county of Sutherland, on a bay to which it gives name, in which is a good ſalmon fiſhery; 48 miles N. of Dornock.

Farr *Bay*, a bay on the N. coaſt of Scotland, in the county of Sutherland. N. lat. 58° 34′. W. long. 4° 2′.

FARRA, a town of Japan, on the S. coaſt of the iſland of Niphon; 40 miles S. of Jeddo. N. lat. 36° 4′. E. long. 139° 12′.

Farra, in *Ichthyology*, the name given by authors to a ſpecies of the corregonus, not differing eſſentially from the lavaretus or bezola. This ſpecies has had a great number of different names, and been deſcribed as five or ſix different fiſh. But all the deſcriptions of the ſeveral authors agree to prove it to be that ſpecies only of the corregoni, which Artedi has diſtinguiſhed by the name of the corregonus, with the upper jaw longer and flat, and with fourteen rays in the back fin. This name equally agrees with the ſeveral deſcriptions of the farra or ferro, bezola, lavaretus, &c. and they agree in all the eſſential characters with one another. See Lavaretus and Salmo.

FARRANT, Richard, in *Biography*, one of the gentlemen of Edward VI. and queen Elizabeth's chapel, and ſome time maſter of the children of St. George's chapel at Windſor, died about 1585. Dr. Boyce has publiſhed ſeveral of his productions, which are grave and ſolemn, but ſomewhat dry and unintereſting.

FARREATION, Farreatio, in *Antiquity*, the ſame with confarreation.

FARRENBACH, in *Geography*, a river of Franconia, which runs into the Rednitz, 2 miles below Furth.—Alſo, a town of the principality of Anſpach, 5 miles E. of Langenzen.

FARRIER, a perſon whoſe office is to ſhoe horſes, and cure them when diſeaſed or lame.

An action on the caſe to recover damages lies againſt a common farrier, who lames a horſe in ſhoeing him. See Assumpsit.

Farrier's *Pouch*, in the *Manege*, a leathern bag, in which they carry drivers, nippers, ſhoes for all ſizes of feet, good ſharp nails, and all that is proper for new-ſhoeing a horſe that has loſt his ſhoe upon the road.

FARRINGDON, in *Geography*, a market-town in the hundred of the ſame name, and county of Berks, England, is ſituated about two miles from the river Thames, on the weſt ſide of a hill, thence called Farringdon-hill. The church, which ſtands on an eminence, is an ancient and ſpacious ſtructure, diſplaying different ſpecimens of ſtyles of architecture. It was built in the form of a croſs, but with a double tranſept. The eaſt end is remarkable for its antiquity; the windows being of the ſame form as thoſe of the Temple church in London. Part of the ſpire was deſtroyed in the civil wars; the remainder is very little higher than the body of the church. A caſtle was erected here in the reign of king Stephen, by Robert earl of Glouceſter; but the king ſoon reduced it and levelled it with the ground. The ſite is ſaid to have been granted by king John, in the year 1202, for building an abbey of the Ciſtereian order. The death of king Edward the Elder is recorded in the Saxon annals to have happened in this town. Farringdon is 68 miles diſtant from London; has a good market on Tueſdays, and two annual fairs. The population, as returned to parliament in 1801, was 1691; the number of houſes 309. Lyſons's Magna Britannia, vol. i. 4to.

FARRUCH, Cape, a cape on the E. coaſt of Majorca. N. lat. 39° 47′. E. long. 3° 18′.

FARSA, a town of European Turkey, in Theſſaly, anciently *Pharſalia*, the ſee of a biſhop; 10 miles S. Livadia.—Alſo, a town of Italy, in Sabina; 16 miles N. of Tivoli.

FARSANG. See PARASANG.

FARSCHOUT, a town of Upper Egypt, which is ill-built, and bears every appearance of wretchedneſs. It is ſituated on the weſt ſide of the Nile, at more than two leagues from it, and is about a mile in compaſs. It is the reſidence of a ſcheick, who is not only the governor of this town, but alſo of ſeveral adjacent diſtricts, to a conſiderable extent. The environs are pleaſant, and moſt of the roads that lead to the town are planted with Acacia trees. Between it and the Nile lies a town called "Basjoura," the reſidence of a kiaſchef. The harbour of both theſe places is a ſmall village, named Sahet. Sonnini thinks it probable that Farſchout ſtood upon the ſcite of Acanthus, an ancient city of Egypt, near which there was a ſacred wood. Another city of the ſame name ſtood on the ſpot where Daſchour is now built, a little to the ſouth of Saccara. At Farſchout there is a convent of Franciſcans. It lies 20 miles S. of Girgé, the capital of Upper Egypt.

FARSIDUNGA, a town of Bengal; 40 miles N.W. of Beyhas.

FARSISTAN, FARS, *Perſis*, or *Perſia Proper*, a province of Perſia, ſurrounded with mountains on the N.W. and S., and on the E. ſeparated by a deſert from Kerman. Irak lies northward; Chuſiſtan or Choſiſtan to the weſt; Lariſtan and the Perſian gulf towards the ſouth, and Kerman eaſt. This province contains the beautiful city of Shiraz, or Schiras, the capital; together with Iſtakar, and the ruins of Perſepolis. It is about 420 miles long from N. to S., and 360 from E. to W. Towards the ſouth the air is very hot, and the land ſo ſandy, that it produces little elſe than palm-trees: towards the north it abounds with mountains, on which are found the moſt beautiful falcons in Perſia, wild ſwine, and wild cats. The principal productions of the cultivated parts are rice and fruit. See PERSIA.

FARTACK, or FARTACH, a ſea-port of Arabia Felix, in the province of Hadramaut, belonging to the ſcheick of Keſchim, 132 miles S.E. of Hadramaut. N. lat. 15° 36'. E. long. 51°.

FARTACK, or *Fartaſh*, *Cape*, a cape on the eaſt coaſt of Arabia Felix, oppoſite to Gardefui or Gardefan; the diſtance between them, in a line drawn acroſs from one to another, being not above 50 leagues. The breadth between theſe two lands diminiſhes gradually for about 150 leagues, till at laſt it ends in the ſtraits, whoſe breadth does not ſeem to be above 6 leagues. Bruce's Travels, vol. i. p. 315. N. lat. 15° 30'. E. long. 51° 4'.

FARTHEL, or FARTHELLING, among *Seamen*, was uſed for the ſame with what they commonly call *furl*, or *furling*, which is taking up the ſails, and binding them cloſe to the yards.

FARTHING, a ſmall Engliſh copper coin, amounting to one-fourth of a penny.

It was anciently called fourthing, as being the fourth of the integer or penny.

FARTHING *of Gold*, a coin uſed in ancient times, containing in value the fourth part of a noble, or 20*d.* ſilver, and in weight the ſixth part of an ounce of gold. It is mentioned in the ſtat. 9 Hen. V. cap. 7. where it is enacted, that there ſhall be good and juſt weight of the noble, half-noble, and farthing of gold.

FARTHING *of Land*, in *Rural Economy*, a term anciently employed to ſignify a certain quantity of land, but which, at preſent, is not well aſcertained. It would ſeem, however, to differ from that of farding-deal, as Blount has ſhewn from an entry made in an old ſurvey-book of the manor of Weſt-Hapton in the county of Devon, in which it is ſtated that A. B. holds ſix farthings of land at 126*l. per annum.* Conſequently the farthing of land muſt be of conſiderable extent, a great deal more than a rood, which is the quantity ſuppoſed by the former term.

FARTIN, in *Geography*, a ſmall river of the county of Kerry, Ireland, running into the Atlantic ocean, oppoſite to Valentia iſland.

FARTREY, a river of the county of Wicklow, Ireland, which runs into the Iriſh ſea, at the town of Wicklow.

FARUGANIE', a town of Egypt, on the eaſt branch of the Nile; 18 miles N. of Cairo.

FARUNDEL *of Land*, a term formerly uſed to ſignify the ſame as *farding-dale*.

FASAD, in *Geography*, a town of Perſia, in the province of Segeſtan; 35 miles S. S. W. of Zareng.

FASCE, FASCIO, in *Heraldry*. See FESSE.

FASCES, in *Antiquity*, axes tied together with rods or ſtaves, and borne before the Roman magiſtrates as a badge of their office and authority.

Florus, lib i. cap. 5. aſſures us, that the uſe of faſces was introduced by the elder Tarquin, the fifth king of Rome, and that they were then the mark of the ſovereign dignity. In after-times they were borne before the conſuls, but by turns only, each his day; "ne ſi ambo faſces haberent duplicatus terror videretur." (Livy, lib. ii. cap. 1.) They had each of them twelve, borne by ſo many uſhers, called lictors. (See LICTOR.) Dionyſ. Halicarn. lib. iii. cap. 84.

Others will have Romulus the author of the inſtitution, and aſcribe the number twelve to the number of birds which foretold him his kingdom. Others hold that he borrowed it from the Etrurians, and that the number twelve anſwered to the twelve nations of Etruria, who, in creating him king, gave him each an officer to ſerve him as lictor. Silius Italicus aſcribes their firſt invention to a city of Etruria, called Vetulonia.

Theſe faſces conſiſted of branches of elm, in the middle whereof was a ſecuris or ax, the head whereof ſtood out beyond the reſt. Plutarch relates the reaſon of this diſpoſition. Publicola took the ax out of the faſces, as Plutarch aſſures us, to remove from the people all occaſion of terror. After the conſuls the prætors aſſumed the faſces. Cenſorin, De Die Natal. obſerves, that the prætors had only two, though Polybius and Plutarch give them ſix.

In the government of the decemviri it was the practice at firſt for only one of them to have the faſces; afterwards each of them had twelve, in the ſame manner as the kings.

In funeral proceſſions it was the cuſtom to carry the faſces reverſed, as a token of grief.

FASCETS, in *Glaſs making*, the irons thruſt into the mouths of the bottles when made to remove them into the annealing-tower.

FASCH, CHARLES, in *Biography*, chamber muſician to the late king Frederic II. of Pruſſia, and ſon of the celebrated chapel-maſter. He ſucceeded Emanuel Bach as harpſichord player at his majeſty's concerts. His reputation as a performer was very high 30 years ago, and in his compoſitions for his inſtrument the greateſt fire and delicacy are united.

FASCIA, in *Architecture*, by the workmen called *Facia*, *Facio*, or *Face*, a broad liſt, fillet, or band, particularly uſed in architraves and pedeſtals.

The architrave conſiſts of three faſciæ or bands; thus called by Vitruvius, as reſembling ſwaths, called in Latin *faſciæ*.

That author admits of no faſciæ in the Tuſcan and Doric architrave ; *i. e.* he makes it all plain, without any diviſion or cantoning into parts or faſciæ ; but the modern architects take the liberty to differ from him in this particular.

In brick-buildings, the jutting out of the bricks beyond the windows in the ſeveral ſtories, except the higheſt, are called faſcias or faſciæ.

Theſe are ſometimes plain, and ſometimes moulded ; but the moulding is only a *cima reverſa*, or an ogee, at the bottom, with two plain courſes of brick over it ; then an aſtragal, and laſtly a boultine.

Fascia, in *Anatomy*, is the thin tendinous covering which ſurrounds the muſcles of the limbs, and binds them in their places. The term ſeems to have been ſuggeſted by the analogy of theſe parts to bandages; which they reſemble in embracing and cloſely preſſing the muſcles, &c. which they cover. The word *aponeuroſis* is ſometimes employed. A general account of the ſtructure of theſe organs will be found under the article Fibrous *Syſtem :* we have to deſcribe at preſent the ſituation and connections of the individual faſciæ.

Theſe organs, conſiſting of thin ſheets of a fibrous texture, differ conſiderably in their ſtrength at different parts ; at the outſide of the thigh and fore-arm they are very ſtrong ; much thinner on the inner ſide of the limbs ; and particularly thick and denſe in the ſole of the foot. Where they ſurround the whole of a limb, they generally are connected to one or more tenſor muſcles. which have the power of ſtretching them. Theſe muſcles, being put in action when the reſt of the limb is exerted, render the faſciæ tenſe, and thus bind down firmly the other muſcles. They are relaxed when the limb is at reſt ; and the faſciæ conſequently become looſe. We cannot explain very clearly how the action of muſcles is facilitated, nor how the amount of their exertion is increaſed by the preſſure of the faſciæ ; yet ſome effect of this kind is probably produced. Workmen often bind their limbs when about to exert conſiderable muſcular power, on the ſuppoſition that it favours exertion ; and firm bandaging, as employed in ſurgery, ſerves in many inſtances to ſtrengthen parts very conſiderably. A perſon who had bruiſed the muſcles of the loins found great benefit in a firm bandage round the body ; which diminiſhed his pain, and enabled him to move his trunk with eaſe, which before he could accompliſh only with the greateſt difficulty. Couriers in the Eaſt, who go on foot for great diſtances, find themſelves benefited by bandaging the trunk.

The habitual compreſſion of the faſciæ favours the circulation of fluids in the limbs. Hence the varices, which are common in the ſuperficial veins, placed externally to the faſcia, are never met with in the deeper-ſeated veſſels : and the moſt effectual method of curing theſe affections is by the artificial compreſſion of bandages. For the ſame reaſon, anaſarcous depoſits in the cellular membrane always appear much later and to much ſmaller extent within the faſciæ than in the ſub-cutaneous cellular texture.

Faſciæ are connected, on their internal ſurfaces, generally by means of looſe cellular texture, to the muſcles: ſometimes, however, the fleſhy fibres derive their origin from the faſcia, which cannot, in ſuch caſes, be diſſected away without cutting the ſubſtance of the muſcle. Sometimes ſepta extend from their inner ſurface between the muſcles down to the bone. Theſe add to the ſtrength of attachment, and offer a ſurface for muſcular origin. Externally, faſciæ are connected to the integuments by a yielding cellular ſtructure ; and the ſuperficial nerves and veins are generally interpoſed between theſe parts.

The faſcia of the arm—is one of the thinneſt and moſt delicate of theſe organs, and approaching in its texture almoſt to a condenſed cellular ſubſtance. It ſeems to ariſe among that ſubſtance in the axilla, and is manifeſtly continuous, at the front and back of the armpit, with expanſions proceeding from the latiſſimus dorſi and pectoralis major. On the anterior and external aſpects of the deltoid it does not ſeem to exiſt, commencing apparently below this muſcle. Behind, it is continuous with the aponeuroſis covering the infra-ſpinatus. Deſcending along the arm, it envelopes the brachial muſcles, and adheres to the ſeptum at the outer edge of the brachialis internus. It is continuous in a great meaſure with the faſcia of the fore-arm, and has attachments to the two condyles of the humerus.

Every where ſub-cutaneous, this faſcia is covered merely by the ſuperficial veins, lymphatics, and nerves of the arm. It encloſes all the brachial muſcles, as well as the arteries, veins, and nerves, which form a large faſciculus deſcending on the inner ſurface of the limb. Its texture, ſimply cellular in many points, offers manifeſt tendinous fibres in others ; and it exhibits very clearly the continuity of the aponeurotic and cellular ſtructures. The pectoralis major and latiſſimus dorſi are to be regarded as its tenſor muſcles ; but they cannot act on it with very great efficacy, as their fibres paſs very obliquely with reſpect to the faſcia.

Faſcia of the fore-arm.—This covers the muſcles of the fore-arm. Its origins above are, from the faſcia of the arm, with which it is continuous, from the production furniſhed by the tendon of the biceps, and from the condyles of the humerus. It deſcends over the whole ſurface of the fore-arm, terminates behind at the annular ligament, which binds down the extenſor tendons at the back of the wriſt, and in front at the annular ligament of the hand. Separated from the ſkin by the ſuperficial veins, nerves, and lymphatics, this faſcia covers all the ſuperficial muſcles of the fore-arm, connected to theſe generally by cellular tiſſue. Near the cubital end of the limb it adheres cloſely to the muſcles ; and ſends aponeurotic ſepta between them ; *viz.* in front between the pronator teres, palmaris longus, flexor ſublimis, and flexor carpi ulnaris ; behind between the extenſor carpi radialis brevior, extenſor communis digitorum, extenſor digiti minimi, extenſor carpi ulnaris and anconeus. On the radial ſide of the limb it has no attachment : it is fixed to the olecranon, and to nearly the whole inner edge of the ulna, where it affords origin to the flexor carpi ulnaris.

The anti-brachial faſcia differs from that of the arm by its much greater denſity and ſtrength. Its component fibres decuſſate each other in various directions, without following any fixed courſe. The biceps flexor cubiti is the tenſor of this faſcia, by means of the production ariſing from its ulnar ſide, covering the brachial veſſels at the bend of the arm, and expanding into the faſcia at the upper and inner part of the limb.

The annular ligament of the fore-arm may be regarded as a part of the faſcia, terminating it towards the back of the hand. Several fibrous ſheaths belonging to the extenſor tendons (ſee Extensor) are placed under this ligament ; *viz.* thoſe of the three extenſors of the thumb, the extenſores carpi radiales, extenſor digitorum communis, indicator, extenſor proprius auricularis, and extenſor carpi ulnaris. The ſheaths belonging to theſe muſcles are independent of each other ; each poſſeſſing peculiar ſemi-circular fibres of its own. They are all covered by the annular ligament, which conſiſts of longitudinal parallel fibres, very white and diſtinct, and ſeparated by vaſcular intervals. Implanted in the external and inferior part of the radius, it croſſes the back of the wriſt obliquely, covering and intimately adhering to the above-mentioned fibrous ſheaths, and is attached ſlightly to the extremity of the ulna, but chiefly to the os piſiforme.

Palmar faſcia, *aponeuroſis palmaris*—is a very ſtrong aponeurotic layer, compoſed of firm and cloſe fibres, poſſeſſing a triangular form, and covering particularly the middle of the hand. Towards the wriſt it ariſes from the annular ligament of the hand (which is deſcribed in the article EXTREMITIES), and from the tendon of the palmaris longus. It is continued to the digital extremities of the metacarpal bones, growing broader, having its fibres ſeparated from each other, and divided at laſt into four diſtinct portions. There are, however, very obvious tranſverſe fibres connecting together the longitudinal ones after they have ſeparated. Each portion of the faſcia ſplits into two diviſions, embracing the flexor tendons, and there inſerted into the ligaments belonging to the digital ends of the metacarpal bones.

From the edges of the palmar faſcia a thin continuation is ſometimes obſerved to extend over the muſcles of the thumb and little finger.

The palmar faſcia is cloſely connected to the ſkin, ſome of its fibres being apparently connected to the inner ſurface of that organ. It covers the flexor tendons of the fingers, the lumbricales muſcles, the trunk and ramifications of the ulnar artery, and the digital branches of the ulnar and median nerves, confines theſe organs in their relative ſituations, and gives to the palm a firmneſs well ſuited to its office of ſeizing and holding external objects.

The two following are its tenſor muſcles.

Palmaris longus, ulnaris gracilis, petit palmaire,—are the different names given to a long and very ſlender muſcle, placed in the fore-arm near the ulnar edge of the flexor carpi radialis. It ariſes from the common tendon connected to the internal condyle, and from the aponeurotic ſepta, which ſeparate it from the neighbouring muſcles. A ſmall rounded faſciculus of fibres very ſoon forms a thin and flat tendon, which takes a ſtraight direction to the annular ligament of the hand, where it becomes broader. It is inſerted by a few fibres into that ligament, but is chiefly expanded into the palmar faſcia. This muſcle ſometimes does not exiſt. It is placed between the faſcia of the fore-arm and the flexor digitorum ſublimis. It will exert a moſt marked effect in rendering the faſcia tenſe; and it has an equally decided influence in bending the wriſt.

The *palmaris brevis*, or *cutaneus*,—is a ſmall thin and flattened plate of fibres, generally diſpoſed in ſeparate faſciculi, ſituated under the integuments on the ulnar ſide of the palm of the hand. It ariſes from the edge of the palmar faſcia, takes a tranſverſe courſe, and is attached to the integuments of the inner ſide of the palm. Covered every where by the integuments, it lies upon the adductor and flexor brevis minimi digiti, on the ulnar artery and nerve. It renders the faſcia tenſe, and draws the integuments inwards.

Faſcia of the thigh, faſcia lata, vagina femoris, aponevroſe crurale.—This, which is the largeſt and ſtrongeſt faſcia in the body, covers all the muſcles of the thigh. It is ſtrongly connected to the crural arch, in the groin, and it extends over the bones of the pelvis into the abdomen. It is alſo concerned in covering the femoral veſſels where they appear at the front of the thigh, under the crural arch.

The iliacus internus is covered by a thin faſcia, to which the broad tendon of the pſoas parvus is connected when that muſcle is preſent. This faſcia is attached above to the internal edge of the criſta ilii; on the inner ſide to the brim of the pelvis; externally, to the poſterior ſurface of the crural arch, where it conſiſts of two layers, with the circumflex veſſels of the ilium paſſing between them; and in front it is continued over the os innominatum into the thigh. This has recently been deſcribed by the name of *faſcia iliaca*. Its poſterior ſurface covers the iliacus internus, a part of the pſoas magnus, and of the anterior crural nerve. Its anterior ſurface is covered by the ſmall ſuperficial branches of the lumbar nerves, which paſs through perforations in the faſcia, near the crural arch; by the external iliac artery and vein; and by the peritoneum; all which parts are connected to it by the intervention of a looſe cellular texture. The attachment of this faſcia to the crural arch is continued only ſo far as where the iliac veſſels paſs out; at that point it deſcends to the thigh, forms the poſterior part of the ſheath including the femoral veſſels, and is continuous with the faſcia lata. The ſecond origin of the faſcia of the thigh is from the anterior ſurface of the crural arch, from the anterior ſuperior ſpine of the ilium to the point at which the arch begins to be attached to the pubes. In the whole of this ſpace the faſcia lata and aponeuroſis of the obliquus, externus abdominis, are continuous, and are maintained by their continuity in a ſtate of reciprocal tenſion. Hence, when the thigh is extended on the pelvis, all theſe parts are very tenſe; and they all become looſe on bending the limb. Hence, too, in the extended ſtate, the crural arch is drawn down towards the thigh, ſo as to repreſent a convex line. The third origin of the faſcia is from the front edge of the pubes, juſt over the attachment of the pectineus, and under the point at which the crural arch is inſerted into that bone. This portion is continuous with the iliac diviſion of the faſcia. The rami of the pubes and iſchium, and the outer edge of the criſta ilii, are other points of origin. Behind, its commencement cannot be very clearly developed; it appears to ariſe inſenſibly among the cellular ſubſtance over the gluteus maximus, and is firſt diſtinctly viſible about the tendon of that muſcle.

From the various attachments now enumerated the faſcia deſcends over the thigh, embracing all the muſcles, ſending various productions between them, and terminates at the knee; 1ſt, by mingling in front with the common tendon of the extenſors of the knee, and with its lateral productions; 2dly, behind, by extending over the hollow of the knee, and being continued into the aponeuroſis of the leg; and, 3dly, at the ſides, partly by mixing with the laſt-mentioned aponeuroſis, and partly by inſertions into the internal and external tuberoſities of the tibia.

The faſcia is covered in general ſimply by the integuments, with the addition of the ſuperficial veins, nerves, and lymphatics. The abſorbing glands, through which the latter paſs, are found in the groin externally to the faſcia. And at this point the faſcia lata of the thigh, as well as the lower part of the aponeuroſis of the obliquus externus abdominis, is covered by a thin ſheet of condenſed membrane, conſiſting of ſeveral layers intermixed with the abſorbing glands, and ſeldom ſhewing a very diſtinct fibrous texture. This has been deſcribed by the name of the *ſuperficial faſcia*; and, together with the lymphatic glands, it lies exterior to the faſcia lata.

The internal ſurface of the faſcia is in contact with the various ſuperficial muſcles of the thigh. On the front it covers the rectus and vaſti, and includes the ſartorius in a peculiar ſheath. Behind it is placed over the ſemi-tendinoſus, ſemi-membranoſus, and biceps; ſending between the ſhort head of the latter muſcle and the vaſtus externus a ſtrong ſeptum, implanted in the external lamina of the linea aſpera, and affording origin to the two muſcles. It is interpoſed, for a ſhort ſpace, between the gluteus maximus and medius; and afterwards the front edge of the latter has a moſt extenſive and powerful connection to it. (See Gluteus.) In front of the edge of the latter muſcle it covers very cloſely the gluteus medius, which ariſes here from the inner ſurface of the faſcia. It then encloſes its own tenſor muſcle in a peculiar ſheath, which unites it cloſely to the gluteus medius and minimus. On the inſide of the thigh it covers the muſcles, without diſpatching any productions between them.

It is extremely denſe and thick on the outſide of the thigh; much leſs ſo before and behind; and thinneſt on the inſide; when in the neighbourhood of the perineum, it can hardly be recognized as poſſeſſing a fibrous texture. Fibres decuſſating each other in every variety of direction, compoſe its ſubſtance. Veſſels and nerves perforate it in various ſituations; *viz.* the ſaphena minor vein in the ham, and ſeveral ſuperficial nervous twigs on the front and upper part of the thigh. The moſt conſpicuous opening, however, is near the inner end of the crural arch, where the great ſaphena paſſes to the femoral vein. Here we find a large oval depreſſion, bounded upwards and outwards by a creſcent-ſhaped production of the faſcia, called the *ſemi-lunar edge* of the faſcia lata, or the *falciform proceſs.* In deſcribing the origin of the faſcia lata, we have mentioned its continuity with the crural arch. Tracing this from the ilium downwards, we come to a part, near the front of the arch, where the faſcia is folded inwards, and connected with the thin poſterior border of the tendon of the obliquus externus. This portion covers the paſſage of the femoral vein, and forms the anterior boundary of that diviſion of the faſcia which ariſes from the crural arch. It terminates here by a thin, ſharp, and lunated edge, of which the upper corner is connected to the crural arch, the concavity is turned towards the oppoſite limb, and the inferior corner turns again upwards and inwards, ſo as to form another very ſharp edge, bounding the oval ſpace below. The ſaphena interna, or major, paſſes over this inferior ſharp edge to join the femoral vein. The parts now deſcribed bound the oval opening above, on the outſide, and below. The internal boundary is wanting, and the depreſſion is here continuous with that part of the faſcia lata which covers the pectineus muſcle By preſſing the handle of a knife cloſe on this portion of the faſcia, we elevate the femoral veſſels, ſo as to ſhew that they are not here covered by faſcia lata; and we prove that the faſcia paſſes behind them, and becomes continuous on the oppoſite ſide with the ſemi-lunar edge.

The tenſor muſcles of this faſcia are the gluteus maximus, (ſee Gluteus,) and the tenſor vaginæ femoris. The latter, called alſo muſculus faſciæ latæ, and tenſeur aponevrotique crural, is placed at the upper and outer border of the thigh. Elongated and flattened in its form, it increaſes gradually in breadth from above downwards. Its origin is from the anterior and ſuperior ſpine of the ilium, where it lies between the ſartorius and gluteus medius; it deſcends, paſſing obliquely outwards, and growing broader by the divergence of its fibres, and terminates by a broad inſertion into the external part of the faſcia lata. It is in contact, at both ſurfaces, with layers of the faſcia, which include it, and unite into one lamina at its inſertion. The thin portion of faſcia, which covers it externally, ſeparates it from the integuments; and the poſterior layer from the rectus and vaſtus externus. On its outer edge, it is in contact with the gluteus medius and minimus.

Beſides the tenſion of the faſcia lata, which is the firſt effect of this muſcle, and by which it may be ſuppoſed to aid the action of the ſubjacent muſcular organs, it rotates the thigh inwards; and it will aſſiſt alſo in bending the limb on the pelvis. Suppoſing the thigh to be fixed, the tenſor vaginæ may incline the pelvis laterally; and, in the attitude on one foot, it may rotate the pelvis outwards.

The *faſcia of the leg, faſcia aponeurotica cruris, aponevroſe jambiere*—analogous in ſtructure, but inferior in ſtrength to that of the thigh, envelopes the muſcles placed on the correſponding part of the lower extremity. Behind, it is continuous with the faſcia lata: as alſo on the outſide, where it ariſes further from the extremity of the fibula, and from the tendon of the biceps flexor cruris; on the inſide its origins are from the expanded tendons of the ſartorius, ſemi-tendinoſus, and gracilis. The crural aponeuroſis deſcends from theſe points over the poſterior, external, and anterior aſpects of the leg; but not over the internal, conſiſting of the broad ſurface of the tibia, which is immediately ſubcutaneous, and has the faſcia attached to its two edges. Below, this faſcia is continued into the ſuperior annular ligament; on the outſide it is continuous with the fibrous ſheaths encloſing the tendons of the peronei; within, with the internal annular ligament; and behind, it is inſenſibly loſt towards the heel, being apparently confounded with the cellular ſubſtance.

This faſcia lies immediately on the muſcles, being covered externally by the integuments, ſuperficial veins, &c. It is thick and very tenſe on the front and outſide of the leg, binding the muſcles together very cloſely. In theſe aſpects its internal ſurface gives origin above to the fleſhy fibres of the tibialis anticus, extenſor longus digitorum pedis, and peroneus longus; while below it is connected to the muſcles by cellular ſubſtance. Two ſepta are continued from it; between the extenſor communis and peroneus longus; and between the latter muſcle and the ſoleus. Both theſe partitions are attached to the fibula. It is much thinner, and more looſe on the calf of the leg; and is attached to the muſcles by a looſe cellular texture. At the lower part of the back of the limb it divides into two layers; a ſuperficial and thinner one covering the tendo Achillis; a thick and deep-ſeated diviſion paſſing in front of the tendon, embracing very cloſely the muſcles which lie on the back of the bones, and ſeparating them from the muſcles of the calf. The latter is fixed to the edges of the tibia and fibula below, and is inſenſibly loſt in the cellular ſubſtance above.

The biceps flexor cruris, on the outſide; and the ſartorius, gracilis, and ſemi-tendinoſus on the inſide, are the tenſors of this faſcia.

Superior annular ligament of the foot.—This is a ſtrong tendinous plane, covering and confining the tendons on the back of the foot, and continuous wth the crural faſcia. Ariſing from the ſuperior depreſſion of the os calcis, where its fibres are ſurrounded by much fat, it paſſes inwards, dividing into two layers, which form a ſheath including the tendons of the peroneus tertius, and extenſor longus digitorum; then continues over the tendons of the extenſor longus hallicis, and tibialis anticus; and is fixed in front of the internal malleolus. A production of it is continued over the laſt mentioned tendons to the os ſcaphoides and plantar faſcia. This ligament differs from that of the hand, as the ſheaths of the tendons are formed in it by the ſeparation of its fibres. Continuous above with the crural faſcia, it ends below in the dorſal aponeuroſis: it is covered by the integuments, and lies upon the tendons, and the extenſor brevis digitorum.

The internal annular ligament—is a thick and broad fibrous plane, ariſing from the lower and front part of the malleolus internus, and inſerted into the inner and lower edge of the os calcis. It forms the internal concavity of the latter bone into a channel, containing the fibrous ſheaths of the tibialis poſticus, and flexors of the toes ; the poſterior tibial nerves and veſſels, and a conſiderable quantity of fat. The crural faſcia is continued into it above ; it gives origin below to the abductor hallicis ; and it is covered externally by integuments.

Dorſal faſcia of the foot.—This is a thin, and ſometimes hardly diſtinguiſhable fibrous plate, ariſing from the front edge of the ſuperior annular ligament ; deſcending over the extenſor brevis digitornm ; ſlightly attached to the ſides of the metatarſus ; and loſt towards the toes in cellular ſubſtance.

Plantar faſcia ; faſcia aponeurotica plantaris ; aponevroſe plantaire.—This is a very thick, denſe, and firm fibrous organ, covering the middle and ſides of the ſole of the foot. Its origin is from the poſterior and inferior part of the os calcis ; paſſing forwards, it ſoon divides into three portions ſeparated by two deep grooves. The lateral diviſions cloſely cover the abductor hallicis, and the abductor minimi digiti ; and grow thinner towards the front, where they are connected to the edges of the foot. The external is ſtrongly attached to the laſt metacarpal bone. Their oppoſite edges are connected by croſs portions to the middle diviſion. The latter, which is the principal portion, paſſes forwards, growing broader and broader, and divides at the front of the metacarpus into five pieces. Each of theſe ſubdivides into two others, which have lateral attachments to the metatarſal bones, and leave an interval occupied by the flexor tendons, lumbricales muſcles, and the digital veſſels and nerves.

The plantar faſcia is extremely thick and cloſe in its texture behind ; but its fibres are more ſcattered in front. Many filaments proceed from its inferior ſurface to the ſkin, intercepting portions of fat. Its upper ſurface is in contact with the three ſuperficial muſcles of the foot, and affords a point of origin to their fibres. It diſpatches between theſe two ſepta correſponding in ſituation to the two grooves already mentioned. It has no tenſor muſcle.

The *faſcia tranſverſalis*—is a thin production extended from the crural arch between the tranſverſus abdominis and peritoneum ; ſee Obliquus *externus abdominis*.

Bichat ; Anatomie deſcriptive, vol. 2. Murray, De faſcia lata, Upſal ; 1777. Barth, Muſkellehre ; with plates. Cooper's plates of herniæ, part 2, with the deſcriptions. Burn's obſervations on the ſtructure of the parts concerned in crural hernia ; in the 2d volume of the Edinburgh Medical and Surgical Journal ; p. 265.

Fascia, in *Surgery*, a bandage, fillet, roller, or ligature. See Bandage.

Fasciæ, or *Faſciolæ*, in *Roman Antiquity*, were pieces of cloth, uſed by the Romans, who wore neither ſtockings nor breeches, for wrapping their legs and thighs ; and they were denominated from the parts which they covered, *viz.* *tibialia* and *femoralia*.

Fasciæ, in *Aſtronomy*, two rows of bright ſpots obſerved on Jupiter's body, appearing like ſwathes or belts.

The faſciæ, or belts of Jupiter, are more lucid than the reſt of the diſk, and are terminated by parallel lines. They are ſometimes broader, and ſometimes narrower ; nor do they always poſſeſs the ſame part of the diſk.

M. Huygens likewiſe obſerved a very large kind of faſcia in Mars ; but it was darker than the reſt of the diſk, and took up the middle thereof. See Belts.

FASCIALIS, in *Anatomy*, a muſcle of the leg, called alſo ſartorius.

FASCICULATE, in *Botany*, applies to leaves when gathered together into a tuft, as in the larch and cedar ; and occaſionally to ſuch ſmall leaves as form axillary cluſters in ſeveral plants, witneſs the pink or Sandwort tribe, ſome ſpecies of *Selago*, and many others. A faſciculate or cluſtered ſtem is a preternatural luxuriance, or diſeaſe, of that part, in which numerous branches or ſtems appear to cohere longitudinally into one, aſſuming a broad, flat figure, crowded with leaves, flowers, or both, at the extremity, and bearing occaſionally a few ſcattered leaves here and there at the ſides. We have ſeen it in the Aſh, Holly, *Daphne*, *Antirrhinum*, *Ranunculus*, &c. In compound flowers, as the *Anthemis* or *Matricaria*, the receptacles are ſometimes united into one linear ſeries. In the Top-knot Pea, *Piſum comoſum*, Rivin. Pentap. Irr. t. 38, the faſciculate ſtem is a permanent variety, propagated by ſeed. The legume of this pea has no cartilaginous lining, and is therefore eatable entire.—Faſciculate flowers are ſuch as grow in a peculiar form of infloreſcence, termed a *faſciculus*. See that article. S.

FASCICULUS, a faſcicle, is one form of infloreſcence, compoſed of ſeveral flowers, ſupported on little ſtalks variouſly inſerted and ſub-divided, collected into a cloſe bundle, level at the top ; as in the Sweet William, *Dianthus barbatus*.

Fasciculus, in the *Materia Medica*, a term ſometimes uſed to expreſs a certain quantity or meaſure of herbs.

By faſciculus is meant ſo much as may be held in the arm when bent, and reſted on the top of the hip. Phyſicians note it in preſcription by *faſc.*

FASCINATION denotes a ſort of witchcraft, ſuppoſed to operate by the influence either of the eye or the tongue.

The word is formed from the Greek, βασκαινειν, which ſignifies the ſame.

Ancient writers diſtinguiſh two ſorts of faſcination, one performed by looking, or the efficacy of the eye. Such is that ſpoken of by Virgil in his third eclogue :

> " Neſcio quis teneros oculus mihi faſcinat agnos."

The ſecond by words, and eſpecially malignant praiſes. Such is that mentioned by the ſame poet in the ſeventh eclogue :

> " Aut, ſi ultra placitum laudârit, baccare frontem
> Cingite, ne vati noceat mala lingua futuro."

Horace touches on both kinds in his firſt book of epiſtles :

> " Non iſtic obliquo oculo mea commoda quiſquam
> Limat, non odio obſcuro, morſuque venenat."

Among the Romans there was a deity called Faſcinus, who prevented faſcination or enchantment.

FASCINE, a bundle of boughs, twigs, &c. firmly bound together, and made of certain dimenſions, according to the uſe for which it may be intended. Faſcines are much uſed in field-fortification, for the purpoſe of retaining looſe ſoil within certain ſpaces, ſuch as the merlons of batteries, the defences of trenches, the raiſing of epaulements, &c. Simple as the formation of a faſcine may appear, for it is nothing more than a faggot, much attention to method is requiſite towards their being rendered equal in ſize, and compact in every part. When ſuch a convenience can be had, it is proper to make them on treſtles, or any kind of ſupport placed at about two feet aſunder from centre to centre : forked ſticks driven into the ground anſwer admirably, as they receive the ſeveral ſticks, but allow ample ſpace for the bands, which ſhould be of hazle, birch, or other pliant tough wood, that will bear to be well twiſted. In the firſt inſtance a ſtrong piece of very ſmooth cord, technically termed a "choke-rope," ſhould be paſſed round ſo as to draw the bundle as tight as poſſible, and to bring the whole within a certain girth marked on the rope by means of any diſtinct token; if deficient, the faſcine muſt be filled up to that meaſurement. That being effected, the bands are ſeverally paſſed round at leaſt twice, and firmly ſecured by twiſting their ends together, and by paſſing them between ſome of the twigs: theſe bands ſhould never be more than a foot apart.

Five men ſhould be employed at each faſcine; three to make up on the treſtle, and two to collect and prepare the twigs, bands, &c. attention being paid to placing all ſhort pieces in the middle of the diameter. Birch and fir are conſidered the beſt wood for this work. It is alſo found expedient to double ſome very long pieces at the ends of a faſcine, ſo as to form a loop, through which a ſtake may be driven for the purpoſe of ſecuring the ends more firmly than they can poſſibly be when left ragged. Faſcines are made of various dimenſions, according to the works for which they are intended; generally, they are about 18 feet in length, and 10 or 12 inches in diameter; ſuch being ſuited to the revetement, or facing of embraſures. When intended for the exterior, or the lining of the merlons, they are uſually made 8 feet long for the former, and 12 for the latter purpoſe: the diameter the ſame as thoſe for the revetements of embraſures.

French faſcines, from 4 to 6 feet long, and from 4 to 9 inches diameter, are uſed in ſieges, chiefly for the purpoſe of binding works of ſmall bulk, and for upholding looſe ſoil in parts where no great ſtrength is requiſite.

Water faſcines are uſually made about 6 feet long, and from 1 to 2 feet thick: they are uſed to cover marſhy ſpots, ſo as to give a firm footing; but where the water is more than a few inches deep, they ſhould be well laden with ſtones, &c. to cauſe their ſettling to the bottom. Great care muſt be taken to arrange them properly, ſo that the wheels of carriages may not be obſtructed: with this view they are generally laid acroſs the road, having their ſurfaces well filled up with ſap-faggots, which are rarely more than 3 feet in length, or more than 8 inches in thickneſs.

Covering faſcines are uſed to form the tops of magazines, or of ſaps. Theſe ſhould be made remarkably ſtrong, of the thickeſt branches, and generally bound upon ſubſtantial poles, that they may bear a great weight; it being common to load them to the depth of many feet, with ſoil, ſo as to defend the interior from ricochet ſhots, grenades, &c. The dimenſions of faſcines for this purpoſe muſt depend on circumſtances; where timber can be obtained, it, of courſe, is preferred, otherwiſe every endeavour muſt be uſed to render this ſubſtitute as firm as circumſtances may admit.

The general computation is, that five men will make two faſcines 18 feet long, and a foot thick, within an hour, provided materials are at hand: if to be brought from a diſtance, more men muſt be employed. The treſtles, or, which are better, the forked ſticks, ſhould ſtand at ſuch a height as may enable the binders to put on the bands with little or no ſtooping. Experience proves that except for the lining of embraſures, for which faſcines 18 feet long are preferable, thoſe of from 8 to 12 feet are the moſt convenient; ſuch may be eaſily carried, and rarely require any cutting. It is proper, however, to have ſeveral 18 feet long made, for the purpoſe of binding the corners of a merlon, &c. and to remark, that care ſhould be taken not to let two joints ſtand one above the other.

The following will be found requiſite for the conſtruction of a faſcine battery of two guns, or howitzers.

90 Faſcines each 9 feet long.
20 Ditto 18 ditto.

This number will face the outſide, as well as the inſide, of the epaulement; which, if the earth be ſtiff, will not always prove neceſſary, at leaſt not higher than the ſoles of the embraſures on the outſide. In the latter caſe, five faſcines, of nine feet each, will be ſpared for other uſes.

A mortar-battery will not require any long faſcines, (*i. e.* of 18 feet,) for lining the embraſures; but if a battery be ſo expoſed as to require a ſhoulder (epaulement) to cover it in flank, about fifty faſcines, of nine feet, will be neceſſary for that purpoſe. The ſimpleſt method of aſcertaining the number of faſcines for a mortar battery, or for any other plain breaſt-work, is to divide the length of work to be faſcined, by the length of each faſcine in feet; multiply by the number of layers, and the reſult will ſhew the number of faſcines required.

Every faſcine will require a picket for every yard of its length, and one for its extremity; thus, one of 18 feet will require ſeven pickets; nine feet, four ditto.

Obſerving, that where any fractional part exceeds a foot, an additional picket muſt be given. By adding to the above computation 30 faſcines of nine feet, and 10 of 18 feet, the number of faſcines, and conſequently of pickets, for every additional gun may be aſcertained. But as, owing to the damages uſually ſuſtained from the fire of the enemy, repairs will often be neceſſary, it is proper to have a certain number of ſpare faſcines, at ſome ſecure depot, for that purpoſe; and as parts of the wadding, &c. are apt to be impelled towards the faſcine-revetements of the embraſures, water ſhould always be at hand for their extinction. Nothing is more common than for the beſieged to make a ſortie, with the intention of burning the breaching and mortar batteries.

FASCINERY, in *Engineery*, ſignifies wattled wood or hedge-work for groins, &c. to retain the pebbles or beach, and break the waves on the ſea ſhore. Smeaton's Reports, i. 271.

FASCIOLA, in *Zoology*, a genus of inteſtinal worms, with which man, and various animals, are afflicted. The body is flattiſh, with an aperture at the anterior extremity, and another in the middle of the abdomen, or at a diſtance beneath. Some are of conſiderable magnitude, being from an inch to two inches or more in length, while others are ſcarcely perceptible, and they differ alſo in their habits of life, being either ſolitary or gregarious. They occur moſt frequently in the mucus of the ſtomach, or the inteſtines, and liver; or ſometimes in the fleſh immediately under the ſkin, examples of which have been obſerved in many kinds of fiſhes, and in ſome quadrupeds. When they occupy the biliary canal in animals, they tumefy all the parts, and become the ſource of many maladies, an effect too generally experienced in that uſeful creature the common ſheep, and alſo in cattle. The particular kind with which the ſheep is infeſted (F. hepatica) is known among agriculturiſts by the familiar name of Fluke, or Gourd-worm, and is ſufficiently underſtood to be the occaſion of the dropſy; and alſo of that diſorder uſually called the rot, in which caſe the wool falls off the infected carcaſe, and the animal periſhes miſerably. Sometimes theſe pernicious internal depredators are found in brooks, and other watery places, where it is concluded they have been vomited up by the afflicted ſheep, and dropped into the water.

The labours of Goeze, Müller, Bloch, and other naturaliſts have tended, in a remote degree, to elucidate the hiſtory of thoſe particular ſpecies which infeſt the more uſeful kinds of domeſtic animals in Europe. Much, however, we are perſuaded, ſtill remains to be obſerved, even in this partial branch of the enquiry; there are probably many other ſpecies which infeſt thoſe animals already examined, but which, from their ambiguity of character, or extreme minuteneſs, have hitherto eluded the vigilance of the obſerver. Again, thoſe which infeſt the inferior tribes of European animals have ſcarcely claimed the leaſt attention, and ſuch as are peculiar to animals in hotter climates than thoſe of Europe appear, with one or two exceptions, to be utterly unknown. The latter we conceive to be numerous indeed, and this idea is rendered probable, when we conſider how exceedingly conducive the heat, even of our own climate, is known to be to the increaſe both in ſize and numbers of thoſe deſtructive inmates.

Theſe vermes are declared hermaphrodite, and the ſuppoſition is plauſible, becauſe it has been aſcertained, from accurate inſpection, that among the immenſe numbers of the gregarious kinds which occaſionally occur together every individual is furniſhed with ovaries; but it muſt alſo be admitted that we are not ſo fully converſant with the myſtery of their generation and manner of life as to ſpeak with certainty even from this circumſtance, although it hence appears an admiſſible opinion The faſciolæ adhere by means of the abdominal as well as the anterior pore, the latter of which is however the true mouth through which they derive ſuſtenance, and from whence the inteſtinal cavity may be traced to the inteſtines, and thence to the vent or abdominal pore. The inteſtines are flexuous, and the ovaries placed laterally.

Species.

* *Infeſting Man.*

HUMANA. Doever. verm. Cleric. Lumbr.

* * *Infeſting Mammalia.*

VULPIS. Orbicular; head thick, rounded, and ſeparated from the trunk by a circular arch; poſterior part flexuous at the ſides; tail with two cylindrical membranaceous appendages each ſide. Goeze.

Found in the inteſtines of the fox, and is not perhaps of this genus.

PUTORII. Minute and ſubrotund, with two approximate pores. Goeze.

Length an inch and a half; the ſpecies found in the inteſtines of the polecat.

MELIS. Thick; head triangular. Goeze.

Inhabits the inteſtines of the badger.

VESPERTILIONIS. Elongated and tapering with red inteſtines. Müll.

Body reddiſh fuſcous, and fleſhy, with minute dots diſpoſed in tranſverſe ſtriæ. This kind is found in the inteſtines of the long eared bat, which it frequently penetrates and occaſions death.

HEPATICA. Ovate and ſub-petiolate Linn Depreſſed-ovate, whitiſh fuſcous with the anterior part lengthened and tubular. Fabr. &c. Limax ovate, livid with acute margin, Amoen. Acad. *Planaria latiuſcula*, Goeze.

Infeſts the liver of ſheep, where it is generally found adhering by a pore at the extremity, and another in the middle of the abdomen, and occaſions the diſorder in ſheep called the rot. The body is about an inch long, broader on the fore part, and terminated by a tube, the back marked with furrows. The five following kinds are conſidered by ſome as varieties of hepatica.

BOUM. In the liver of cattle, Müll.

PORCORUM. In the liver of ſwine. Goeze.

APRI. In the liver of boar. Cleric.

CERVI. In the liver of deer. Borlaſe.

EQUI. In the liver of the horſe. Buffon.

ELAPHI. Body conic-ovate, with a very large aperture behind; mouth aſſurgent and remote.

Inhabits the ſtomach of the ſtag, and is gregarious.

* * * *Infeſting Birds.*

BILIS. In the gall-duct of the black eagle. Braun.

Body thick, and gregarious.

BUTEONIS. Inhabits the inteſtines of the buzzard. Goeze.

Body with two pores.

MILVI. Body flat with a double pore; inteſtines frondoſe. Goeze.

Small. Found in the inteſtines of the kite.

STRIGIS. Body roundiſh, with a ſingle pore. Goeze.

In the inteſtines of the kite. Perhaps not of this genus.

PUPILLA. Very minute; ſhape various, incloſed in a cyſt, and tenacious of life. Braun.

Found in the thorax of the owl, (ſtrix aluco) and alſo under the ſkin in the common hedge hog. Probably not of this genus.

ANATIS. Reddiſh and roundiſh, with a ſingle pore. Goeze. *Cuculanus conoideus*, Bloch. *Hirudo faſciolaris*. Müll.

An internal worm, ſuppoſed to be of this genus, and which is found in the inteſtines of the common domeſticated duck. The body is ſmall, pellucid, and ſometimes white; the anterior part ending in a truncated triangle, the poſterior rounded; inteſtines black and flexuous; ovaries lateral.

ANSERIS. Oblong-ovate, with oppoſite papillæ placed in two rows; pores approximate. Froelich.

Found in the rectum of the common gooſe.

GRUIS. Inhabits the inteſtines of the crane. Bloch.

This may not be ſpecifically diſtinct from faſciola anatis.

ARDEÆ. Sub-orbicular. Goeze.

Found in vaſt numbers in the inteſtines of the bittern, which it often penetrates.

* * * * *Infeſting Reptiles.*

SALAMANDRÆ. Oblong, ſub-linear, reſembling an oil-flaſk; pores remote. Froelich.

In the rectum of the ſalamander.

RANÆ. Sub-clavated, mouth ſeſſile. Goeze.

Found in the inteſtines, lungs, and liver of the frog; is very ſlow in motion, contracting itſelf into a globular form, and when dilated is broad and flattiſh.

UNCINULATA. Poſterior part of the body armed with two elaſtic hooks. Braun.

Inhabits the frog under the common integuments of the abdomen, and occurs either ſolitary, or in number; its motion reſembles that of the common leech.

* * * * * *Infeſting Fiſhes.*

BINODIS. Elongated, round, and caudated, with a papillary lateral pore. Müll. Zoega, &c.

Infeſts the inteſtines of various fiſhes; the body is of equal thickneſs, with papillary pores; the anterior one larger, and extending over the fore part of the body; tail filiform, and half as long as the body.

DITISCHA. Elongated, round, with a projecting excavated lateral pore. Zoega.

Infeſts the inteſtines of various fiſhes; the body is wrinkled, and tapering behind; the anterior part ſomewhat

what bifid at the end, the diviſions unequal, and excavated at the tip.

Anguillæ. In the common eel. Lewenh.

Scabra. Elongated, round, tranſverſely ſtriated, and ſerratulate at the margin. Müll.

In the ſtomach of the whiting pout. The body is ſcarcely perceptible to the naked eye; pellucid, and protruding from the mouth a hard and hollowed ſphærule, with a white double filiform veſſel, and another blackiſh flexuous one filled with eggs extending the whole length of the body.

Æglefini. Linear, and ſlightly depreſſed; no neck. Müll.

Length half an inch, colour cinereous, form rounded at the extremities.

Blennii. Linear, and flat; neck inflated with a divergent truncated baſe. Bloch.

Found in the inteſtinal mucus of the viviparous blenny; ſize ſmall, being almoſt imperceptible to the naked eye; colour white, pellucid, and generally curved into an obtuſe angle; lateral pore large, placed in the angle of the body, and prominent when in motion with two white veſicles.

Scorpii. Elliptic, and perforated at one end with a minute papilla; no neck. Müll.

In the inteſtines of the Father laſher; inviſible to the naked eye, pellucid, whitiſh grey, obtuſe at each end, and filled with eggs.

Platessæ. Elliptic, and green. Müll.

Extremely minute, opaque, divided into ſix alternate ſpaces of green and white; terminal pore large, lateral one placed in the middle; eggs deep green. Found in the inteſtinal mucus of the plaiſe.

Luciopercæ. Ovate-oblong, and ſlightly ventricoſe; neck ſhort; margin of the terminal pore dilated and ſmooth. Müll.

Size of a grain of ſand; colour browniſh; neck cylindrical; lateral pore ſlightly prominent, and narrower downwards. In the inteſtines of perca lucioperca.

Percæ. Ovate, ventricoſe; neck ſhort; terminal, pore nodulous at the margin. Müll.

Found in the inteſtines of the ruffe, and in ſize rather exceeding the former. The body is brown; neck white and cylindrical, granulated, and terminated by a pore; lateral pore ſeated at the baſe of the neck; body obtuſe behind.

Lagena. Body rotund; neck long. Braun.

In the inteſtines of the common river perch.

Varica. Linear, round, neck divergent, obtuſe, and perforated beneath the tip. Müll.

Found in the ſtomach of the ſalmon. This is of an elongated form, often diverging into an acute angle, ſmooth when extended, and rather wrinkled when contracted; lateral pore nearly in the middle; a double filiform white veſicle down each ſide, and connected below with two white opaque bodies of an ovate form; eggs numerous, ſcattered, yellowiſh green, and contained in a flexuous hyaline tube; each of the eggs incloſed in a pellucid membrane.

Eriocis. Elliptic, hyaline, and rufous in the middle. Müll.

Infeſts the inteſtines of ſalmo eriox; the ſize very minute; anterior part of the body retractile, and extenſile, including a filiform conglomerated inteſtine, and two veſicles.

Farionis. Oblong and a little depreſſed; the fore part with ſix equal lobes on the margin. Müll.

In the inteſtinal mucus of the ſalmon. The body is yellowiſh, and about the twelfth part of an inch in length; the margin obtuſely crenulated; the anterior lobes nearly ſquare and membranaceous.

Umblæ. Oblong, flat, with a narrower retractile neck. O. Fabr.

Found in vaſt numbers beneath the ſkin in the back of the ſalmo umbla. The length is one-eighth part of an inch; the body is whitiſh, and reſembling a flaſk, broader behind, and obtuſely truncated, the margin acute.

Lucii. Lanceolate, with a crenated depreſſed margin; neck long and round. Müll.

An inch and a half in length, the colour bright red; found in the ſtomach and œſophagus of the common pike.

Halecis. Found in the ſtomach of the herring. Leuwenh.

Bramæ. Oblong, round, tapering, and obtuſe at the baſe; neck rounded and ſlightly incurved. Müll.

In the inteſtines of the bream. The body is white, the lateral pore at the baſe of the neck.

Jesis. Body ovate, the anterior part narrower. Bloch.

Found in the inteſtines of cyprinus jeſes, and reſembles a flaſk, or long-necked bottle.

Truttæ. Oblong, with two white lucid orbicular ſpots behind the lower aperture. Froel.

In the rectum of the trout.

Clavata. Body roundiſh, livid, wrinkled, and clavated behind. Linnæan Tranſ.

Found in the ſtomach of the ſcomber pelamis, in the Pacific ocean. The length is about two inches; the body whitiſh brown, with a blueiſh caſt, and annulated with fine wrinkles; towards the lower extremity ſpherically gibbous, and terminating in an aperture; neck ſlender; pore larger than the terminal one.

Spari. In the mucus of ſparus aurata, &c. *La faſciole de la dorade*, Boſc.

Brunnea. In the mucus of ſparus aurata. *La faſciole bruné*, Boſc.

Caudata. In the mucus of ſparus aurata. *La faſciole caudate*, Boſc.

* * * * * * *Infeſting Worms.*

Loliginis. Body oblong, white; mouth with tranſverſe papillæ. O. Fabr.

Found in the inteſtines of the cuttle-fiſh.

FASHION. The word is French, *façon*, which ſignifies *making*.

Fashion is particularly uſed among *Artificers*, for the trouble, time, and labour, employed in a piece of work, particularly of ſilver or gold.

It is by the faſhion that the workmen's wages, or ſalary, are regulated.

The word is alſo uſed to denote the prevailing mode or taſte.

Fashions, a name ſometimes given to the farcin.

Fashion-*Pieces*, in *Sea Language*, two pieces of timber which form the breadth of a ſhip at the ſtern, and are the outmoſt timbers of the ſtern on each ſide, forming its ſhape, and united to the ſtern-poſt, and to the extremity of the wing-tranſom, by a rabbit, and a number of ſtrong nails or ſpikes driven from without.

FASIANO, in *Geography*, a town of Naples, in the province of Bari; 12 miles S. of Monopoli.

FASIKANI, a town of Japan, in the iſland of Niphon; 30 miles W. of Xenday.

FASSETS, among *Jewellers*. See Facets.

FASSUS, in our *Old Writers*, is uſed for a faggot of wood. It ſeems to come from the French *faiſſeau*.

FAST, a ſpace of time wherein a perſon takes little or no food.

For the advantages of faſting with regard to health, ſee ABSTINENCE.

The Bramins never bleed their ſick, but make them faſt.

FAST is peculiarly uſed for an abſtinence on account of religion, or a ſpace of time wherein the church prohibits the uſe of food, or at leaſt reſtrains it to certain kinds, and to certain hours.

Faſting has been practiſed by moſt nations from the remoteſt antiquity. The Jews obſerved faſts from their firſt eſtabliſhment. Moſes appointed one ſolemn faſt before the feaſt of expiation: and others were inſtituted by the following prophets on different occaſions; ſo that in the time of Zacharias there were four regular faſts, *viz.* in the months of June, July, September, and December. To theſe they have ſince added three others, in memory of ſore diſtreſſes they have at different times ſuffered. Beſides theſe there are various kinds of faſts, ſome for devotion, others for the new moons; and ſome among them kept an anniverſary faſt, in memory of the tranſlation of the Septuagint, in order to expiate the baſe compliance of their doctors for a foreign prince, and the outrage offered to the dignity of their law, which, in their opinion, was only deſigned for themſelves: "Non fecit taliter omni nationi."

There is no occaſion to deſcribe exactly the various obſervances that accompanied theſe acts of humiliation, as they are generally known. Their abſtinence laſted twenty-ſeven or twenty-eight hours, beginning before ſun-ſet, and not ending till ſome time after ſun-ſet the next day. On theſe days they were obliged to wear white robes, in token of their grief and repentance; to cover themſelves with ſackcloth, to lie on aſhes, to ſprinkle them on their head, and on great occaſions to cover the ark of the covenant. In order to complete their abſtinence, they eat nothing at night but a little bread ſteeped in water, ſeaſoned with ſalt, and bitter herbs and pulſe. Some of them continued the following day and night praying in the temple, or ſynagogue, bare-footed, and occaſionally ſcourging themſelves.

Thoſe that would be particularly informed of theſe auſterities may conſult Maimonides, Leo of Modena, and Buxtorf.

The Egyptians, Phœnicians, and Aſſyrians, neighbours to the Jews, had alſo their faſts. The faſt of the Ninivites, occaſioned by the preaching of the prophet Jonas, is too well known to be inſiſted on.

Nor were the Greeks without their faſts. Ariſtotle informs us, that the Lacedæmonians having reſolved to ſuccour a city of the allies, ordained a general faſt through the whole extent of their dominions, without excepting the domeſtic animals; and this they did for two ends, one that they might ſpare proviſion in favour of the beſieged, and the other to draw the bleſſing of heaven on their enterprize. The Athenians, among others, had the Eleuſinian and Theſmophorian faſts, the obſervation of which was accompanied with ſtrict faſting, particularly among the women, who ſpent one whole day ſitting on the ground in a mournful dreſs, without taking any nouriſhment; on which account this day was called νηϛεια.

In a word, all the Pagan deities, whether of the male or female ſex, required this duty of thoſe that deſired to be initiated into their myſteries, of the prieſts and prieſteſſes that gave the oracles, and of thoſe that came to conſult them.

In Italy faſting was obſerved much in the ſame way. The inhabitants of Tarentum, being beſieged by the Romans, demanded ſuccours from their neighbours of Regium, who immediately ordained a faſt throughout their whole territories, with the ſame intention as the Lacedæmonians, *viz.* to render the gods favourable, and to ſpare proviſion for their allies. Their enterprize having had good ſucceſs by their throwing a convoy with proviſions into the town, the Romans were obliged to raiſe the ſiege; and the Tarentines, in memory of this delivery, inſtituted a perennial faſt. So that here we have two faſts for the ſame event; that obſerved by thoſe who were the means of obtaining the deliverance, and that obſerved by them who received it. The Roman ſenate, Livy tells us, being alarmed by many prodigies, happening in a train one after another, ordered the decemviri to conſult the Sibylline books; who having executed their commiſſion, declared, that to prevent the fatal conſequences, it was neceſſary to eſtabliſh a faſt in honour of Ceres, to be obſerved every fifth year. That Jupiter had ſtated faſts at Rome, appears from the following paſſage of Horace, where a mother is introduced praying to Jupiter for the recovery of her ſon from a quartan ague, and promiſing that the patient ſhould purify himſelf in the Tiber on the morning of the faſt-day ſacred to that god:

> "Frigida ſi puerum quartana reliquerit, illo
> Mane die quo tu indicis jejunia, nudus
> In Tiberi ſtabit."

Faſting muſt have been very ſacred at Rome, ſince we find it practiſed by kings and emperors. Numa Pompilius, Julius Cæſar, Auguſtus, Veſpaſian, and others, we are told, had their ſtated faſt days; and Julian the Apoſtate was ſo exact in this obſervance as even to outdo the prieſts themſelves, and the moſt rigid philoſophers.

In a word, every country, nation, and religion have had at all times their prieſts, druids, gymnoſophiſts, and philoſophers, who diſtinguiſhed themſelves by their frugality, auſterity, and abſtinence. The practice of the Pythagoreans is well known; their whole life was a continued lent, but with this difference between them and us, that they believed the uſe of fiſh equally unlawful with that of fleſh. They lived entirely on bread, fruits, and pulſe, with great ſobriety, in imitation of their maſter Pythagoras; though in this reſpect they muſt have fallen far ſhort of him, if we may believe Diogenes Laertius, who ſays that he continued his faſts for no leſs than forty days. Apollonius Tyaneus, one of his moſt famous diſciples, could never by all his endeavours equal his maſter in this point, though his faſts greatly exceeded the ordinary intervals.

The gymnoſophiſts or brachmans reckoned faſting among their religious duties. Father Le Compte, in his memoirs, tells us, that the Chineſe have at all times had regular faſts with form of prayers, for preſerving them from barrenneſs, inundation, earthquakes, and ſuch like public calamities. The Mahometans too, who poſſeſs ſo large a part of Aſia and Africa, have times of faſting, called by them *ramadan* (which ſee) as regular as we have lent: and their derviſes are remarkable for their mortification and faſting. Compte, Mem. tom. ii. p. 142.

The Turks are ſo ſcrupulous on the point of faſting, that they will not at thoſe times ſo much as take the ſmell of any perfume by the noſe. They hold that odours themſelves break faſt. If they bathe, it is forbid to put the head under water for fear of ſwallowing any of it; and as for women, they are forbid to bathe at all on faſt-days, for a reaſon peculiar to the ſex.

It was not unuſual among the ancients to faſt on account of dreams.

Mr. Bayle obſerves, that whole books have been written on long faſting. Cyriacus Lentulus has compoſed one, "De Prodigioſis Inediis." Fortunius Licetus, profeſſor of medicine at Padua, beſides a great many others, has publiſhed one book in folio, "De iis qui diu vivunt ſine Alimento," or "De Feriis Altricis Animæ."

Though faſting is not poſitively enjoined by Chriſt or his apoſtles, a practice prevailed among the firſt Chriſtians of joining abſtinence with their prayers, eſpecially when they were engaged in affairs of extraordinary importance. But in the moſt ancient times we find no mention of any public and ſolemn faſts, except upon the anniverſary of Chriſt's crucifixion. However, in proceſs of time, days of faſting were gradually introduced, firſt by cuſtom, and afterwards by poſitive appointment; though it is not certain what thoſe days were, nor whether they were obſerved in the firſt century. Mr. Moſheim acknowledges, that thoſe who affirm, that in the time of the apoſtles, or ſoon after, the fourth and ſixth days of the week were obſerved as faſts, are not deſtitute of ſpecious arguments in favour of their opinion. Eccleſ. Hiſt. vol. i. p. 131. 8vo.

Towards the cloſe of the third century faſting was held in much greater eſteem, from a notion that it ſerved as a ſecurity againſt the power of dæmons, who directed their ſtratagems principally againſt the luxurious. The Latins, contrary to the general cuſtom, faſted the ſeventh day of the week; and as the Greeks and Orientals refuſed to follow their example, this afforded a new ſubject of contention between them. About the end of the fourth century this notion ſtill more generally prevailed; and faſting was alſo conſidered as the moſt effectual means of appeaſing the anger of an offended deity. Hence proceeded the eſtabliſhment of this practice as an indiſpenſible duty, by expreſs laws enacted by the rulers of the church. The Quadrageſima or Lent faſt was held more ſacred than all the reſt, though it was not yet confined to a certain number of days. But as faſting became more general, it was contrived to render it more eaſy; and therefore a mere abſtinence from fleſh and wine was judged ſufficient: which opinion prevailed from this time, and became univerſal among the Latins. Ib. vol. i. p. 293. 398.

The ſtrict canonical faſt only allows of one meal in twenty-four hours. F. Thomaſſin obſerves that the ancient faſt was to ſup without dining, *i. e.* only to take one meal, and that not till after noon: adding, that to dine without ſupping, was a breach of the faſt. The practice of the Latin church was to faſt thirty-ſix days in the year; which is, as it were, the tithe of the year.

Tertullian wrote an expreſs treatiſe, "De Jejuniis," of faſts, to ſupport the new laws of faſting, which the Montaniſts were for impoſing.

The ancient catholics allowed of no obligatory or commanded faſts beſides that preceding Eaſter, ſince called *Lent*; the terms of which were to forbear eating till the evening.

The other faſts obſerved were only of devotion; ſuch were the fourth and ſixth feriæ; *i. e.* Wedneſdays and Fridays.

This Lent faſt was called *ſtation*. Beſides theſe there were occaſional faſts enjoined by the biſhops, &c. See Abstinence and Lent.

Some introduced the xerophagy into faſts; that is, the uſe of dried fruits for their meals; and made a practice of abſtaining not only from all meats and wines, but alſo from ſucculent fruits, for the whole twenty-four hours; and ſome reduced themſelves to bread and water: but this was more than was commanded.

Fast-*days* are thoſe appointed by public authority, to be obſerved by faſting and humiliation. See Abstinence.

Fast-*ground*, or Fast-*country*, a term uſed by ſome of our *Miners* to expreſs what others call the *ſhelf*; which ſee.

FASTAGE, ſignifies the feagh, fleet, or refuſe ſmall ſpar from a vein.

FASTERMANS, or Fasting-men, q.d. *homines habentes*, was uſed in our ancient cuſtoms for men in repute and ſubſtance; or rather for pledges, ſureties, or bondſmen, who, according to the Saxon polity, were faſt bound to anſwer for one another's peaceable behaviour.

FASTI, in *Antiquity*, the Roman calendar; wherein the ſeveral days of the year, with their feaſts, games, and other ceremonies were expreſſed.

The Romans had their greater and leſſer faſti. The great faſti were called the faſti of the magiſtrates; and the leſſer, the faſti calendares.

The faſti calendares, which were what was properly and primarily called faſti, are defined by Feſtus Pompeius to be books containing a deſcription of the whole year; *i. e.* ephemerides, or diaries, diſtinguiſhing the ſeveral kinds of days, feſti, profeſti; faſti, nefaſti, &c. The author of theſe was Numa, who committed the care and direction of the faſti to the "pontifex maximus," whom the people uſed to go and conſult on every occaſion. This cuſtom held till the year of Rome 450, when C. Flavius, ſecretary to the pontifices, expoſed in the forum a liſt of all the days on which it was lawful to work; which was ſo acceptable to the people, that they made him curule ædile. Liv. lib. ix. cap. 46. Ed. Crevier. tom. i. p. 573.

Theſe leſſer faſti, or faſti calendares, were of two kinds, urbani and ruſtici. The faſti urbani, or faſti of the city, were thoſe which obtained, or were obſerved in the city. Some will have them thus called becauſe they were expoſed publicly in divers parts of the city; though by the various inſcriptions or gravings thereof on antique ſtones one would imagine that private perſons had them likewiſe in their houſes. Ovid undertook to illuſtrate theſe faſti urbani, and comment on them in his "Libri Faſtorum," whereof we have the ſix firſt books ſtill remaining; the ſix laſt, if ever they were written, being loſt. Beſide Ovid, ſeveral other authors had undertaken the ſame ſubject, particularly L. Cincius Alimentatus, Fulvius Nobilior, Maſurius Sabinus, Cornelius Labeo, C. Licinianus, and Niſus; of all whom Macrobius makes mention in his "Saturn." and preſerves fragments of each; beſides a work of one Bæbius Marcus, intitled, "De Faſtis Diebus," quoted by Fulgentius, "De Priſco Sermone."

In the greater faſti, or faſti of the magiſtrates, were expreſſed the ſeveral feaſts, with every thing relating to the gods, religion, and the magiſtrates; the emperors, their birth-days, offices, days conſecrated to them, and feaſts and ceremonies eſtabliſhed in their honour, or for their proſperity, &c.

With a number of ſuch circumſtances did flattery at length ſwell the faſti, when they became denominated magni, to diſtinguiſh them from the bare calendar, or faſti calendares.

In the faſti ruſtici, or country faſti, were expreſſed the ſeveral days, feaſts, &c. to be obſerved by the country people; for as theſe were taken up in tilling the ground, fewer feaſts, ſacrifices, ceremonies, and holidays, were enjoined them than the inhabitants of cities; and they had alſo ſome peculiar ones not obſerved at Rome.

Theſe ruſtic faſti contained little more than the ceremonies of the calends, nones, and ides; the fairs, ſigns of the zodiac, increaſe and decreaſe of the days, the tutelary gods of each month, and certain directions for rural works to be performed each month.

Fasti was alſo a chronicle or regiſter of time, wherein the ſeveral years were denoted by the reſpective conſuls, with the principal events that happened during their conſulates; theſe were called alſo faſti conſulares, or conſular faſti.

Onuphrius Panvinius, Pighius, Sigonius, and Janſſen d'Almelooven, have given us the faſti conſulares; the two firſt, with long and learned comments, wherein are expreſſed not only the conſuls, but alſo the dictators, magiſtri equitum, triumphs, and ovations. Pighius even adds as many of the other officers as he could find, *viz.* prætors, tribunes, &c. J. d'Almelooven confines himſelf to the conſuls alone.

Fasti is ſtill applied to the archives and public records wherein are kept hiſtorical memoirs of public and remarkable events that have happened to a people.

In the like ſenſe the martyrology is called the ſacred faſti of the church.

The Jeſuit Du-Londel has compiled the faſti of Louis le Grand, &c.

Fasti, or *Dies Faſti*, alſo denoted court days. See Day.

The word faſti, faſtorum, is formed of the verb *fari, to ſpeak*, becauſe, during thoſe days the courts were open, cauſes might be heard, and the prætor was allowed fari, to pronounce the three words, *do, dico, addico*; the other days wherein this was prohibited were called *nefaſti*: thus Ovid,

> "Ille nefaſtus erit, per quem tria verba ſilentur:
> Faſtus erit, per quem lege licebit agi."

Theſe dies faſti were noted in the calendar by the letter F: but obſerve, that there were ſome days ex parte faſti, partly faſti, partly nefaſti; *i. e.* juſtice might be diſtributed at certain times of the day, and not at others. Theſe days were called interciſi: they were marked in the calendar thus; F. P. faſtus primo, where juſtice might be demanded during the firſt part of that day.

FASTIGIATI Furni, in *Chemiſtry*, furnaces fitted with ſeveral aludels.

FASTIGIUM, in *Architecture*, the ſame with pediment.

FASTING Men. See Fastermans.

FASTNEL, in *Geography*, the name of a rock in the Atlantic ocean, not far from Cape Clear, on the ſouthern coaſt of Ireland. N. lat. 51° 17′. W. long. 9° 30′.

FASTOLFF, John, in *Biography*, knight and knight-banneret, a renowned general, governor and nobleman in France during our conqueſts in that kingdom, under Henries IV. V. and VI. of England, was ſon of John Faſtolff, eſq. of Yarmouth, and of Mary, daughter of Nicholas Park, eſq. and born, it is preſumed, about the year 1377. He is ſuppoſed to have had a good education, and his father dying while he was young, he became ward to John duke of Bedford, who was afterwards regent of France. The firſt public employments in which Faſtolff was engaged ſeem to have been under Thomas of Lancaſter, afterwards duke of Clarence, the then lord-lieutenant of Ireland, which was in 1401, and it is probable he was with him again in that country in 1405, 6, and 8, as in the beginning of 1409 he was married in that kingdom to a rich young widow of quality, named Milicent, lady Caſtlecomb, relict of ſir Stephen Scope. The marriage was ſolemnized on the feaſt of St. Hilary, and Faſtolff obliged himſelf in a bond of a 1000*l.* to pay her an hundred pounds a-year in the nature of pin-money during her life. There ſeems good evidence that ſhortly after his marriage he went to France, where he was, according to the teſtimony of Caxton, full forty years, ſo that he could not have been a companion with, or follower and corrupter of prince Henry; of courſe Shakeſpeare could not have drawn his ſir John Falſtaff from this gentleman: "The one," ſays the writer of the article in the Biographia Britannica, "is an old humourous, vapouring, and cowardly, lewd, lying, and drunken debauchee, about the prince's court, when the other was a young and grave, diſcreet and valiant, chaſte and ſober commander abroad, continually advanced to honour and places of profit, for his brave and politic atchievements, military and civil; continually preferred to the truſt of one government or other, of countries, cities, towns, &c. or as a general and commander of armies, in martial expeditions, while abroad, made knight-banneret in the field of battle; baron of France, and knight of the garter in England," &c. &c. In the year 1413 Faſtolff had the caſtle and dominion of Veires in Gaſcony committed to his cuſtody and defence. He was afterwards engaged in the celebrated battle of Agincourt, in which, it is ſaid, he ſignalized himſelf by taking the duke d'Alençon priſoner. For his eminent ſervices in this and other great battles he received the honour of knighthood, and the manor and demeſnes of Fritenſe, near Harfleur, beſtowed upon him during life. For various other inſtances of high military proweſs he was elected, about the year 1425, knight of the garter. In October 1428 ſir John Faſtolff with others were diſpatched with ſupplies to the Engliſh army who were beſieging Orleans: two immenſe French armies were ſent to prevent the ſuccours being delivered; theſe, by the valour of ſir John, were defeated, and he accompliſhed the taſk for which he was ſent without difficulty. This circumſtance has been celebrated as almoſt unparalleled in hiſtory. After freſh victories, and much active ſervice in France, where many years he had the government of Normandy, he returned to his native home, and though living in retirement he was a zealous friend of thoſe to whom he could be ſerviceable. He died in the year 1459 or 60, and was buried in a chapel of the abbey church of St. Bennet in Norwich; ſo highly was he venerated, that John Beauchamp, lord of Powyke, appointed by his will a chaunt eſpecially for the ſoul of ſir John Faſtolff. Biog. Brit.

FAT, in *Anatomy*. See Cellular *Subſtance*.

Fat, *Animal*. For the chemical properties of this ſubſtance, ſee the articles Oil, *animal*, and Sebacic *acid*. See alſo Adeps.

The way of preparing fat for medicinal purpoſes is to take out the ſkins, veins, fibres, &c. waſh it till it becomes unbloody; then melt it by a gentle heat, with a little water, till the water is evaporated; ſtrain, put it into an earthen veſſel where it will fix, and preſerve it from air.

Fat *of Whales*. See Blubber.

Fat, in *Agriculture*, is a term which is frequently applied to ſuch neat cattle and ſheep ſtock as are ready for the butcher.

Fat, in *Rural Economy*, is a term which is often applied to the large wooden veſſels in which various ſorts of liquors are contained, while they undergo the ſtate of preparation, as ale, beer, cyder, &c. It is, however, more frequently written *vat*. See Vat.

And it likewiſe ſignifies, with brewers and maltſters, the large wooden veſſel which, for expedition, is employed to meaſure malt, and which contains one quarter, or eight buſhels, according to ſtatutes 1 Hen. V. cap. 10, and 11 Hen. VI. cap. 8.

It is alſo applied to a veſſel or pan of lead, which is made uſe of in the preparation of ſalt. See SALT.

FAT alſo denotes an uncertain meaſure of capacity: thus, a fat of iſinglaſs contains from 3¼ hundred weight to 4 hundred weight; a fat of unbound books half a maund, or 4 bales; of briſtles, 5 hundred weight; of wire, from 20 to 25 hundred weight; and of yarn, from 220 to 221 bundles.

FAT-*Hen*, in *Rural Economy*, is a term often provincially uſed to ſignify the weed called gooſe-foot.

FATA MORGANA, or the *Caſtles of the Fairy Morgana*, the common appellation of a ſingular phenomenon, which is ſometimes ſeen in the Faro of Meſſina, or ſtraits of Reggio, between the iſland of Sicily and the coaſt of Calabria. The origin of this appellation is doubtful, or rather unknown; yet ſome authors are pleaſed to derive it from *μωρος*, *melancholy*, and *γανόω*, *inducing exhilaration*; alluding to the pleaſure which its appearance gives to the ſpectators; for whoever has been an eye-witneſs of this phenomenon, expreſſes himſelf as having been highly delighted by it.

This phenomenon has been noticed and deſcribed by various authors; *viz.* Kircher, Angelucei, Scotus, Giardina, Gallo, Leanti, Minaſi, Brydone, Swinburne, and others; but of all theſe authors, Fr. Antonio Minaſi, who had thrice been ſpectator of this remarkable appearance, ſeems to deſcribe it in a more explicit manner. His diſſertation on the ſubject was publiſhed at Rome in the year 1793.

The north-eaſt angle of the iſland of Sicily comes very near the ſouthern extremity of the kingdom of Naples. The channel between theſe coaſts is narrow, and confined between two ridges of mountains. In this channel the water is continually agitated, and thrown into ridges and whirlings by the violence of the current, by the particular direction of certain winds, and by the irregular conformation of the coaſts. At times it likewiſe happens that a very denſe vapour is accumulated, and condenſed over the water of the channel. "When," Minaſi ſays, "the riſing ſun ſhines from that point whence its incident ray forms an angle of about 45 degrees on the ſea of Reggio, and the bright ſurface of the water in the bay is not diſturbed either by the wind or the current, the ſpectator being placed on an eminence of the city, with his back to the ſun, and his face to the ſea; on a ſudden there appears in the water, as in a catoptric theatre, various multiplied objects; *viz.* numberleſs ſeries of pilaſters, arches, caſtles well delineated, regular columns, lofty towers, ſuperb palaces, with balconies and windows, extended alleys of trees, delightful plains with herds and flocks, armies of men on foot and horſeback, and many other ſtrange figures, in their natural colours and proper actions, paſſing rapidly in ſucceſſion along the ſurface of the ſea, during the whole of the ſhort period of time while the above-mentioned cauſes remain.

"But if, in addition to the circumſtances before deſcribed, the atmoſphere be highly impregnated with vapour, and denſe exhalations not previouſly diſperſed by the action of the wind or waves, or rarefied by the ſun, it then happens that in this vapour, as in a curtain extended along the channel to the height of about four or five and twenty feet, and nearly down to the ſea, the obſerver will behold the ſcene of the ſame objects not only reflected from the ſurface of the ſea, but likewiſe in the air, though not ſo diſtinct or well defined as the former objects from the ſea.

"Laſtly, if the air be ſlightly hazy and opaque, and at the ſame time dewy, and adapted to form the iris, then the above-mentioned objects will appear only at the ſurface of the ſea, as in the firſt caſe, but all vividly coloured, or fringed with red, green, blue, and other priſmatic colours."

Theſe appearances induced this author to diſtinguiſh the phenomenon into three ſpecies under diſtinct denominations; *viz.* calling the apparition on the water by the name of marine morgana; that in the air by the name of aerial morgana; and that which is attended with fringes of colours, the priſmatic morgana.

This deſcription of the phenomenon coincides upon the whole with other accounts, ſo far at leaſt as to the appearance of ſomething extraordinary on the ſurface of the ſea, or in the air, vapour, fog, &c. not much above the ſurface of the water; but when the minuter particulars are inquired into, then all the accounts differ conſiderably from each other. In truth, the phenomenon is always different, tranſient, and ſurpriſing; hence it is no wonder that the accounts ſhould be found to differ. The imagination, which readily ſupplies the imperfect perceptions of the ſenſes, may doubtleſs influence conſiderably the correctneſs of the accounts. The objects which are deſcribed as appearing perfect and well defined by ſome, are ſaid to be extremely indiſtinct and indefinite by others; yet all ſeem to coincide in ſaying that figures of human beings and of other terreſtrial objects are exhibited by the fata morgana; thus Leanti ſays that the ſky appears crowded with a variety of beautiful objects, ſuch as palaces, woods, gardens, veſſels, and ſuch like, together with figures of human beings, and other animals, that appear to move amongſt thoſe fixed objects.

Notwithſtanding the diſagreement of the accounts with reſpect to particulars, the appearance of the phenomenon, which has been obſerved by a vaſt number of creditable authors, ancient as well as modern, cannot poſſibly be doubted; hence philoſophers have endeavoured to account for it upon the known laws of optics, and of other natural powers; but notwithſtanding their exertions, a thorough explanation of the appearance ſtill remains a deſideratum. In his attempts to explain this phenomenon, Minaſi firſt deſcribes the city of Reggio on the coaſt of Calabria, oppoſite to Meſſina, together with the adjacent parts, and then endeavours to prove that all the objects which are ſeen in the fata morgana are the repreſentations of thoſe objects which ſtand on the coaſt. He ſays, "that the ſea in the ſtraits of Meſſina has the appearance of a large inclined ſpeculum; that in the alternate current or tide which flows and returns in the ſtraits for ſix hours each way, and is conſtantly attended by an oppoſite current along the ſhore to the medium diſtance of about a mile and a half, there are many eddies and irregularities at the time of its change of direction; and that the morgana uſually appears at this period."

After various other conſiderations he at laſt accounts for the appearances, by the ſuppoſed inclination of the ſurface of the ſea, and its ſub-diviſion into different plains by the contrary eddies. He explains the aerial morgana by referring it to the reflective and refractive powers of effluvia ſuſpended in the air.

Mr. Brydone, in his tour through Sicily and Malta, ſpeaking of the attempts that have been made for explaining the phenomena of the fata morgana, ſays, "they think it may be owing to ſome uncommon refraction or reflection of the rays, from the water of the ſtraits; which, as it is at that time carried about in a variety of eddies, and vortexes, muſt of conſequence, ſay they, make a variety of appearances on any medium where it is reflected. This, I think, is nonſenſe; or at leaſt very near it. I ſuſpect it is ſomething in the nature of our aurora borealis; and, like many of the great phenomena of nature, depends upon electrical cauſes;

which, in future ages, I have little doubt will be found to be as powerful an agent in regulating the univerſe, as gravity is in this age, or as the ſubtile fluid was in the laſt."

We ſhall laſtly preſent our readers with a ſtatement of the conjectures which Mr. Nicholſon was enabled to derive from an examination of the accounts, obſervations, &c. "It ſeems," he ſays, "that, by the ſituation of the Faro of Meſſina, the current from the ſouth, at the expiration of which this phenomenon is moſt likely to appear, is ſo far impeded by the figure of the land, that a conſiderable portion of the water returns along ſhore. 2. That it is probable the ſame coaſts may have a tendency to modify the lower portion of the air in a ſimilar manner, during the ſouthern breeze; or, in other words, that a ſort of baſon is formed by the land, in which the lower air is more diſpoſed to become motionleſs and calm than elſewhere. 3. That the morgana marina preſents inverted images below the real objects, which are multiplied laterally, as well as vertically; and that there are repetitions of the ſame multiplied objects at more conſiderable vertical intervals. 4. That the aerial morgana is not inverted, but, as I am diſpoſed to conjecture, is more elevated than the original objects. 5. That the fringes of priſmatic colours are produced in falling vapours, ſimilar to many appearances which have been deſcribed by authors, but not accurately explained by the general principles of refraction through ſpheres of water. The ſhip is referred to by Minaſi as an object ſurrounded by theſe fringes, whence it appears that the colours apply to the direct rays from objects, as well as to thoſe of the marine morgana. 6. The various other objects in the deſcription afford matter for queſtion and conjecture; but none perhaps which it may be proper to enlarge upon, until the theory be better known. 7. It ſeems, at all events, more probable that theſe appearances are produced by a calm ſea, on one or more ſtrata of ſuper-incumbent air, differing in refractive, and conſequently reflective power, than from any conſiderable change in the ſurface of the water, with the laws of which we are much better acquainted than with thoſe of the atmoſphere. 8. By attentive reflection upon the facts and reaſonings in Mr. Huddart's paper, (Phil. Tranſ. for 1797,) we may form a theory to account for the erect and inverted images: the poliſhed ſurface of the ſea may perhaps account for the vertical repetition; but for the lateral multiplication we muſt have recourſe to reflecting or refracting planes in the vapour, which appear nearly as difficult to deduce or eſtabliſh, as thoſe which have been ſuppoſed on the water." Phil. Journal for Auguſt, 1797.

FATAGAR, in *Geography*, a country of Africa, ſituated to the ſouth-eaſt of Abyſſinia; about N. lat. 9°. E. long. 39°.

FATATINDA, a town of Africa, in the country of Woolly, on the river Gambia, about 500 miles from its mouth, where the Engliſh had a factory, but were compelled to abandon it in the year 1734, by the conduct of the king of Tomani; 10 miles S. of Medina. N. lat. 15° 20′. W. long. 13° 8′.

FATE, FATUM, in a general ſenſe, denotes an inevitable neceſſity depending on ſome ſuperior cauſe.

Fate is a term much uſed among the ancient philoſophers. It is formed *a fando*, *from ſpeaking*, and primarily implies the ſame with *effatum*, *viz.* a word or decree pronounced by God; or a fixed ſentence, whereby the Deity has preſcribed the order of things, and allotted every perſon what ſhall befal him.

The Greeks call it ειμαρμενη, *quaſi* ειρμος, *nexus*, *a chain*, or neceſſary ſeries of things indiſſolubly linked together.

All things, ſays Plato, are in fate; *i. e.* within its ſphere or ſcheme, but all things are not fated; and he thus explains the diſtinction: it is not in fate, ſays he, that one man ſhall *do* ſo and ſo, and another *ſuffer* ſo and ſo, for that would be deſtructive of our free agency and liberty; but if any one ſhould chooſe ſuch a life, and do ſuch or ſuch things, then it is in fate that ſuch things and ſuch conſequences ſhall enſue upon it. The ſoul, therefore, is αδεσποτον, free and uncontrolled, and it lies within itſelf to act or not; and there is no compulſion or neceſſity here; but what follows upon the action ſhall be accompliſhed, καθ' ειμαρμενην, according to fate, or the conſtitution of things; *e. gr.* that Paris ſhould bear off Helen by force was ſomething dependent on himſelf; but that a war ſhould enſue is the conſequence. Ex. Alcinoo de Platon. Dogmat.

The ſame philoſopher, as cited by Hierocles, obſerves to this purpoſe: the choice of action is in our own power; but the juſt award or retribution of good or ill which enſues upon the choice, lies in the breaſt of thoſe etherial judges who are appointed under God.

But beſide this ſenſe of the word wherein it is uſed, ſometimes to denote the connection of cauſes in nature, and ſometimes in the divine appointment, the word fate has a farther intention, being uſed to expreſs a certain neceſſity or external deſignation of things, whereby all agents, both neceſſary and voluntary, are ſwayed and directed to their ends. See NECESSITY.

Some authors divide fate into *aſtrological* and *ſtoical*.

FATE, *Aſtrological*, denotes a neceſſity of things and events, ariſing, as is ſuppoſed, from the influence and poſitions of the heavenly bodies, which give law both to the elements and mixed bodies, and to the wills of men.

In which ſenſe the word is often uſed by Manilius, "Certum eſt & inevitabile fatum: materiæque datum eſt cogi, ſed cogere ſtellis."

FATE, *Stoical*, or *fatality*, is defined by Cicero an order or ſeries of cauſes, wherein cauſe being linked to cauſe, each produces the other; and thus all things flow from one prime cauſe. Chryſippus defines it a natural invariable ſucceſſion of all things *ab æterno*, each involving the other. The Stoic idea of providence is, not that of an infinitely wiſe and good being, wholly independent of matter, freely directing and governing all things, but that of a neceſſary chain of cauſes and effects, ariſing from the action of a power, which is itſelf a part of the machine regulated by it, and which, equally with that machine, is ſubject to the immutable law of neceſſity. Hence, it appears, that providence, in the Stoic creed, is only another name for abſolute neceſſity or fate, to which God and matter, or the univerſe which conſiſts of both, is immutably ſubject.

Thus the poet: the Parent of all-things made laws at the beginning, by which he not only binds other things but himſelf. So Seneca: "Eadem neceſſitas & deos alligat. Irrevocabilis divina pariter & humana curſus vehit. Ipſe ille omnium conditor & rector ſcripſit quidem fata, ſed ſequitur: ſemel ſcripſit, ſemper paret." (See STOICS.) The doctrine of the Stoics concerning fate, was ſtrenuouſly oppoſed by Carneades. See CARNEADES.

The eternal ſeries of cauſes mentioned by the Stoics the poets call Μοιρα and *Parcæ*, or *Deſtinies*.

Fate is divided by ſome later authors into *phyſical* and *divine*.

FATE, *Phyſical*, is an order and ſeries of natural cauſes appropriated to their effects.

This ſeries is neceſſary, and the neceſſity is natural. The principle or foundation of this fate is nature, or the power and manner of acting which God originally gave to the ſeveral bodies, elements, mixts, &c. By this fate it is that fire warms, bodies communicate motion to each other, the ſun and moon occaſion the tides, &c. and the effects of this fate are all the events and phenomena in the univerſe, except ſuch as ariſe from the human will. See Nature.

Fate, *Divine*, is what we more uſually call *Providence.* Plato in his Phædo includes both theſe in one definition, as intimating, that they were one and the ſame thing, actively and paſſively conſidered. Thus, "Fatum eſt ratio quædam divina, lexque naturæ comes, quæ tranſiri nequeat, quippe a cauſa pendens, quæ ſuperior ſit quibuſvis impedimentis." Though that of Boethius ſeems the clearer and more juſt, "Fatum," ſays he, "eſt inhærens rebus mobilibus diſpoſitio, per quam Providentia ſuis quæque nectit ordinibus."

FATESH, in *Geography*, a town of Ruſſia, and diſtrict of the government of Kurſk; on a rivulet falling into the Svopa.

FATHER, Pater, a term of relation, denoting a perſon who begot a child, either male or female.

Among the ancient Romans the fathers of three children had very conſiderable privileges allowed them as ſuch. By the law of Romulus a father had an abſolute and unlimited power over his children. Amongſt the Lacedæmonians, as we learn from Ariſtotle's Politics, the father of three children was excuſed from the duty of mounting guard for the ſecurity of the city; and a father of four children was exempted from every public burden. Concerning the duties and claims of fathers and mothers; ſee Parent.

Father, *Adoptive*, is he who takes the children of ſome other and acknowledges them as his own. See Adoption.

Father, *Putative*, is he who is only the reputed or ſuppoſed father. Joſeph was putative father of our Saviour.

Father, *Natural*, is he who has illegitimate children.

Father-*in-Law*, is a perſon married to a woman who has children by a former huſband, &c. to which children he is ſaid to be a father-in-law,

Father is alſo uſed in *Theology* for the firſt Perſon in the Trinity.

Father is alſo uſed in a figurative ſenſe on divers moral and ſpiritual occaſions. Thus, it is applied to the patriarchs; as we ſay Adam was the father of all mankind, Abraham the father of the faithful, &c.

Fathers, *Apoſtolical.* See Apostolical.

Fathers, in an *Eccleſiaſtical Senſe*, denote the ancient prelates and doctors of the church.

The fathers aſſembled at the council of Nice: Chryſoſtom, St. Baſil, &c. were Greek fathers, and St. Auguſtine, St. Ambroſe, &c. were Latin fathers.

The appellation of fathers is uſually confined to the theological writers of the firſt ſix centuries.

Learned men have differed in their opinion concerning the degree of eſteem that is due to the ancient fathers, more eſpecially as moral writers. Whilſt ſome repreſent them as the moſt excellent guides in the paths of piety and virtue: others place them in the very loweſt rank of moraliſts, conſidering them as the very worſt of all inſtructors, and treat their precepts and deciſions as perfectly inſipid, and, in many reſpects, pernicious. Although we allow that in the writings of the primitive fathers there are ſeveral ſublime ſentiments, judicious thoughts, and many things that are naturally adapted to form a religious temper and virtuous character; yet it muſt be confeſſed that they abound ſtill more with precepts of an unreaſonable and exceſſive auſterity, with ſtoical and academical dictates, vague and indeterminate notions, and, what is ſtill worſe, with deciſions that are abſolutely falſe, and in evident oppoſition to the precepts of Chriſt. In later ages, and particularly towards the cloſe of the eighth century, the labours and induſtry of divines were totally employed in collecting the opinions and authorities of the fathers, *i. e.* the theological writers of the firſt ſix centuries; and ſo blind and ſervile was their veneration for theſe doctors, that they regarded their dictates as infallible, and their writings as the boundaries of truth, beyond which reaſon was not permitted to extend its reſearches. The Iriſh, or Hibernians, who in the eighth century were known by the name of Scots, were the only divines who refuſed to diſhonour their reaſon by ſubmitting it implicitly to the dictates of authority. Naturally ſubtile and ſagacious, they applied their philoſophy, ſuch as it was, to the illuſtration of the truth and doctrines of religion: a method which was almoſt generally abhorred and exploded in all other nations. It is much to be lamented, that the fathers of the Chriſtian church ſoon departed from the ſimplicity of the apoſtolic age, and corrupted the purity of the Chriſtian faith. This is chiefly to be aſcribed to the two following cauſes; *viz.* firſt, the practice which at that time ſo generally prevailed of clothing the doctrines of religion in an allegorical dreſs; and, ſecondly, the habit of ſubtle ſpeculation, which the more learned converts from Paganiſm brought with them from the ſchools of philoſophy. The practice of allegorical interpretation prevailed in a very great degree among the Gentile converts, who had been educated in the Alexandrian ſchools, and among thoſe Jewiſh Chriſtians who, by the ſame help of allegory, had been inſtructed in the Cabbaliſtic doctrines, which before this time had ſprung up in Egypt, and paſſed thence into Judæa. Several of thoſe ſects of Chriſtians, who were called Heretics, particularly the Valentinian Gnoſtics, made uſe of allegorical language to diſguiſe the unnatural alliance which they had introduced between the fanciful dogmas of the Oriental philoſophy, and the ſimple doctrine of Chriſt. The orthodox fathers of the church, too, defended themſelves with the ſame armour both againſt heretics and infidels; applying with more ingenuity than judgment the ſymbolical method of interpretation to the ſacred ſcriptures. In the ſame manner in which Philo and other Alexandrian Jews had corrupted the Jewiſh church, Clemens Alexandrinus, Origen, and other diſciples of the Alexandrian ſchool, in the ſecond century, introduced error and corruption into the church of Chriſt. Among the Chriſtian fathers, who had abandoned Paganiſm on account of its inferiority to the doctrine of Chriſtianity, there were not wanting advocates for different ſects of Grecian philoſophy. When Origen and his followers, together with many others, favoured the Eclectic method of philoſophiſing, which had been followed in the Alexandrian ſchools, they eaſily perſuaded themſelves, that as a coalition had been effected in theſe ſchools, between Plato and Ariſtotle, it would not be difficult to accompliſh a ſimilar coalition between Jeſus Chriſt and Ariſtotle. Others reaſoned in the ſame manner with reſpect to the doctrines of the Stoics. The Epicurean was almoſt the only ſect which met with no patrons among the Chriſtian fathers. But the ſect which obtained moſt favour in the Chriſtian ſchool was the Platonic. See Platonics.

It ſhould be readily acknowledged, that the early teachers of the Chriſtian church were honeſt and zealous advocates for the cauſe of Chriſt; and that many of their apologies diſcover an extenſive acquaintance with ancient philoſophy and learning, and ſerve to caſt much light upon the philoſophical and theological hiſtory of preceding times. But it muſt, at the ſame time, be candidly confeſſed, that in the heat of controverſy they not only fell into various miſtakes, but made uſe of unſatisfactory methods of reaſoning, which betray imbecility of judgment, or inattention to the principles and rules of good writing. The works of the fathers, inſtead of being diſtinguiſhed by correctneſs and ſtrength of argument, furniſh innumerable examples of feeble reaſoning, of interpretations of ſcripture irreconcilable with good ſenſe, and of a careleſs admiſſion of ſpurious writings, as genuine authority. This charge might be eaſily ſubſtantiated againſt Irenæus, Lactantius, Arnobius, Jerom, and others. For their defects in ſound argumentation we may aſſign ſeveral reaſons. Their injudicious zeal induced them to graſp at every ſhadow of argument againſt their opponents; and their want of ſkill in the art of reaſoning led them often to miſtake ſhadows for realities. Their fondneſs for allegory dazzled and confounded their underſtandings, ſo that they were unable to diſtinguiſh between fanciful reſemblances and ſolid arguments. They had not learned to diſtinguiſh accurately between the light of revelation and that of reaſon, and therefore ſuppoſed that their reverence for the former obliged them to depreciate and vilify the latter. Ambroſe, a learned man, but a bad logician, adviſed that in diſputes where faith is concerned reaſon ſhould be laid aſide. Baſil called reaſoning the devil's work. Others who admitted the carefulneſs of uſing the weapons of Ariſtotelian logic in defence of Chriſtianity, contended that Chriſtians were poſſeſſed of a better logic, conſiſting in the demonſtration of the ſpirit, and that they who poſſeſſed this might defend their cauſe without the arms of human reaſon. It might be alleged, as another proof of their want of judgment, that they gave eaſy credit to falſe tales, and received, without due examination, ſuppoſititious writings, which they obtruded upon others, and to which they referred as ſufficient authorities. Nor is it poſſible to exculpate them from the charge of having made uſe of, and even juſtified, diſhoneſt acts and pious frauds, after the example of their adverſaries. Beſides, the ſtyle in which their works are written is, for the moſt part, tumid and puerile; and in ſearch of the dazzling ornaments of falſe eloquence, they ſoon loſt themſelves in the clouds of obſcurity.

Among the cauſes which promoted the corruption of their moral doctrine, we may reckon the practice which they borrowed from the Alexandrian Jews, of affixing an allegorical meaning to the words of ſcripture. Indeed it could not be expected that they ſhould ſucceed better in their interpretation of the ſacred writings, when they undertook to deduce moral doctrines from them without ſtrictly adhering to the rules of ſound criticiſm, and without being accurately acquainted with the general principles of morals. Another principal cauſe of the corruption of the Chriſtian doctrine of morality was, that it was very early tinctured with the enthuſiaſtic ſpirit of the Alexandrian philoſophy. To this ſource we are to trace back the numerous adulterations of the ſimple morality of the New Teſtament, which are to be found in the “Shepherd of Hermas,” and in the writings of Juſtin Martyr, Irenæus, Athenagoras, and Tertullian. Upon the whole we may obſerve, that the Chriſtian fathers contributed little towards the improvement of true and ſound philoſophy. Through ſeveral centuries they partook of the ſpirit of the Alexandrian ſchool, and the Eclectic method of philoſophiſing platoniſed Chriſtianity. And when, in proceſs of time, the philoſophers themſelves began to forſake Plato and follow Ariſtotle, the Chriſtian fathers preferred the Stagyrite as the more accurate philoſopher. In this preference they were confirmed by the example of the Saracens; and hence aroſe that pernicious corruption, both of theology and philoſophy, the “Scholaſtic ſyſtem.” At the ſame time, the adulterated Platoniſm of Alexandria continued among the Greek Chriſtians, and produced the “Myſtic Theology.”

The Chriſtian fathers, from the beginning of the ſecond to the ſeventh century, may be divided into two claſſes: thoſe who flouriſhed before, and thoſe who flouriſhed after, the inſtitution of the Eclectic ſect. The firſt claſs commences with Juſtin Martyr; the ſecond with Origen. The apoſtolic fathers, who had derived their knowledge of Chriſtianity, and their habits of thinking, from the apoſtles and evangeliſts, manifeſt, in their genuine writings, few traces of the Grecian or Alexandrian philoſophy. But, when men who had been educated in the Pagan ſchools became converts to the Chriſtian faith, they brought with them their philoſophical ideas and language, and aſſociated them with the doctrine of Chriſtianity. Among theſe Chriſtian philoſophers, the firſt, and moſt celebrated, was Juſtin Martyr, who blended Platonic notions and language with the ſimple doctrine of Chriſtianity, and wrote concerning God and divine things like a Chriſtian Platoniſt. Tatian was his diſciple; and his apology for Chriſtianity, entitled, “Oratio ad Græcos,” every where breathes the ſpirit of the Oriental philoſophy, and the whole tenor of it concurs with his hiſtory to prove, that he was a Platonic Chriſtian. We may alſo rank among the Platoniſing fathers Theophilus of Antioch, Athenagoras, Irenæus, Tertullian, and Clemens Alexandrinus. To theſe we may add, among thoſe who flouriſhed after the eſtabliſhment of the Eclectic ſyſtem, Origen, Anatolius of Alexandria, Arnobius, Euſebius Pamphilus, Didymus of Alexandria, Auguſtine, Syneſius, an African biſhop, and others, who chiefly flouriſhed in the eaſtern countries. In the weſtern world appeared Claudianus Mamertius, Boethius, Æneas Gaza, Zacharias, Philoponus, and Nemeſius. See Brucker's Hiſt. of Phil. by Enfield, vol. ii.

FATHER is alſo a title of honour given to prelates and dignitaries of the church. The right reverend father in God, lord Biſhop of, &c. “Ab curæ ſimilitudine patres appellantur.”

FATHER is alſo applied to the ſuperiors of convents, &c. (See ABBOT.) The father-general; father-provincial, ex-provincial; father prior, ſub-prior; father definitor, in the order of Benedictines; father guardian, in that of the Franciſcans; father corrector, among the Minims, &c.

FATHERS is alſo applied plurally to all congregations of eccleſiaſtics, whether regular or ſecular; as the fathers Cordeliers, Capuchins, Auguſtins, Jacobins, &c. The fathers Jeſuits, fathers of the Oratory, Barnabites, Theatins of the Miſſion, &c. See each under the proper article.

FATHERS *of the Chriſtian Doctrine* is a denomination belonging to two religious orders: one inſtituted in France by Cæſar de Bus, and confirmed in 1597 by Clement VIII. and another in Italy founded by Cuſani, a Milaneſe knight, and eſtabliſhed by the authority of Pius V. and Gregory XIII.

FATHERS *of Somaſquo*, or *regular clerks of St. Maieul*, is the appellation of a religious order deduced from the name of the place where their founder reſided. It was firſt formed into a diſtinct ſociety by Jerome Æmiliani, a noble Venetian, and confirmed by Paul III. and Pius IV. in 1540 and 1563. Their office was the inſtruction of the young and ignorant, and the relief of orphans.

FATHERS is alſo uſed for perſons venerable for their age or quality, or the ſervices they have done the public.

Thus, at Rome the ſenators were called *conſcript fathers, patres conſcripti*, &c.

Father-*Laſher*, in *Ichthyology*, an Engliſh name given to a fiſh, called by ſome authors, though improperly, *ſcorpæna*, and *ſcorpius marinus*. It is properly of the cottus kind. See Cottus *Scorpius*.

FATHIMITES, or Fathemites, the deſcendants of Mahomet by Fathima, or Fathema his daughter.

The dynaſty of Fathimites, *i. e.* of princes deſcending in a direct line from Ali and Fathima his wife, Mahomet's daughter, commenced in Africa in the year of the Hegira 296, of Jeſus Chriſt 908.

The Fathimites afterwards conquered Egypt, and eſtabliſhed themſelves therein in quality of caliphs.

The Fathimites of Egypt ended with Abed, in the year of the Hegira 567, 268 years after their firſt eſtabliſhment in Africa, and 208 years after the conqueſt of Egypt.

FATHOM, in *Rural Economy*, is a long meaſure, which compriſes ſix feet, being taken from the utmoſt extent of both arms, when fully ſtretched out into a right line. It is made uſe of in the meaſurements of mines, quarries, wells, and pits.

This meaſure is chiefly uſed at ſea, or by ſeafaring people, for expreſſing depths of the ſea, lengths of cables, &c. It is hardly ever uſed on land, except ſometimes by miners.

The length of the fathom formerly differed a little, according as it was uſed on veſſels of greater or leſs ſize. Thus in the old edition of Chambers's dictionary, the following explanation is given. "There are three kinds of fathoms accommodated to the different ranks of veſſels. The firſt, which is that of men of war, contains ſix feet. The middling, or that of merchant ſhips, five feet and a half; and the ſmall one, uſed in fluyts, fly-boats, and other fiſhing veſſels, only five feet."

At preſent, however, the meaſure of a fathom is univerſally conſidered as being equal to ſix feet exactly.

Fathom is alſo uſed in ſeveral countries, particularly Italy, for the common yard or ell, whereby things are ordinarily meaſured in commerce.

In this ſenſe it is more commonly called *brace* or *braccio*, *q. d.* arm. In Muſcovy the fathom contains ſeven Engliſh feet, and about one-tenth of an inch.

Fathom-*Tale*, in *Mining*, is a term for work, let to workmen by the fathom meaſure in length, as the driving of ſoughs and levels generally is.

Fathom is a meaſure equal to two yards, or ſix feet in length, in general correſponding with the French toiſe, whereby the ſcale of military meaſures in that country is generally regulated. The French foot being nine lines, or about $\frac{2}{31}$ parts longer than the Engliſh, requires, that in eſtimating the fortifications, and other buildings, &c. of that quarter, we ſhould in general terms make an allowance of about one foot in fifteen and a half, for an exceſs on their part. Therefore, when we ſay that the line of defence of a French fortreſs meaſures 155 toiſes French, it will, according to our ſcale, give full 165 Britiſh fathoms, ſuch as are commonly in uſe throughout our marine. This meaſure has given riſe to a term now perfectly familiar among us, namely, "to fathom the depth of water," &c.; meaning, to aſcertain how many fathoms it may meaſure from the ſurface to the bottom. We have likewiſe a derivative expreſſion, whereby the word fathom is applied metaphyſically; thus, we ſay, "there is no fathoming that fellow's thoughts;" meaning, that he is too deep for us to get to the bottom of his deſigns.

FATIABAD, in *Geography*, a town of Hindooſtan, in the ſoubah of Agra, built in 1041 by Modoud, king of Ghizni; 15 miles S.S.E. of Agra.—Alſo, a town of Hindooſtan, in the circar of Hiſſar; 57 miles W. of Hiſſar.

FATIAH, a town of the Arabian Irak, on the Euphrates; 15 miles S.W. of Korna.

FATNESS, in *Medicine*. See Corpulency.

FATO, in *Geography*, a ſmall iſland on the eaſt ſide of the gulf of Bothnia. N. lat. 63° 52′ E. long. 22° 44′.

FATSISIO, an iſland of Japan, about 80 miles from the ſouth coaſt of the iſle of Niphon, whither the emperor baniſhes the grandees who have offended him, to be employed in making ſilk ſtuffs embroidered with gold. The iſland is barren, and almoſt inacceſſible. N. lat. 33° 40′. E. long. 140° 10′.

FATTALAGUNGE, a town of Hindooſtan, in Oude; 20 miles S.E. of Sumbul.

FATTAPOUR, a town of Hindooſtan, in Oude; eight miles W. of Karabad.

FATTECONDA, a town of Africa, in Bornou. N. lat. 14° 20′. W. long. 10° 20′.

FATTENING, in *Rural Economy*, the art or proceſs of rendering any ſort of animal fat, or fit for food. It is a buſineſs in which much care and circumſpection are requiſite, as well as conſiderable knowledge of the nature of animals.

Fattening *of Cattle*, the means of preparing them for the purpoſe of the butcher. It is a proceſs which is capable of being accompliſhed in ſeveral different methods, but the moſt uſual is that of grazing them in rich feeding paſtures. It is likewiſe effected by keeping them in warm convenient houſes, or ſheds, and feeding them regularly with oats and other ſorts of grain, either ground or in the ſheaf; different kinds of roots, as common and Swediſh turnips, carrots, parſnips, potatoes, &c. with ſome ſort of dry food; and by the uſe of oil-cake in the ſame manner. Theſe modes are termed ſtall-feeding, from the animals being kept up in the ſtalls; and there is much advantage in keeping the houſes properly dry and warm, and the troughs for the food perfectly clean and ſweet. It is alſo eſſential that the food ſhould be given them in a regular manner, in ſuitable proportions, and properly varied, where different ſorts are employed. See Stall-*Feeding*.

This applies equally to neat cattle and ſheep; but the fattening of early lambs, and of calves, is moſtly accompliſhed by the ſuckling of them. See Calf-*Suckling*, and House-Lamb *Suckling*.

Fattening *of Colours*, among *Painters*, denotes a coagulation of the oil, which frequently happens on its being mixed with ſeveral kinds of pigments; whence, after being kept for ſome time, it is rendered of ſo viſcid or glutinous a conſiſtence as to be wholly incapable of being worked with either bruſh or pencil. This alſo happens ſometimes after the colours have been ſpread or laid on the proper ground: in which caſe, one part of the oil will run off in ſmall ſtreams or drops, while the other will remain with the colour, without ſhewing the leaſt tendency to dry. Oils likewiſe will fatten by long keeping, or by being expoſed for a conſiderable time to the ſun and air.

Fattening *of Horſes*. See Horses.

FATTIK, in *Geography*, a town of Africa, and capital of the kingdom of Joali. N. lat. 14°. E. long. 16° 48′.

FATTIKO, a town of Africa, in the kingdom of Jemarrow.

FATTIPOUR, or Fatepour, a town of Hindooſtan, in the ſoubah of Agra, anciently called "Sikari," but on being rebuilt by Acbar changed its name. It was once a magnificent city, but is now in a ſtate of decay; 28 miles W. S. W. of Agra. N. lat. 27° 10′. E. long. 78° 8′.—Alſo, a town of Hindooſtan, in Oude; 35 miles W.S.W.

of Lucknow.—Alſo, a town of Hindooſtan, in the circar of Nagore; 25 miles N.W. of Didwana.—Alſo, a town of Hindooſtan, in Bahar, on the Gunduck; 30 miles N.N.W. of Patna.

FATTY-KAN-DURGA, a town of Hindooſtan, in Moultan; 35 miles N.N.W. of Moultan.

FATUARII, in *Antiquity*, were perſons who, appearing inſpired, foretold things to come.

The word is formed of Fatua, wife of the god Faunus, who was ſuppoſed to inſpire women with the knowledge of futurity, as Faunus himſelf did the men. Fatua had her name from *fari*, q. d. *vaticinari*, *to propheſy*.

FATUUS IGNIS. See IGNIS *Fatuus*.

FAVAGNANA, or FAVOGNANA, in *Geography*, an iſland in the Mediterranean, about 7 miles in circumference, near the W. coaſt of Sicily; anciently called *Æguſa*, or *Capraria*. It has good anchorage in a convenient harbour, and ſome years yields from its fiſheries 80,000 livres. N. lat. 38°. E. long. 12° 25′.

FAVALLI, in *Biography*, an Italian ſinger, with a ſoprano voice. He ſeems to have been the firſt ſinger of that country and kind who made any impreſſion on French ears. He was ſo beloved by Louis XIV. for his fine voice, and the pleaſure which his ſtyle of ſinging gave that monarch, that he permitted him to ſhoot in the royal manors, and even in the park at Verſailles. He firſt arrived in France in 1674, and his powers ſeem to have been miraculous.

FAVANT, LA, in *Geography*, a river of Naples, which runs into the ſea, 9 miles S.S.E. of Squillace.

FAVARA, a river of Sicily, which runs into the Mediterranean, about 5 miles S. of Modica.—Alſo, a town of Africa, in the country of Barca; 30 miles E.S.E. of Derna.—Alſo, a town of Sicily, in the valley of Noto, on a river of the ſame name; 10 miles W. of Noto.

FAVAROTA, a town of Sicily, in the valley of Mazara; 15 miles W.N.W. of Palermo.

FAVART, CHARLES SIMON, in *Biography*, one of the moſt agreeable and pleaſing lyric French poets of the laſt century. He was born at Paris in 1710, educated in the Jeſuits' college, and gave very early ſpecimens of a happy diſpoſition for French verſification. At twenty years of age he compoſed a poem on the Floral games, and was crowned. Many beautiful ſtanzas of his writing were already in circulation. Upon the merits of theſe juvenile pieces he was engaged at the comic opera. "La Chercheux d'Eſprit, or Nicette in ſearch of Wit," which had been preceded by many other comic operas, were ſo favourably received, as to fix his reputation. His "Chercheux d'Eſprit" being regarded as a maſter-piece in its kind, the royal academy of muſic, or the great opera, claimed his talents, and he produced for that theatre the ballet of "Don Quixot." (See BALLET.) In 1744 he married the daughter of a muſician in the band of Staniſlaus, king of Poland, Juſtina de Roncerai, who by a conſtant ſucceſs was one of the principal ſupports of the comic opera. Her talents of different kinds, acting, ſinging, playing on the harp, and dancing, all by turns, ſhe exhibited with equal grace and perfection. We ſaw her in the part of Roxalana in the "Three Sultanas," at near 60, act, look, ſing, romp and dance (with her *petit nez retrouſſé*,) with as much ſeeming vivacity as if ſhe had been only 16. Her various eſtimable talents and conduct juſtified the choice of an author as eminent for the delicacy of his taſte as the decorum and propriety of his manners. He ſignalized his zeal on every intereſting occaſion for his country, and was employed by the court at different feſtivals, and honoured with the title of maſter of the revels, with a penſion of 1000 livres. "At the peace of 1762 he wrote, by order of the government, a piece of one act, for the theatre François, called "l'Anglois a Bourdeaux;" and the celebrated madame D'Angerville, who had quitted the ſtage, returned to play the principal part. The ſucceſs of this work was crowned by his being preſented to the king, who conferred on him another penſion. Men of letters diſcovered in the "Engliſhmen at Bourdeaux" the agreeable author of "Ninette á la Cour," and the "Three Sultanas," and regretted that theatrical etiquette forced him to laviſh on the Italian ſtage talents worthy of the French. The connoiſſeurs have never been ſo unjuſt as to attribute to him the works of others, particularly as he has always with ſcrupulous delicacy informed the public of any aſſiſtance he might have received from his intimate friends. He was the firſt who tried to teach us to liſten to Italian muſic. In adapting it to French words, Philider aſſiſted him, and they ſucceeded. The purity and elegance of his ſtyle, with the gaiety of his ſentiments, are the principal characteriſtics of this amiable author." Laborde.

FAUCHET, CLAUDE, was born at Paris about the year 1529. He was made preſident of the "Cour des Monnoies," an office which he was obliged to ſell to pay his debts. From Henry IV. he obtained a penſion, with the title of hiſtoriographer. He was an able antiquarian, and well verſed in all books relating to the ſubject, making himſelf ſome important additions to the ſtock. He died in 1601, leaving behind him (1) "Antiquités Gauloiſe et Françoiſes," in two parts: the firſt brings down the hiſtory of Gaul to the arrival of the Franks: the ſecond from Pharamond to Hugh Capet. (2) "A Treatiſe on the Liberties of the Gallican Church." (3) "A Treatiſe on the Origin of Knights, Coats of Arms, and Heralds." (4) "Origin of the Dignities and Magiſtrates of France." His works were collected and publiſhed in 4to. at Paris in 1610. Moreri.

FAUCIGNY, or FAUSSIGNY, *Barony of*, in *Geography*, a province of Savoy, bounded on the N. by the territory of Chablais, on the E. by the Valais, and the duchy of Aoſta, and on the S. and W. by the Genevois. Wood and paſture form the principal riches of this country. It is divided into Upper and Lower; the chief towns of the former are Salanche, Samoens, Taninge, and Flumet, and thoſe of the latter are Cluſe, Bonne, and Bonne Ville. This province now belongs to France, and conſtitutes part of the department of the Leman.

FAUCOGNEY, a town of France, in the department of the Upper Saone, and chief place of a canton in the diſtrict of Lure; 9 miles N. of Lure. The place contains 983 and the canton 10,205 inhabitants, on a territory of 200 kiliometres and in 17 communes.

FAUCON, or FALCON, in *Gunnery*, a name formerly given to a ſmall piece of cannon, whoſe diameter was $2\frac{3}{4}$ inches; weight, 750 pounds; length, 7 feet; load, $2\frac{1}{4}$ pound; ſhot, $2\frac{1}{2}$ inches diameter; and $2\frac{1}{2}$ pounds weight. See CANNON.

FAUCONCOURT, in *Geography*, a town of France, in the department of the Voſges; 4 miles N.W. of Ramberviller.

FAUCONET, or FALCONET, in *Gunnery*, a very ſmall piece of ordnance, whoſe diameter at the bore was $2\frac{1}{4}$ inches; weight, 400 pounds; length, 6 feet; load, $1\frac{1}{4}$ pound; ſhot, ſomething more than two inches diameter; and $1\frac{1}{8}$ pound weight. See ORDNANCE and GUN.

FAUD, in *Agriculture*, a provincial term employed in ſome places to ſignify a truſs of ſhort-ſtraw, or as much as the arms are capable of folding.

FAVELONE, in *Geography*, a river of Naples, which runs into the ſea, 4 miles from Squillace.

FAVENTIA, in *Ancient Geography*, a town in the S.E. part of Gallia Ciſpadana. See FAENZA.

FAVERGES, in *Geography*, a town of France, in the department of Mont Blanc, and chief place of a canton in the diſtrict of Annecy. The place contains 2,156, and the canton 12,143 inhabitants, on a territory of 240 kiliometres, and in 16 communes.

FAVERNEY, a town of France, in the department of the Upper Saone; 7 miles N. of Veſoul. N. lat. 47° 46′. E. long. 6° 11′.

FAVEROLLE, a town of France, in the department of the Marne; 12 miles W. of Rheims.

FAVEROLLES, a town of France, in the department of the Cote d'Or; 12 miles E. of Chatillon-ſur-Seine.

FAVERSHAM, a market town in the hundred of the ſame name, and county of Kent, England, is ſituated on a navigable arm of the river Swale, and conſiſts principally of four ſtreets, forming an irregular croſs, in the centre of which is the Guildhall and market place. Though a borough by preſcription as well as charter, it does not appear ever to have been ſummoned to return members to parliament; it has, however, been the place of meeting of a Wittanegemot, or Council of the Wiſe Men, aſſembled by king Athelſtan, about the year 930, "to enact laws, and conſtitute methods for the future obſervance of them." At that time, and long before, the town formed part of the royal demeſnes; and from the high value of the market and appendages, as ſtated in the Domeſday record, it appears to have been then a place of conſiderable reſort and traffic. In 1147, king Stephen founded an abbey here for Cluniac monks, to whom he granted large endowments and privileges, which were confirmed by ſucceſſive ſovereigns: the abbots ſat in twelve parliaments, in the reigns of Edward I. and II.; and the abbey poſſeſſed the right of ſanctuary, which appears to have been attached even to the pariſh church, from the time of the diſſolution till the reformation. The ſurrender of the abbey eſtates was ſtrenuouſly oppoſed by the abbot and monks; but reſiſtance being vain, the deed was ſigned July 8, 1538; the groſs revenues of the abbey at that time were ſtated to be 355*l.* 12*s.* 2*d.* annually; the nett income 286*l.* 12*s.* 6½*d.* The buildings were extenſive and numerous, but moſt of them have been long deſtroyed; the two entrance gateways remained till the middle of the laſt century, when they were taken down on account of their ruinous ſtate.

Faverſham has been an appendage to the port of Dover from a very remote period; its cuſtomary proportion of aid was one ſhip for forty days annually. At the ſiege of Calais, however, in the time of Edward III., this town furniſhed two ſhips and fifty-three mariners. This connection with the Cinque Ports may probably account for the diſtinguiſhed privileges and charters (ſcarcely to be equalled by any town in the kingdom) which Faverſham has immemorially been favoured with by different ſovereigns. The charter under which it is ſtill governed was granted by Henry VIII., A.D. 1545; the juriſdiction is thereby veſted in a mayor, twelve jurats, (the mayor being one,) twenty-four commoners, a ſteward or recorder, a town clerk, and two chamberlains.

"Faverſham," ſays Leland in his Itinerary, "is encluded yn one paroche, but that ys very large. Ther cummeth a creeke to the towne that bareth veſſels of xx tunnes; and a myle fro thens north-eſt, is a great key, cawled Thorn, to diſcharge bigge veſſels. The creeke is fedde with bakke water, that cummeth fro Oſpring." In the ſurvey of maritime places in Kent, made in the reign of Elizabeth, this town is ſtated as having 380 inhabited houſes; 18 ſhips or veſſels, from five to forty-five tons burthen; and 50 perſons occupied in merchandize and fiſhing. The quay, called the Thorn, mentioned by Leland, has long been out of uſe; but its place has been ſupplied by three new quays or wharfs, formed cloſe to the town, where all the ſhipping belonging to the port take in and diſcharge their cargoes. Since Leland's time great improvements have taken place in the navigation of the creek; and veſſels of eighty and an hundred tons burthen can now come up to the town at common tides; whilſt, at ſpring tides, the channel is deep enough for ſhips drawing eight feet water; the corporation are inveſted with the management of the navigation, the expence being defrayed by port-dues of very ancient eſtabliſhment. Upwards of 40,000 quarters of corn are annually ſhipped here for the London markets; hops, fruit, wool, oyſters, &c. are alſo ſent in conſiderable quantities from this port, to which above thirty coaſting veſſels (excluſive of fiſhing ſmacks) belong, of from 40 to 150 tons burthen; the imports are principally coals and fir timber, iron, tar, &c. from Sweden and Norway. A branch both of the exciſe and of the cuſtoms is eſtabliſhed here; the former under the direction of a collector, ſurveyor, and other officers; the latter under a ſuperviſor and aſſiſtants. The oyſter fiſhery of Faverſham is a very extenſive concern, and forms the principal ſource of its trade, affording ſupport to upwards of an hundred families. Here, as at Milton and Rocheſter, the native broods fall very ſhort of the conſumption; and vaſt quantities of ſpat or eggs are annually collected from different parts of the ſurrounding ſeas, even as diſtant as the Land's End in Cornwall, and the coaſts of Scotland and France, and placed in the beds belonging to this fiſhery, there to increaſe and fatten.

The company of the "free-fiſhermen and free-dredgermen of the hundred and manor of Faverſham" are under the immediate protection and juriſdiction of the lord of the manor, as tenants thereof; and he appoints a ſteward to hold two annual courts, called admiralty, or water, courts, for the neceſſary regulations of the fiſhery. No perſon is admitted as a free dredger unleſs he has ſerved an apprenticeſhip of ſeven years to a freeman, and is married. The right of the fiſhery was anciently an appurtenance to the manor of Milton, but was ſeparated from it by king John, and granted, with the property of the grounds, to Faverſham abbey; in that grant the company of free-dredgers of Faverſham is firſt mentioned, but it is generally ſuppoſed to have exiſted from time immemorial. Before the war, Faverſham oyſters, to the amount of between 3000*l.* and 4000*l.* were annually exported to Holland. The only manufacture carried on in the vicinity of Faverſham is that of gun-powder, which is under the ſuperintendance of a branch of the ordnance eſtabliſhed here, the principal officers of which are a ſtorekeeper, a clerk of the cheque, and a maſter fireworker, who all have reſpectable houſes. The various mills, ſtorehouſes, &c. are chiefly ſituated on the ſtream that flows from Oſpringe, and forms ſeveral ſmall iſlands in its courſe to the Faverſham creek. This manufacture is ſuppoſed to have been eſtabliſhed here prior to the reign of Elizabeth; but it was a private concern, and ſo continued till about the year 1760, when the reſpective works were purchaſed by government, and ſoon afterwards were rebuilt in a more ſubſtantial and ſafe manner. Not all the care that can be exerted is, however, ſufficient to prevent accidents by the occaſional ignition of the powder. The moſt dreadful exploſion that has occurred took place in April 1781, when the corning-mill and duſting-houſe were deſtroyed by the blowing up of about 7000 pounds of powder, which ſo impregnated the air with ſulphur, for many miles round, as greatly to affect reſpiration. The quantity of powder annually manufactured here is computed at between 12 and 13,000 barrels: the perſons employed are nearly 400.

The church of Faverſham is a ſpacious and handſome edifice, built of flint, in the form of a croſs, and coigned with ſtone. It conſiſts principally of a nave, with aiſles, chancel, and tranſept, with a light tower at the weſt end, ornamented with pinnacles, and terminated by an octagonal ſpire, 73 feet high. On the north ſide of the church-yard is a free grammar-ſchool, founded in the 18th year of queen Elizabeth, and endowed with certain lands then in the poſſeſſion of the crown, but which had been given in the 18th of Henry VIII. to the abbey of Faverſham, by Dr. Cole, a Kentiſhman, warden of All Souls' college in Oxford, for the "maintenance of a ſchool, wherein the novices of the abbey were to be inſtructed in grammar."

The town has been greatly improved within the laſt 40 years; in 1773 a ſpacious avenue was formed, by which it was laid open to the high London road. The contiguous roads have ſince been rendered more commodious. The ſtreets alſo have been new paved and lighted, under an act of parliament obtained in 1780. Faverſham is ſituated 48 miles diſtant from London: has two annual fairs, and two markets, well ſupplied with all kinds of proviſions, on Wedneſdays and Saturdays; and was returned under the act of parliament in 1801 as containing 570 houſes, inhabited by 3364 perſons.

Among the eminent natives of this town, ſeveral were ſurnamed de Faverſham: of theſe Hamo de Faverſham was a learned Franciſcan friar, who became provincial of his order, and died in Italy, at an advanced age, in the year 1244; and Simon de Faverſham was chancellor of the univerſity of Oxford about 1304. The celebrated muſician, Dr. John Wilſon, was alſo born in this town, in 1595. Haſted's Hiſtory of Kent.

FAUFEL, in *Botany*, Cluſ. Exot. 187. See ARECA, ſp. 1.

FAUGELAI, in *Geography*, a town of Egypt, on the right bank of the Nile.

FAUGH, in *Agriculture*, a term uſed provincially to ſignify a fallow, or land lying in the ſtate of tillage without being cropped. It likewiſe implies land which is repeatedly ploughed over without any intervening crops. It is moſtly made uſe of in the more northern parts of the iſland, and frequently written *fauf*.

FAUGHAN, or FAHAN, in *Geography*, a river of the county of Londonderry, Ireland, which riſes in the mountains ſeparating that county from Tyrone, and winding to the weſt receives a conſiderable addition from the Glenrandle river near Clady. It afterwards takes a north-eaſtern direction, and being navigable for ſmall craft ſcarcely one mile, runs into Lough Foyle, not far from the place where the river Foyle alſo runs into it. Sampſon's Londonderry.

FAVIDA, an iſland in the gulf of Georgia, diſcovered by the Spaniards in the year 1791, near the W. coaſt of North America, from which it is ſeparated by a channel, called "Canal del Nueſtra Signora del Roſario," 30 miles in length from N.W. to S.E. and from 2 to 5 in breadth. The N.W. point is named Point Marſhal, and the S.E. point, Point Upwood.

FAVILLÆ SALIS, in *Natural Hiſtory*, a name given by Vitruvius, and ſome of the more ancient writers, to the nitrum or nitre of the ancients. Our chemical writers, who have been uſed to delight much in hard names, have applied the ſame phraſe to expreſs our nitre; but this is a very different ſalt from the other.

FAVISSA, among *Antiquaries*, a hole, pit, or vault, under ground, wherein is kept ſomething of great value.

The word ſeems formed of *foviſſa*, a diminutive of *fovea*, *a pit* or *ditch*.

The faviſſa, according to A. Gellius and Varro, was much the ſame with what the ancient Greeks and Romans called θησαυρος, *theſaurus*, and what in ſome of the modern churches is called *archives* and *treaſury*. In the Capitol there were divers faviſſæ. They were ſubterraneous places, walled and vaulted, having no entrance or light but by a hole at the top, which was uſually ſtopped up with a huge ſtone.

They were chiefly deſtined for keeping the old worn ſtatues and other ancient moveables formerly uſed in the temple; ſo religiouſly did that people reſpect and preſerve whatever was conſecrated. Catullus would have lowered the floor of the Capitol, but that the faviſſæ prevented him.

Feſtus, however, gives us a different account of the faviſſæ. According to that author they were wells or pits of water near the temples, and for the uſe thereof, the ſame with what the Greeks called ομφαλος, *navel*, as being round, &c. Gellius likewiſe gives them the name of ciſterns, as well as Feſtus; but it is apparently for no other reaſon than that they bore a reſemblance to them in figure.

In effect, the two notions are pretty eaſily reconciled; it being certain that the treaſuries of ſome of the ancient Greek temples were the ciſterns or reſervoirs of water wherein people uſed to waſh themſelves before they entered the temple.

FAULBACH, in *Geography*, a town of Germany, in the county of Wertheim; 3 miles W. of Wertheim.

FAULQUEMONT, a town of France, in the department of the Moſelle, and chief place of a canton in the diſtrict of Metz, near the river Nied; 16 miles E. of Metz. N. lat. 49° 3′. E. long. 6° 40′. The place contains 1,050, and the canton 13,555 inhabitants, on a territory of 250 kiliometres and in 35 communes.

FAULT, in *Mining* and *Geology*, is a term pretty generally uſed for the fiſſures which are found dividing the meaſures or ſtrata of the earth, which form one of the moſt curious and important facts that the cruſt or ſurface of the earth preſents. The great prevalence of faults, and the important interruption which they ſometimes give to mining, have occaſioned them to be noticed by the practical miners of every diſtrict; and, as is too often the caſe, they have received from them a great number of different names, in different diſtricts, or according to the mode in which they appear to affect the vein or ſeam which they are working. In the courſe of our reading or practice we have met with all the following names for faults; *viz*.

Break
Breaſt
Cleft
Crack
Depreſſion
Dip-dyke
Down-caſt
Down-leap
Down-trap
Dyke
Fall
Fault
Fiſſure
Flooking
Gaſh
Gaw
Gulph
Hitch
Horſe
Jump
Knot
Leap-up
Leap-down
Let-down
Load
Lum
Mare
Mear
Ridge
Rift
Riſe-dyke
Shake
Shift
Slip
Trap-down
Trap-up
Trouble
Up-caſt
Up-leap
Up-trap
Vein
Wam.

and probably others! Doubtleſs there are ſome which we never heard or met with. The above liſt ſtrongly ſhews the neceſſity for a reform in the language of mining. That faults are real breaks or mechanical fractures of the ſtrata, no one who has ever ſeen and examined one can poſſibly doubt; and ſince the worn ſtate of their ſurfaces, or of the edges of the ſtrata which they ſeparate, has been attended to, there cannot remain a doubt but moſt of them have had a ſliding motion, or formed the vertical junction between two maſſes of ſtrata, which often ſlid or ground forcibly againſt each other, as Mr. Farey has obſerved, and which gave the firſt riſe to a new theory on this and many other points in geology. (Philoſophical Magazine, vol. xxx. p. 258.) The direction of faults ſeldom differs greatly from a perpendicular to the planes of the ſtrata, which they interſect, although they are ſometimes much inclined to the perpendicular to the horizon. They generally proceed in ſtraight lines, or nearly, until they interſect into other faults, which they never fail to do. The quantity of the ſink, or riſe, on one ſide, compared with the other, is ſeldom the ſame for any great length of the ſame fault, but it decreaſes one way, until the meaſures on the two ſides will at a certain place be found to match; and it is believed, that in ſome places, where the fault continues forward, that the ſame is reverſed, and the ſide which before had the meaſures the higheſt, now has them the loweſt, and increaſingly ſo. On the contrary, if a fault be purſued in the direction in which it increaſes the derangement of the meaſures, a point will be found, where it either terminates by interſecting into another, or croſs fault, or ſhould it continue its firſt direction, in which it will begin to decreaſe, and perhaps continue to do ſo until the meaſures ceaſe to have any derangement in their levels, but are merely ſeparated by a fiſſure; and where, if a croſs fault occurs, the ſame may be ſaid to terminate, and actually does ſo, againſt the ſolid face of the meaſures on the oppoſite ſide of the croſs fault in ſome inſtances. It is believed by ſome, that the principal faults generally take the ſame direction as the ſlines, or natural joints, by which the rock is divided into blocks, in which caſe they are ſaid by the quarry-men or miners to agree with the face of their work. In mineral diſtricts it is certain that the faults are much influenced in their directions by the mineral veins, which are of older formation, and that the principal ones follow the veins, dividing the matters they contain into two parts, and when the fracture has happened through the rib of ore, the ſame is in a very curious manner poliſhed, as Mr. Whitehurſt obſerves, under the name of *ſlicker-ſides*, which ſee. This preference of the faults for the mineral veins has occaſioned moſt of the cliffs or facades in the denudated mineral diſtricts of Derbyſhire and Staffordſhire to happen at the ſide or ſkirt of the vein; and in ſome inſtances conſiderable veins of ore have been worked at the foot of ſuch cliffs, as at Middle-peak, Runtor and Yoke-cliff veins near Wirkſworth. It ſeems ſurpriſing, that circumſtances ſo extraordinary and important as attend the faults ſhould have engaged ſo little of the attention of the writers on mining and geology as we find by their works. Mr. William Martin, though in moſt reſpects a very accurate obſerver, in his recent work, "Outlines of the Knowledge of Extraneous Foſſils," p. 372, conſiders mineral veins and faults as having the ſame origin, and indeed almoſt confounds them together.

It is neceſſary to obſerve, reſpecting the term fault, and many others in the above liſt, that they not only mean the fiſſure or ſeparation itſelf, and the derangement of the ſtrata occaſioned thereby, but alſo are applied to the ſolid and extraneous matters with which the fiſſure or fault is in general filled; for it often happens that the fiſſure is of ſome width, ſometimes many yards, and is wedged quite full of matter, generally clay, with ſome mixtures of other ſubſtances, and ſometimes angular and rounded ſtones are among theſe. A large portion of the faults are water-tight; and hold up the ſprings of water contained in the ſtrata on one ſide of them. But it is not true, we believe, that water is ever lodged in the fault itſelf, as Mr. Kirwan aſſerts (Geol. Eſſ. 296.), but it frequently happens, that the cutting of a fault by miners, that is, the driving a paſſage through it, or the burſting-in of a thin fault, lets in a great body of water to the mine, which was before pent up in the porous ſtrata and open cracks of the rocks on the other ſide, which has probably occaſioned his miſtake. In the neighbourhood of old mines in particular, the utmoſt precautions are often neceſſary in cutting or even approaching the thin faults, for fear of drowning the miners by a ſudden influx of water.

FAUNALIA, in *Antiquity*, feaſts celebrated by the Romans in honour of the god Faunus.

The deity Faunus, to whom the ſolemnity was devoted, and from whom it was denominated, was the ſame among the Romans with the Pan of the Greeks.

The Faunalia were held on the day of the nones of December; *i. e.* on the fifth day of that month. The principal ſacrifice was a roe-buck; or rather, according to Horace, a kid attended with libations of wine, and burning of incenſe.

It was properly a country feſtival, being performed in the fields and villages, or in the midſt of woods, with peculiar joy and devotion.

Horace gives us a very gay deſcription thereof in the eighteenth ode of his third book:

> " —— Tener pleno cadit hœdus anno:
> Larga nec deſunt Veneris ſodali
> Vina crateræ: vetus ara multo.
> Fumat odore."

Struvius, in his Roman calendar, marks the feaſt of Faunus on the day of the ides of February, which is the thirteenth day of that month; and the Faunalia he places on the fifth of the ides of December, or the ninth of that month; and in chap. ix. he ſhews, that there really were two Faunalia, the one in February, mentioned by Ovid, Faſt. lib. vi. ver. 246. the other on the ninth of December, mentioned by Horace, in the place juſt cited.

FAUNS, Fauni, among the ancients, were a ſpecies of demi-gods inhabiting the foreſts; called alſo Sylvans, Sylvani, and little differing from the Satyrs. They delighted more particularly in vineyards, and they generally appear as attendants of Bacchus, in the repreſentations of Bacchanal feaſts and proceſſions. They were repreſented as half men, half goats, having the horns, ears, feet, and tail of a goat, a very flat noſe, and the reſt human.

The Roman Faunus, we have obſerved, was the ſame with the Greek Pan. Now, in the poets we find frequent mention made of Fauns and Panes in the plural number; in all probability, therefore, the Fauns were the ſame with the Panes.

Though the Fauns were held for demi-gods, yet they were ſuppoſed to die after a long life. Arnobius ſhews that their father or chief, Faunus himſelf, only lived 120 years.

FAVONIUM, in *Botany*, from *favus*, a honey-comb, in alluſion to the appearance of its receptacle after the ſeeds are fallen. Gærtn. v. 2. 431. t. 174. Claſs and order, *Syngeneſia Polygamia-fruſtranea*. Nat. Ord. *Compoſitæ oppoſitifoliæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common Calyx* double; the *external* of many unequal, elliptical, entire, ſpinous leaves, the outer ones much the largeſt; *internal* ſimple, of one leaf, firmly united with the receptacle, bordered with numerous, unequal, ſpinous teeth. *Cor.* compound, radiant; florets of the diſk androgynous, tubular, five-cleft, regular: thoſe of the radius neuter, ligulate, three-toothed. *Stam.* Filaments five; anthers united into a tube. *Piſt.* Germen obovate, crowned; ſtyle rather longer than its own corolla; ſtigmas two, revolute. *Peric.* none, except the permanent calyx. *Seeds* ſolitary, inverſely pyramidal, ſmooth, lead-coloured; crown membranous, of one leaf, cut half-way down into numerous radiating teeth. *Recept.* broad, naked, deeply cellular, the cells irregular, with thick, even, ſmooth edges.

Eſſ. Ch. Receptacle naked, deeply cellular. Down many-toothed. Florets of the radius ligulate. Outer calyx many-leaved; inner many-toothed.

1. F. *ſpinoſum.* (Polymnia ſpinoſa; Linn. Suppl. 384. Choriſtea ſpinoſa; Thunb. Prod. 163. Didelta ſpinoſa; Ait. Hort. Kew. v. 3. 256. Willd. Sp. Pl. v. 3. 2262.) See DIDELTA, where this plant is deſcribed, but from which genus we are now convinced, by Gærtner's remarks, it ought to be removed.

FAVONIUS, among the Romans, the wind which blew directly from the weſt.

FAVORINUS, in *Biography*, a celebrated Platonic philoſopher, who flouriſhed under the reigns of Trajan and Adrian, was born at Arles in Gaul, and ſtudied under Dio Chryſoſtom. He was himſelf profoundly ſkilled in philoſophy, and wrote numerous books on the ſubject. He taught with much reputation at Rome, and at Athens. He was highly reſpected by Adrian, and frequently diſputed with that prince, though not always with the deciſion of a philoſopher. Being once reproached for having tamely given up a point in debate, he replied "are you aſtoniſhed that I ſhould ſubmit to the ſuperior learning of one who has thirty legions of troops at his command?" He is reported to have been an eunuch, and is ſaid to have felt ſurpriſe at three things, *viz.* that being a Gaul, he could ſpeak Greek ſo well;—that being an eunuch, he ſhould have been accuſed of adultery;—that being a ſubject of envy and jealouſy, he ſhould be permitted to have lived ſo long.

FAVORINUS, VARINUS, who flouriſhed in the 16th century, was born near Camerino, a ducal town of Umbria. He ſtudied under Angelo Politian, and John Laſcaris at Florence, and was patronized by Lorenzo the Magnificent. Having determined on an eccleſiaſtical life, he undertook the care of a congregation, and was appointed preceptor to John de Medici, afterwards pope Leo X. Favorinus was appointed keeper of the Medicean library in the year 1512, and two years afterwards his former pupil nominated him to the biſhopric of Nocera; the duties of this high office he performed, ſo as to obtain high and very general reſpect, till his death, which happened in 1537. His principal work, as a literary man, was a Greek lexicon, entitled "Magnum Dictionarium, ſeu Theſaurus Linguæ Græcæ," &c. fol. This work is wholly in Greek, and furniſhes ſcholars with the various explications of words, which are to be found in other lexicons. It has gone through many editions, but the moſt beautiful and correct is ſaid to be that of Venice in 1712. He was author of ſeveral other publications. Moreri.

FAVORITE, in *Ornithology.* See FULICA *flaviroſtris.*

FAVORITO, in the *Italian Muſic*, is an epithet given to ſuch parts of any compoſition as are performed to the greateſt advantage. Thus, choro favorito is a chorus in which are employed the beſt voices and inſtruments to ſing the recitativos, play the ritornellos, &c. This is otherwiſe called the *little chorus*, or *choro recitante.*

FAVOUR, in *Commerce.* See DAYS *of Grace.*

FAVOUR, in *Mythology*, a deified perſon among the ancients, of whom we merely learn, that Apelles made a fine picture of this deity.

FAVOURABLE LAKE, in *Geography*, a lake of N. America, in N. lat. 52° 50'. W. long. 92° 30', which is the ſource of two large rivers, at the mouth of one of which, emptying into Winnipec lake, ſtands the Canadian houſe. The other is the S. W. branch of Severn river.

FAUP, one of the Caroline or New Philippine iſlands, in the Pacific ocean.

FAUQUEMBERQUES, a town of France, in the department of the ſtrait of Calais, and chief place of a canton, in the diſtrict of St. Omer, 11 miles S. W. of St. Omer. The place contains 1,250, and the canton 14,852 inhabitants, on a territory of 182½ kiliometres, and in 24 communes.

FAUQUEMONT, or VALKENBERG, or *Falkenberg*, a town of France, in the department of the Lower Meuſe, ſituated on the Geule; 12 miles W. of Aix-la-Chapelle.

FAUR, GUY DU, *Lord* DU PIBRAC, in *Biography*, an eminent lawyer and man of letters, was born of a diſtinguiſhed family at Toulouſe in 1528. He was educated at Paris, and then went to Italy, to perfect himſelf in juriſprudence. On his return he figured away with high reputation in the parliament of his native city, and was choſen a deputy to the ſtates of Orleans in 1559, at which he had the firmneſs to preſent a memorial of grievances to the king. He was afterwards ſelected as ambaſſador from Charles IX. to the council of Trent, where he ably defended the rights of the Gallican church. In 1565, he was nominated advocate general in the parliament of Paris, and in this capacity he compoſed an apology in Latin, for the infamous maſſacre of St. Bartholomew. He next accompanied the duke of Anjou, afterwards Henry III. when he went to take poſſeſſion of the crown of Poland. He was ſelected to other high diplomatic ſtations, but was at length charged with indulging an amorous paſſion for the queen of Navarre. Some reſpectable writers treat this charge as a mere calumny. He died in 1584, leaving behind him, as memorials of his literary character, "Pleadings and Harangues," "A diſcourſe on the Soul and the Sciences," but his name is chiefly famous for a ſeries of moral maxims in French verſe, entitled "Quatrains;" they are written with elegance and ſpirit, were extremely popular, and have been tranſlated into the Latin, Greek, and modern languages. Moreri.

FAURANO, in *Geography*, a town of Naples, in Lavora; 17 miles E. of Naples.

FAVRE, ANTONY, in *Biography*, was born at Bourg-en-Breſſe in 1557, ſtudied at Paris and Turin, and was raiſed to ſeveral important poſts under the duke of Savoy, and finally was made governor of that country, and all the provinces beyond the mountains. He was alſo preſident of the council of the Genevois for the duke of Nemours. His character for profeſſional knowledge, and ſtrict undeviating integrity, was extremely high, and he might have attained to conſiderable rank in France under Lewis XIII. could he have induced him to quit Savoy. He died in 1624. His works on juriſprudence were publiſhed in ten vols. folio, of which the principal is entitled "Codex Fabrianus." This has been referred to in all the parliaments of France. Moreri.

FAVRE, CLAUDE, lord of Vaugelas, ſon of the preceding, was born in 1585, and early brought up in attendance upon the court. He was made gentleman in ordinary, and afterwards chamberlain to Gaſton, duke of Orleans, whom he followed in all his fortunes, though to the ruin of himſelf and his proſpects. He was a diſtinguiſhed member of the French academy, and devoted his whole leiſure time to the ſtudy of his native language, by which he has perpetuated his name. He publiſhed "Remarks on the French Language," and a tranſlation of "Quintus Curtius." On the latter he is ſaid to have ſpent thirty years, and it accordingly obtained for him a high reputation. Lewis XIII. had ſettled upon his father and family a penſion, the payment of which, however, had ceaſed, but was renewed to Claude, with a view of inducing him to engage in the compilation of the dictionary of the academy. On this occaſion Richelieu ſaid to him, "I hope you will not forget the word *penſion* in your dictionary." "No," my lord, replied Favre, "and ſtill leſs the word gratitude," a delicate, but forcible reproof for the cardinal. Favre died inſolvent in 1650. Moreri.

FAUSSE, *Fr.* in *Muſic*, falſe, out of tune, by being too high or too low. There are falſe voices, as there are falſe ſtrings. It is ſuppoſed that this is occaſioned by a bad ear, but the miſchief is done before the ſound arrives at the ear; and we have known perſons ſing out of tune, who ſtop perfectly well in time on the violin, and who judge very accurately of the intonation of others. It is often from defect of the organ, which is diſobedient to the will of the owner, that falſe intonations occur; *intonationi perfidi*.

FAUSSE-*Bray*, in *Fortification*, is a ſtrong parapet, or a low rampart, formed by a continuation of the revetement of the ſcarp, carried up to ſuch a height, generally about ſeven feet, as ſhould enable the defenders to fire directly into the covert-way, and to obſtruct the aſſailants not only from making any lodgment there, but from attempting the paſſage of the ditch. Theſe are certainly points of importance, and it ſhould ſeem that the fauſſe-bray poſſeſſed in itſelf the means of anſwering every part of its intention; and ſuch, indeed, would probably have continued to be the caſe, were it not that the invention of ricochet-firing, by which the ball is made to lob along the interior of a defence, (ſee ENFILADE and EPAULEMENT) totally diſqualifies the fauſſe-bray from being conſidered a place of ſecurity. Add to this moſt formidable objection, that, where the rampart is furniſhed with a revetement of maſonry, the ſplinters occaſioned by ſuch ſhots as may ſtrike thereon, prove more deſtructive than the open fire of many ſituations apparently more expoſed.

In conſequence of ſuch important defects, modern engineers have totally diſcarded the fauſſe-bray as a defence, though it may be advantageouſly conſtructed in certain inſtances as the only effectual means of preventing the rubbiſh occaſioned by the breaching-batteries of the aſſailants from falling into the ditch, ſo as to afford the means of aſcent. In lieu of a fauſſe-bray, it is now the practice to plant a very ſtrong fence, a few feet diſtant from the foot of the rampart, for the above purpoſe, as well as to conceal ſuch perſons as may have occaſion to paſs along the berm. The defence of the covert way, and of the paſſage of the ditch, is found to be more effectually ſupported by the conſtruction of a low work, called a *tenaille*, (ſee CONSTRUCTION *Military*,) placed before the poſterns in the curtains; and from which the fire is more powerful than that from the flanks; it being more horizontal, and much nearer.

FAUSSE *Chenille*, in *Natural Hiſtory*, a term uſed by Mr. Reaumur, and other of the French writers, to expreſs a large claſs of worms produced from the eggs of ſeveral ſpecies of four-winged flies. Theſe worms have greatly the appearance of caterpillars in their general form, ſo that they have deceived many writers on inſects into an opinion that they were really ſo; but M. Reaumur has ſhewn that they are very different. Hiſt. Inſ. vol. ix. p. 133.

FAUSSE *Quarte*, *Fr.* in *Muſic*, another name for the tritonus, or ſharp 4th. See TRITONUS.

FAUSSET, *Fr.* is that kind of voice which ſings an octave above its natural compaſs, to imitate a boy or a female. A voice on this occaſion reſembles a flute or organ pipe over-blown, or blown with a ſharper current, when it breaks into the octave. See OCTAVE and FALSET.

FAUST, JOHN, in *Biography*, a goldſmith at Mentz, celebrated on account of the ſhare which he had in the invention of the art of printing. It has never been aſcertained to whom we are chiefly indebted for this admirable art. Claims have been made for perſons named Guttemberg and Schœffer, and it has been aſſerted that Fauſt only furniſhed money to Guttemberg to enable him to bring the invention to a ſtate of maturity, he having previouſly, at Straſburgh, made the attempt with carved blocks. Schæffer, who was ſon-in-law to Fauſt, invented punches and matrices. To the firſt work that was printed the names Fauſt and Schæffer are attached; this was entitled "Durandi Rationale divinorum officiorum," 1459. Among other works to which theſe names are attached are the Bible, and two editions of the Pſalter. Theſe were executed with characters engraved on wood, and are now exceedingly rare, and conſidered as maſter-pieces of typography: the characters are cut to imitate the fineſt writing, and the initial letters are printed in three colours, blue, red, and purple. It has been ſaid that Fauſt went to Paris to ſell ſome copies of his bible, and having ſold them at a low price, in compariſon of what was given at that time for manuſcript bibles, and at different rates, his cuſtomers having heard of his mode of printing them, proſecuted him on account of the overcharge. From this period Fauſt never appeared at Paris, and it is thought he died of the plague in the year 1466. Nouv. Dict. Hiſt. See PRINTING.

FAUSTED, in *Mining*, is a refuſe ſort of ore and ſpar, intended to be dreſſed over again.

FAUSTINA BORDONE, in *Biography*, a celebrated female ſinger at the early part of the laſt century; ſhe was a Venetian, and a ſcholar of Michael Angelo Gaſparini of Lucca. She in a manner invented a new kind of ſinging, by running diviſions with a neatneſs and velocity which aſtoniſhed all who heard her. She had the art of ſuſtaining a note longer, in the opinion of the public, than any other ſinger, by taking her breath imperceptibly. Her beats and trills were ſtrong and rapid; her intonation perfect; and her profeſſional perfections were enhanced by a beautiful face, a ſymmetric figure, though of ſmall ſtature, and a countenance and geſture on the ſtage, which indicated an entire intelligence and poſſeſſion of the ſeveral parts ſhe had to repreſent. She firſt appeared, as a theatrical ſinger, at Venice, in 1716, when ſhe performed in the opera of "Ariodante," compoſed by Carl. Fran. Pollarolo. In 1719, ſhe appeared on the ſame ſtage with Cuzzoni and Bernacchi, in an opera compoſed by her maſter Gaſparini. Here ſhe is called Virtuoſa di Camera of the Elector Palatine. In 1722, ſhe ſung in Leo's opera of "Bajazet," at Naples; and, in 1725, we find her at Vienna, where, according to Apoſtolo Zeno, ſhe received great honours, as well as preſents. At the palace of prince Lichtenſtein, ſinging to a great aſſembly, ſhe was preſented with a purſe containing a hundred pieces of gold (ungheri ruſpi), and near as much more at the French ambaſſador's. "But," ſays this poet, "whatever good fortune or encouragement ſhe meets with, ſhe merits it all by her courteous and polite manners, as well as talents, with which ſhe has enchanted and gained the eſteem and affection of the whole court." The ſame author ſpeaks "della bravura di Fauſtina," and the "bella muſica di Porſile," in an opera by the Abate Paſquini, performed at Vienna, 1725; and of the regret expreſſed by the whole court at her quitting that city to go to London. She remained here but two ſeaſons, and then returned to Venice, where, in 1732, ſhe was married to the celebrated Saxon compoſer Haſſe, and ſoon after went to Dreſden, in the ſervice of which court ſhe remained till the year 1756. At the bombardment of that city by the late king of Pruſſia, Haſſe, her huſband, had all his manuſcripts burned, which were to have been printed at the expence of his maſter and patron, the elector.

A late writer upon muſic, of conſiderable merit with reſpect to the preſent times, though frequently erroneous as to the paſt, ſpeaking of the Fauſtina, ſays that her agility of voice has ſeldom been equalled; a matchleſs facility and rapidity in her execution; dexterity in taking her breath, exquiſite ſhake, new and brilliant paſſages of embelliſhment, and a thouſand other qualities contributed to inſcribe her name among the firſt ſingers in Europe.

The Cuzzoni, an exquiſite ſinger in a different ſtyle from that of the Fauſtina, being here at the ſame time, occaſioned ſuch freſh feuds among the nobility and gentry, ſubſcribers to the Royal Academy, as form an era in the annals of muſical conteſts; for ſo diſputable were the talents of theſe two ſingers, that in Handel's opera of "Aleſſandro," the flames of diſcord were kindled to ſuch a height among the frequenters of the opera, and patrons of the art, as to excite a greater degree of enmity than even the theological and political parties of High church and Low, or of Whig and Tory, which then raged in this country.

It was related by the Hon. Mr. Walpole (late earl of Orford) that his mother, the lady of ſir Robert Walpole, had theſe two ſirens at her houſe to ſing in a concert, at which were all the firſt people of the kingdom. She was under the greateſt difficulty how to ſettle the precedence, or prevail on either to relinquiſh the pas, which could only be accompliſhed by renouncing the pleaſure of hearing either of them herſelf: the knot could not be untied, but it was cut, by the following expedient. Lady W. finding it impoſſible to prevail on one to ſing while the other was preſent, took Fauſtina to a remote part of the houſe, under the pretence of ſhewing her ſome curious china, during which time the company obtained a ſong from Cuzzoni, who ſuppoſed that her rival had quitted the field. A ſimilar expedient was practiſed in order to get Cuzzoni out of the room, while Fauſtina performed.

The Fauſtina had a mezzo-ſoprano voice that was leſs clear than penetrating. Her compaſs was only from B flat to G in alt.; but after this time ſhe extended its limits downwards. She poſſeſſed what the Italians call "un cantar granito:" her execution was articulate and brilliant. She had a fluent tongue for pronouncing words rapidly and diſtinctly, and a flexible throat for diviſions, with ſo beautiful and quick a ſhake that ſhe could put it in motion upon ſhort notice, juſt when ſhe would. The paſſages might be ſmooth or by leaps, or conſiſting of iterations of the ſame tone, their execution was equally eaſy to her as to any inſtrument whatever. She was doubtleſs the firſt who introduced, with ſucceſs, a ſwift repetition of the ſame tone. She ſung adagios with great paſſion and expreſſion, but was not equally ſucceſsful, if ſuch deep ſorrow were to be impreſſed on the hearer, as might require dragging, ſliding, or notes of ſyncopation, and tempo rubato.

She had a very happy memory in arbitrary changes and embelliſhments, and a clear and quick judgment in giving to words their full power and expreſſion. In her action ſhe was very happy; and as ſhe perfectly poſſeſſed that flexibility of muſcles and features, which conſtitutes face-playing, ſhe ſucceeded equally well in furious, amorous, and tender parts: in ſhort, ſhe was born for ſinging and acting. The violence of party for theſe two ſingers, Cuzzoni and Fauſtina, was very great.

For, according to Toſi, their contemporary, and a moſt excellent judge of their ſeveral merits, their talents, and ſtyles of ſinging, were ſo different, that the praiſe of one was no reproach to the other. "Indeed, their merit," ſays he, "is ſuperior to all praiſe; for with equal force, in a different ſtyle, they help to keep up the tottering profeſſion from immediately falling into ruin. The one is inimitable for a privileged gift of ſinging, and enchanting the world with a prodigious felicity in executing difficulties with a brilliancy, I know not whether from nature or art, which pleaſes to exceſs. The delightful ſoothing cantabile of the other, joined with the ſweetneſs of a fine voice, a perfect intonation, ſtrictneſs of time, and the rareſt productions of genius in her embelliſhments, are qualifications as peculiar and uncommon, as they are difficult to be imitated. The pathetic of the one, and the rapidity of the other, are diſtinctly characteriſtic. What a beautiful mixture it would be, if the excellences of theſe two angelic beings could be united in a ſingle individual!" (Oſſario ſopra il canto fig.) Are not theſe reflections applicable to the two great ſingers (Banti and Billington) of the preſent time, who have each their excluſive admirers? It is a very ancient remark among muſical critics, that pathetic ſingers have no brilliancy of execution, nor thoſe poſſeſſed of great agility of throat, much pathos. Would it not have afforded more delight to perſons of taſte and diſcernment, to hear two great performers at the head of different ſtyles, than the perpetual ſtruggle of two contending ſirens in the ſame ſtyle? Then, after taking ſides, partiſans have an opinion to defend, which generates diſputes that ſeldom end ſhort of contempt and hatred of each other.

In June, 1772, we found the old Fauſtina and her huſband, the admirable Haſſe, commonly called Saſſoni by the Italians, and their two daughters at Vienna. She was then about 72, but lively, and curious after what was tranſacting in the world. The daughters were very fine ſingers in different ſtyles. On the Fauſtina being aſked to ſing, ſhe cried out: Ah! non poſſo; ho perduto lutte le miei facoltà!" Alas! I am no longer able, I have loſt all my faculties!" This worthy family remained at Vienna till the year 1775, then retiring to Venice, the place of the Fauſtina's nativity where the daughters were well married, ſhe ended her days in 1783, at the great age of 81; and Haſſe died ſoon after, at nearly the ſame age.

FAUSTINO, *St.* in *Geography*, a town of South America, in New Granada; 40 miles N. of Pamplona. N. lat. 6° 55'. W. long. 71° 34'.

FAUTAC, a town on the eaſt coaſt of Madagaſcar. S. lat. 24°. E. long. 47° 45'.

FAUVILLE-EN-CAUX, a town of France, in the department of the Lower Seine, and chief place of a canton, in the diſtrict of Yvetot; 10 miles N. of Caudebec. The place contains 1,346, and the canton 10,956 inhabitants, on a territorial extent of 112½ kiliometres, in 20 communes.

FAUX, *Fr.* in *Muſic*, falſe. See FAUSSE.

FAUX-*Bourdon*, *Fr.* See FALSO-BORDONE, and FABURDEN.

FAUX-*Bourdon*, *baſtard humble bee*, in *Natural Hiſtory*, a name given by Reaumur and other French naturaliſts to the bees uſually called by us drones, and by the common people of that nation bourdons, confounding them with the common humble-bee under that name. See Drone.

Faux *Puceron*, a name given by Reaumur and others to a genus of inſects much reſembling the pucerons in many things, but differing in ſome material circumſtances. The two principal kinds of theſe are found on the back of the leaves of the fig-trees, and in little hollow balls at the ſummits of the branches of box, formed of the upper leaves vitiated by the bitings of theſe creatures.

FAUXVILLERS, in *Geography*, a town of France, in the department of the Forêts, and chief place of a canton in the diſtrict of Neuſchateau. The place contains 938 and the canton 5,841 inhabitants, on a territory of 255 kiliometres and in 14 communes.

FAWKES, Francis, in *Biography*, was born in Yorkſhire about the year 1721. He received his grammar learning at Leeds, whence he was transferred to Jeſus college, Cambridge. He was educated for the church, and preſented to the vicarage of Orpington, with St. Mary Cray, in Kent, by archbiſhop Herring, whoſe death, in 1757, was noticed in an elegy by Mr. Fawkes. In 1761, he publiſhed a volume of poems by ſubſcription, and took a part in ſome periodical publications. In 1767, he publiſhed an eclogue, addreſſed to the honourable Charles Yorke, on partridge ſhooting. He is more celebrated for tranſlations than for original compoſitions. His verſions of Anacreon, Sappho, Bion, Moſchus, and Muſæus, were popular, and are ſtill in good repute. In 1774, he exchanged his vicarage for the rectory of Hayes, where he died in 1777. After his deceaſe a tranſlation from his pen of the "Argonautics," was publiſhed by ſubſcription. "He poſſeſſed," ſays his biographer, "an eaſy flow of verſification, and though his diction is not highly poetical, yet it has the merit of extraordinary clearneſs, which leaves no heſitation about the meaning of the original." Gen. Biog.

FAWN, among *Hunters*, is a buck or doe of the firſt year, or the young one of the buck's breed in its firſt year.

Fawn, in *Geography*, a townſhip of America, in York county, Pennſylvania, on the W. bank of Suſquehannah river, on the Maryland line; containing 1,214 inhabitants.

FAY, a town of France, in the department of the Indre and Loire; 13 miles S. of Chinon.

Fay-*Billot, Le*, a town of France, in the department of the Upper Marne, and chief place of a canton, in the diſtrict of Langres; 12 miles S. E. of Langres. The place contains 1,999, and the canton 11,453 inhabitants, on a territory of 277½ kiliometres, and in 23 communes.

Fay-*le-Froid*, a town of France, in the department of the Upper Loire, and chief place of a canton, in the diſtrict of Le Puy; 15 miles E. S. E. of Le Puy. The place contains 525, and the canton 5,590 inhabitants, on a territory of 175 kiliometres, and in 6 communes.

Fay, *To*, in *Ship Building*, is to ſet any two pieces of wood ſo as to join cloſe together: the plank is ſaid to fay to the timbers when it bears or lies cloſe to all the timbers.

FAYAL, in *Geography*, the moſt weſtern of the Azore iſlands. This iſland derives its name from the great number of beech-trees (Faya, in Portugueſe,) which grow here; beſides which it abounds with other wood. It is about 27 miles long, and 9 wide: the climate is good, the air is mild, the winter-cold is never felt, and the heat of ſummer is counteracted by refreſhing winds. The bullocks and hogs of this iſland are very good, but the ſheep are remarkably poor; poultry, vegetables, and fruit may be had at a reaſonable price: but the chief produce of the iſland is wheat and Indian corn, with which they ſupply Pico, and ſome of the other iſles. Birds are numerous, and the coaſt affords abundance of fiſh. Fayal, although the moſt noted for wine, does not raiſe ſufficient for its own conſumption: this article is raiſed on Pico, and thence brought to De Horta, for foreign ſhipping. The chief town is called Villa de Horta, or Orta. Fayal was firſt peopled by Flemings, who, grudging the expence of a Portugueſe garriſon, undertook to defend the iſland. But they had reaſon to repent of their preſumption; for the Engliſh, at different times, made deſcents upon the iſland, and took it; they deſtroyed the fortifications, after having ſeized and burnt a ſquadron of rich homeward-bound ſhips that lay in the harbour. Since this time a Portugueſe garriſon has conſtantly been maintained in the iſland. N. lat. 38° 32′ 24″. W. long. 28° 40′ 54″.

Fayal, *Bay or Road of*, is ſituated at the E. end of the iſle, before Villa de Horta, and facing the W. end of Pico. It is 2 miles broad, and 3-4ths of a mile deep, being of a ſemi-circular form. The depth of water is from 20 to 10 and even 6 fathoms, and the bottom ſandy, except near the ſhore, where it is rocky, and alſo beyond the line which joins the two parts of the bay. It is not a bad road; but the winds moſt to be apprehended are thoſe which blow from between the S. S. W. and S. E. Round the S. W. point there is a cove, called Porto Piere, in which a ſhip or two may lie in tolerable ſafety.

FAYD, a town of Syria, on the frontiers of Arabia Deſerta; 400 miles E. of Damaſcus.

FAYDIT, Anselm, in *Biography*, a native of France, who flouriſhed towards the cloſe of the 12th century. He is celebrated as a Provençal poet, and for his excellent ſinging, by which he made himſelf agreeable to perſons of rank. He not only compoſed, but repreſented comedies, which obtained ſo large a ſhare of popular favour, as to put the author in poſſeſſion of conſiderable wealth, which he ſquandered away in licentious pleaſures, and vain expence. In poverty, he was fortunate enough to attract the notice and favour of Richard Cœur-de-Lion, king of England, who had a paſſion for poetry, and by him was once more raiſed to a ſtate of affluence. After the death of Richard, Faydit returned to Aix, where he married a woman as imprudent as himſelf, but who died ſhortly after marriage. He next went to the court of the marquis of Montferrat, and afterwards to that of the lord of Sault, where he died about 1220. He wrote a poem on the death of his patron king Richard; another, entitled "The Palace of Love," and ſeveral comedies, of which one, entitled "L'Heregia dels Preſtres," *The Hereſy of Prieſts*, was written to gratify and flatter the wiſhes of perſons of rank, who at that period were favourers of the opinions of the Albigenſes, and who he probably expected would become his friends and patrons. Moreri.

Faydit, Peter, a French prieſt, born at Riom, in Auvergne, about the middle of the 17th century. In 1662, he entered into the congregation of the Oratory, from which he was expelled for having publiſhed a treatiſe on the principles of the Carteſian philoſophy. He afterwards became famous for the part which he took in the controverſy between pope Innocent XI. and France, in which he compared the pontiff with pope Anicetus in his diſpute with Polycarp, and with pope Victor in his difference with Polycrates and the Aſiatic biſhops concerning Eaſter. This led to other controverſies of much repute at the time, but which may now be well conſigned to oblivion. In 1695, he publiſhed "Illuſtrations of the doctrine, and of the Eccleſiaſtical Hiſtory of the firſt two centuries;" and, in the following year, "A treatiſe on the Trinity;" for which he was accuſed of tritheiſm, convicted and impriſoned at Paris. His ſuffering had no tendency to repreſs his zeal, though it probably led him to caution in his future publications. But the freedom of his language, and the want of attention and reſpect which he ſhewed to certain illuſtrious individuals, excited their anger ſo much, as to procure an order from the ſovereign that he ſhould retire to his native place, where he died in 1709. His other works are, "A Collection of Memoirs," intended to ſatirize "Tillemont's Eccleſiaſtical Hiſtory," which were ſoon ſuppreſſed; "Remarks on Virgil, on Homer, and on the Poetic Style of the Scriptures," in 2 vols. A critique on Telemachus, entitled "Telemaco-manie." And other pieces in Latin verſe, and French proſe. Moreri.

FAYE, in *Geography*, a town of France, in the department of the Maine and Loire; 10 miles S. of Angers.

Faye *le Vineuſe*, in the department of the Indre and Loire; 3 miles S.E. of Richelieu.

FAYENCE, a town of France, in the department of the Var, and chief place of a canton in the diſtrict of Draguignan, celebrated for its manufacture of earthen ware; 10 miles N.E. of Draguignan. The place contains 2,712 and the canton 9,488 inhabitants, on a territory of 192½ kiliometres, in 6 communes.

FAYETTE, Mary-Magdalen Proche de la Vergne, *Counteſs of*, in *Biography*, a lady in high favour at the court of Lewis XIV. She was intimately connected with the wits of that period, who were accuſtomed to aſſemble at her houſe, and to many of whom ſhe was a liberal benefactreſs. Segrais was her particular friend, and in his name the celebrated romances entitled "Zaide," and "The Princeſs of Cleves," were given to the public, but he has himſelf teſtified that his part in them was only contributing to the plot and diſpoſition, and that the filling-up and ornaments were entirely by Madame de la Fayette. Theſe were extremely popular, and they are ſpoken of by Voltaire as the firſt in which the manners of perſons of condition were painted, and natural adventures were deſcribed with eaſe and grace. She wrote likewiſe "Memoirs of the Court of France in the years 1688 and 1689;" "The Princeſs of Montpenſier;" "The Hiſtory of Henrietta of England;" and "Divers Portraits of Perſons about the Court." Theſe were all very much admired for the grace of ſtyle, and the delicacy and livelineſs of deſcription. She died in 1693. During her life ſhe was ever moſt flattered with the praiſe of having a judgment ſuperior to her wit, and loving the truth above all things. Moreri.

Fayette, in *Geography*, an American ſettlement in Tioga county, New York, between the Unadilla and the main branch of the Chenengo. It is laid out in 100 lots of ſquare mile each, as nearly as the ground will permit.

Fayette, a county of Pennſylvania, bounded N. by Weſtmoreland, S. by part of Maryland and Virginia, and W. by Monongahela river; 39 miles long and 29 broad; containing 473,280 acres; divided into 17 townſhips, of which Union is the chief. The number of inhabitants is 20,159.

Fayette, a diſtrict of North Carolina, comprehending ſix counties, *viz.* Moore, Cumberland, Sampſon, Richmond, Robeſon, and Anſon. It is bounded N. by Hillſborough, S.E. by Wilmington and Newbern, W. by Saliſbury, and S. by the ſtate of South Carolina. It is 120 miles in length, and 50 in breadth, and contains 41,358 inhabitants, of whom 8206 are ſlaves. The ſurface is varied with hills and dales, and is in general well watered.

Fayette, a county of Kentucky, 24 miles long, 20 broad, bounded N. by Scott county, N.E. by Bourbon, E. by Clark, S. by Madiſon and Jeſſamine, and W. by Woodford. The ſoil is excellent, though it lies on an eminence. The number of inhabitants is 12,233, of whom 3786 are ſlaves. The chief town is Lexington.

Fayette, a town in Kennebeck county and ſtate of Maine, bounded weſterly by Livermore, eaſterly by Mount Vernon, Wayne, and a large pond, called Great Amereſkoggen pond. It has 532 inhabitants.

FAYETTEVILLE, ſo called in honour of the marquis La Fayette, a flouriſhing poſt town of North Carolina, pleaſantly ſituated in Cumberland county, on the weſt ſide of the N.W. branch of Cape Fear river, nearly at the head of the navigation; 100 miles above Wilmington, and 61 ſoutherly of Raleigh. The town is ſituated about a mile from the river, near the junction of Blount's and Croſs creek; on both ſides of the creek are about 400 houſes, and handſome edifices for public uſe. The ſtreets are regularly laid out, and the principal ones are 100 feet wide. Here are three mills, two conſiderable diſtilleries and breweries, and ſeveral extenſive tan-yards. This town carries on a conſiderable trade to Wilmington in tobacco, wheat, flour, beef, pork, flax-ſeed, hemp, cotton, butter, lumber, ſtaves, naval ſtores, &c. The town ſtands in a ſettlement of Scots Highlanders, and has a poſt office, and 1656 inhabitants. N. lat. 35° 11'. W. long. 79°.

FAYORO, a town of Spain, in the province of Aragon, at the conflux of the Matarana and the Ebro; 15 miles S. of Fraga.

FAYOUM, Faioum, or Feium, a province of Egypt, on the weſt ſide of the Nile, extending from the river to the lake Berkit Caroun or Burkit-el-Kerun, the ancient lake Moeris. This was formerly the province of *Arſinoe*, (which ſee,) interſected by canals, which formed a communication between the river and the lake, and diſtinguiſhed by its beauty and fertility, as well as the variety and value of its productions. Since that period this province has, by the oppreſſion of the Turks, undergone a very great change; inſtead of flouriſhing cities it now preſents to view cottages and hamlets built of mud, canals nearly choaked up, and the ſea of Moeris reduced to two-thirds of its former extent; and yet the obſerver will diſcover the ſame productions which Strabo has deſcribed, and the ſame abundance whereever the waters can penetrate. The Copts ſtill cultivate the olive and the vine planted by their fathers. They gather an excellent grape, of which they make a white wine of very agreeable flavour. The whole country is at preſent covered with corn, with barley, with dourra or Indian millet, which follow one another in regular ſucceſſion during ſeven or eight months. The ſuperb flax, the ſugar-cane, and all ſorts of vegetables, ſpring up almoſt without culture. The cucumber, and various ſorts of excellent melons, line the banks of the rivulets. Groves of fruit trees, amongſt which are the date-tree, the fig-tree, the banana, the caſſia, &c. are here and there diſperſed over the plain; near the villages are groves of roſe-trees, from the odoriferous flowers of which they diſtil the roſe-water, which forms a valuable branch of commerce. The canals and the lakes abound with fiſh, which ſupplies the neighbouring provinces at a cheap rate. When winter is covering the northern countries with ſnow and hoar-froſt, innumerable flocks of birds come to winter in lake Moeris, and the canals of Faioum. The inhabitants take a vaſt number of geeſe, with golden plumage and of an excellent flavour; wild ducks that are fat and delicate, teals, ſwans, of whoſe ſkins they make furs, and pelicans. Sayary's Letters on Egypt, vol. i.

Fayoum, or *Faioum*, a town of Egypt, and capital of the province above deſcribed, which formerly poſſeſſed public baths, markets, and colleges, divided by the canal of Joſeph into two parts, and ſurrounded by gardens. At preſent it is only half a league in circumference, and is ſituated on the eaſtern bank of the canal. The remainder is deſtroyed; the colleges no longer ſubſiſt; the houſes built with brick, dried in the ſun, preſent the dreary aſpect of a heap of cottages. The inhabitants are poor, and, under oppreſſion, deſtitute of energy; and all the arts are reduced to ſome manufactures of mats, coarſe carpets, and the diſtillation of roſe-water. This town is governed by a cachef, in the name of one of the beys of Grand Cairo. Several Arabian ſcheicks, who poſſeſs lands in the neighbourhood, compoſe his council, and they repair to the divan two or three times a week, when the governor invites them. Their chief is held in high eſtimation; but harmony among the members of the adminiſtration is of ſhort continuance. The frequent ſucceſſive wars at Grand Cairo diſturb the tranquillity of the provinces, and the victorious party deprives the poſſeſſors of their governments and their lands; 49 miles S.S.W. of Cairo. N. lat. 29° 27′. E. long. 30° 39′. Savary.

FAYS, a town of France, in the department of Upper Marne; five miles N.W. of Joinville.

FAZILPOUR, a town of Hindooſtan, in Guzerat; 12 miles N. of Brodera.

FAZULA, a town of Hindooſtan, in Oude; three miles N. of Lucknow.

FAZULAPOUR, a town of Hindooſtan, in Bahar; 13 miles N.W. of Bahar.

FAZZELLO, Thomas, in *Biography*, was born at Sacca, a town of Palermo, in the year 1498. He was entered in the order of Dominican monks, and was their provincial, and might have been elected general of the order, had not his own modeſty thwarted the meaſures taken for the purpoſe. He was ten times choſen prior of the monaſtery at Palermo, and died in poſſeſſion of that office in 1570. He wrote many works, but the moſt conſiderable was a "Hiſtory of Sicily," written in Latin in 20 books, which firſt appeared in Palermo in 1558, and which has paſſed through ſeveral editions, and was tranſlated into the Italian language. Moreri.

FAZZIO, Bartholemew, was born at Spezio, on the coaſt of Genoa, in the beginning of the 15th century. Though of very humble deſcent, he became learned in the ancient languages, and tranſlated "Arrian's Hiſtory of Alexander." He likewiſe wrote a hiſtory of that prince in ten books; and a hiſtory of the war between the Genoeſe and the Venetians, which commenced in 1377. He is chiefly regarded for his work "De Viris Illuſtribus," which contains brief eulogies of the moſt famous men who were his contemporaries, with anecdotes of their lives, and an account of their principal works. This was not publiſhed till a long time after the death of the author, when Mehus annexed ſome MS. letters of Fazzio relating to the hiſtory of the times. We have likewiſe two moral treatiſes by Fazzio, the one entitled "De Humanæ vitæ Felicitate;" and the other, "De Excellentia & præſtantia Hominis;" and a Latin poem. The early part of life he paſſed at Genoa, whence he was invited to the court of Alphonſo, king of Naples, a great patron of learned men, where he remained till his death in 1457. His ſtyle is ſaid to be generally pure and elegant, eſpecially in compariſon with that of other writers in the ſame period. A great hatred prevailed between Fazzio and Lorenzo Valla, on account of their rivalſhip for the favour of Alphonſo, and each wrote four books of invectives againſt the other. Gen. Biog.

FAZZOLO, in *Geography*, a town of Naples, in the Capitanata; 13 miles S.W. of Manfredonia.

FE′, Santa, a town of Spain, in the province of Granada, near the Xenil, built by Ferdinand and Iſabella in the year 1491, during the ſiege of Granada: it is ſituated in a fertile tract, and though a ſmall town, contains about 2000 inhabitants; five miles N.W. of Granada.—Alſo, a town of Spain, in Aragon; five miles S. of Saragoſſa.

Fe′, *Santa*, a province of South America, in the vice-royalty of New Granada; and the name is ſometimes given to the vice-royalty itſelf from that of its capital.

Fe′ *de Bogota*, *Santa*, the capital of the vice-royalty of New Granada, ſituated near the river Funza or Pati, which at the diſtance of 35 miles falls into the Magdalena. This city was founded in 1538 by Queſada the Conqueror. Although it lies at a conſiderable diſtance to the eaſt of the grand chain of the Andes, which paſſes N. of the province of Carthagena, between the rivers Magdalena and Cauca, and though it is only four degrees from the equator, the climate is unexpectedly rather cold. It ſtands in a beautiful and ſpacious plain, called Alcarazes, and the ſoil is ſufficiently fertile. The city is large and handſome, and its ſtreets are wide and well laid out. There are four ſquares, and five bridges over two little rivulets, called San Franciſco and San Auguſtin, which ſpring from the eaſtern mountains, and run weſtward both of the city and its plain, which is about 20 leagues in length and 11 in breadth, till they join the Funza, called alſo the river of Bogota. The whole year, ſuch is the temperature of the climate, may here be called a perpetual ſpring, and the fertility of the ſoil produces two harveſts. The cathedral is magnificent, and has 16 prebends. Here are alſo three pariſh churches and eight convents, with four nunneries, and the great hoſpital of San Pedro. Beſides two religious colleges for education, there is the univerſity of St. Thomas, with a large public library, eſtabliſhed in 1772. This beautiful city preſents ſeveral other churches and chapels. The population is thought to exceed 30,000 ſouls; and the inhabitants are generally of a good character: and though phlegmatic in their appearance, their ſtature and aſpect are agreeable, and their wit acute. Juſtice is adminiſtered by two alcalds, according to the code of the Indies, with an appeal to the Royal Audience. The municipality is compoſed beſides of ſix regidors and other officers. The inhabitants are, in general, not rich, and many of them are occupied in trade, the means of which, however, are rare and uncertain; the ſecular juriſdiction of this capital comprehends ſeven little diſtricts in its neighbourhood, with 52 villages, and 3017 Indians, not including the people of colour, ſuppoſed to be fourfold that number. N. lat. 4° 6′. W. long. 78° 30′. For other particulars, ſee Bogota.

Fe′, *Santa*, a town, or rather a village of America, though it is the capital of New Mexico, ſituated 2400 miles N. of the capital city of Mexico. It is the ſee of a biſhop and reſidence of a governor. It was founded, in 1682, on the ſkirts of a high chain of mountains, whence ſprings a clear river abounding in excellent trout. The river iſſues from a lake on the ſummit of the mountain, and paſſes through the middle of the town. The climate reſembles that of Spain, having ſeaſonable rain and ſnow, the ſpring being mild, and the ſummer heats maturing cotton in abundance; the population conſiſts of 300 Spaniſh families, the Indians in that diſtrict not wiſhing to live in the ſame town with their maſters. The ſurrounding territory is clear of woods, fertile and pleaſant, producing wheat, maize, garden plants, fruits, and particularly grapes, of which good wines are made. The paſtures are well watered, and repleniſhed with horſes, cattle, and ſheep. The Rio Bravo riſes 50 leagues N.W. of the capital, diffuſes fertility, and has its margins adorned with beautiful woods, and its ſtream abounding with excellent fiſh. The neighbouring mountains are cloathed with tall barren pines, and with thoſe of a ſmaller ſort which bear large cones; the other trees are oaks of different kinds, ſapines and others which form excellent timber. The animals are deer, bears, wolves, foxes, wild ſheep, and ſtags of the ſize of a mule, the horns of which are not leſs than two yards in length, probably the mooſe deer. There are mines of tin, which do not defray the expence of working. N. lat. 36° 50′. W. long. 108° 48′.

Fe′, *Santa*, a town of South America, in the vice-royalty of La Plata, or Buenos Ayres, at the confluence of the river Salado with the Plata, built by Ferdinand V. The town is of a ſquare form, and ſurrounded with walls, flanked with towers, and a deep ditch. The two ſtreets interſect each other in the form of a croſs. It contains one pariſh and one convent. The environs abound in ſilk, corn, wine, and fruit; and game is plentiful. S. lat. 31° 50′. W. long. 60°.

Fe′ *d'Antioquia, Santa,* the capital of a province ſo called, ſituated on the river Cauca, in the vice-royalty of New Granada; highly celebrated for its rich mines of gold. N. lat. 6° 48′. W. long. 74° 36′.

Fe′ *de Chiribique, Santa,* a town of South America, in New Andaluſia, on the coaſt; 24 miles W. of Cumana. N. lat. 10° 5′. W. long. 65°.

Fe′, or Foy, *Santa,* a place in the middle of Veragua, a province in the Audience of Guatimala, in North America, where the king of Spain keeps officers for caſting and refining gold. It ſtands at the ſource of a river which runs into the North ſea.

Fe′, *Santa,* a city of Paraguay, in South America, 150 leagues S. by W. of the city of Aſſumption, ſeated on the river Paraguay. The inhabitants are chiefly employed in huſbandry, grazing, and weaving cloth. They ſell their productions and manufactures advantageouſly in Brazil.

FEABES, in *Rural Economy,* a term applied in ſome places to gooſeberries; and which is ſometimes written *feaberries.*

FEAGH, in *Mining,* ſignifies the refuſe ſpar and rubbiſh of a mine.

FEAL, in *Rural Economy,* a term often uſed in the more northern diſtricts to ſignify the turf or ſward of graſs land, when cut up or pared from the ſoil, for the purpoſe of forming ſods. This ſort of cutting or flaying off the ſurface of old graſs lands was formerly very common, but from its being found highly prejudicial, has been lately much laid aſide, and ſhould be wholly diſcontinued.

Feal-*Dike,* a term applied in the northern counties to a fence which is conſtituted either wholly or partially of ſods or feal cut from the adjoining graſs land.

Feal-*Manure,* in *Agriculture,* is that ſort of earthy manure, which is produced from the decompoſition and decay of the graſſy ſurface of land which has been cut in the manner of feal, and thrown together in a heap for the purpoſe. When incorporated with a little dung it forms an excellent top-dreſſing for hay-lands.

Feal, was anciently uſed for *faithful;* hence the tenants by knights ſervice uſed to ſwear to their lords to be *feal* and *leal*; that is, *faithful* and *loyal.*

FEALE, in *Geography,* a river of the county of Kerry, Ireland, which riſes in the weſtern part of the county of Limerick, and paſſes the towns of Abbyfeale and Liſtowel; after this it meets the river Gale, and with it forms the Caſhin, a river which is navigable for eight or ten miles, and runs into the eſtuary of the Shannon.

FEALTY, Fidelitas, denoted, under the feudal ſyſtem, an obligation on the part of the vaſſal to be faithful to his lord, and to defend him againſt all his enemies; and by the feudal law an oath of fealty was required to be taken by all tenants to their landlord, which is couched in almoſt the ſame terms as our ancient oath of allegiance; except that in the uſual oath of fealty there was frequently a ſaving or exception of the faith due to a ſuperior lord by name, under whom the landlord himſelf was perhaps only a tenant or vaſſal. But when the acknowledgment was made to the abſolute ſuperior himſelf, who was vaſſal to no man, it was no longer called the oath of fealty, but the oath of allegiance, in which the tenant ſwore to bear faith to his ſovereign lord, without any ſaving or exception. See Allegiance.

Fealty is uſually mentioned as ſynonymous with homage; but it differs from it, as homage conſiſts in taking an oath when the tenant comes to his land, and is done but once, being an obligation which is permanent, and binds for ever, which fealty does not.

They differ alſo in the manner of the ſolemnity; for the oath of homage is taken by the tenant kneeling, but that of fealty is taken ſtanding, and includes ſix things, which are compriſed in the words *incolume, tutum, utile, honeſtum, facile, poſſibile.*

Incolume, that he do no bodily injury to the lord; *tutum,* that he do him no ſecret injury in any thing which is for his defence, as in his houſe or caſtle; *honeſtum,* that he do him no injury in his reputation; *utile,* that he do not damage him in his poſſeſſions; *facile* and *poſſibile,* that he make it eaſy and not difficult for the lord to do any good which otherwiſe he might do: all which is likewiſe compriſed in Leg. Hen. I. cap. 5.

He that holds land by this only oath of fealty, holds in the freeſt manner; for all, even thoſe that have fee, hold *per fidem & fiduciam*; that is, by fealty at the leaſt.

This fealty is alſo uſed in other nations, as in Lombardy and Burgundy.

Indeed, as the very firſt creation of this tenure grew from the love of the lord towards his followers, ſo did it bind the tenant to fidelity, as appears by the whole courſe of the feuds, and the breach thereof is loſs of the fee.

Hottoman, in his "Commentaries de Verbis Feudalibus," ſhews a double fealty; the one general, to be performed by every ſubject to his prince, anſwering to our oath of allegiance; and the other ſpecial, required only of ſuch, as in reſpect of their fee are tied by this oath towards their lords. We read of both alſo in the Grand Cuſtomary of Normandy, &c.

Fealty ſpecial was with us performed either by freemen or villains. By 17 Ed. II. ſtat. 2. the form of this oath is appointed, and as now obſerved it is as follows: "I A. B. will be to you my lord C. true and faithful, and bear to you fealty and faith for the lands and tenements which I hold of you; and I will truly do and perform the cuſtoms and ſervices that I ought to do to you. So help me God." The oath is adminiſtered by the lord or his ſteward; and though it is neglected in ſome manors, yet in copy-hold manors, where courts are kept, and copy-hold eſtate granted, it is generally uſed. Every lord, of whom tenements are holden at this day, may, and ought to call upon his tenants to take this oath in his court-baron, becauſe if it be long neglected he may loſe his ſeignory, and the profits ariſing from eſcheats and other contingencies.

Fealty is incident to all ſorts of tenures, except from frank-almoign and tenancy at will.

FEAR, in *Ethics*, is the apprehenſion of ſome evil likely to befal us, attended with a deſire of avoiding it. This paſſion has been found to leſſen perſpiration and urine.

FEAR, in *Mythology*, was a deity among the Greeks, and afterwards adored by the Romans, together with "Paleneſs," its inſeparable companion. When men were ſtruck with the view of events, of which the cauſes were unknown, and which infuſed a terror into their minds that required foreign relief, they made a divinity of the diſturbing paſſion itſelf, from which they ſought to be delivered, by addreſſing to it vows and prayers. It is not poſſible to determine the preciſe time when they began to pay adoration to theſe two divinities. They were known, however, to the earlieſt poets of Greece. Heſiod, after having told us in his Theogony that fear was the daughter of Mars and Venus, adds, in the deſcription of Hercules's buckler, that this god was repreſented upon it in his chariot, accompanied with fear and terror. Homer (Il. l. 4.) gives theſe goddeſſes the ſame original. Accordingly, whenever he makes the god of war appear in battle, he gives him fear, terror, and flight for his retinue; he alſo places the ſame divinities ſometimes upon the tremendous Ægis of Minerva, and ſometimes upon the buckler of Agamemnon. (Il. l. 11.) A divinity, ſo well marked by theſe two poets, and ſo formidable in herſelf, could not fail to command religious worſhip. Accordingly they had recourſe to gifts and ſacrifices, in order to appeaſe and to be delivered from her. In a battle fought by Tullus Hoſtilius, the Albans, who had declared for him, withdrew and joined the enemy. His men were at firſt diſmayed, and all ſeemed to be loſt, when that prince vowed to erect a temple to fear and paleneſs; this vow produced its effects; the ſoldiers reſumed their courage, and Tullus gained a complete victory. This event, which is the era of introducing the worſhip of theſe two goddeſſes into Rome, is marked upon two medals of the family of Hoſtilia. Upon the one is a head with the hair erect, the countenance raiſed towards heaven, the mouth open, and a terrible aſpect, which are lively figures of the divinity whom the medal repreſented. The other exhibits a meagre face much lengthened, the hair laid flat, and a ſtaring aſpect. And this is the true portrait of paleneſs, which is the effect of fear. According to Plutarch, the Lacedæmonians placed the temple of fear by the tribunal of the "Ephori," from a perſuaſion that nothing is ſo neceſſary as to inſpire the wicked with fear of ſevere chaſtiſement. Moreover, fear was joined in oaths with the other gods. Æſchylus informs us, that in the ſolemn oath taken by the ſeven chiefs of the Theban expedition, in the midſt of ſacrifices, all of them holding their hands in the blood of the victims, ſwore by fear, by the god Mars, and by Bellona.

FEAR, *Putting in*, in *Law*, is the criterion that diſtinguiſhes robbery from other larcenies. For if one privately ſteals ſixpence from the perſon of another, and afterwards keeps it by putting him in fear, this is no robbery, for the fear is ſubſequent (1 Hal. P. C. 534.) However, it is not neceſſary, though uſual, to lay in the indictment that the robbery was committed by *putting in fear*; it is ſufficient, if laid to be done by *violence*. And when it is laid to be done by putting in fear, this does not imply any great degree of terror or affright in the party robbed; it is enough that ſo much force, or threatening by word or geſture, be uſed, as might create an apprehenſion of danger, or induce a man to part with his property without or againſt his conſent. (Foſt. 128.)

FEAR, *Cape*, in *Geography*, a cape on the coaſt of North Carolina. N. lat. 33° 50′. W. long. 78° 11′.

FEAR *River*, *Cape*, a river formed by the union of two ſtreams, which unite near Wilmington in North Carolina, and run into the ſea at Cape Fear.

FEARN, a town of Scotland, in the county of Roſs; four miles S. E. of Tain.

FEAST, or FESTIVAL, a church ſolemnity, or rejoicing in honour of God or a ſaint.

The word is formed of the Latin, *feſtum*, which ſome derive *a feriari, to keep holiday*; others from the Greek, εστιαω, *I feaſt* or *entertain*, of εστια, *hearth, fire*.

Feaſts, and the ceremonies attending them, have made great part of the religion of almoſt all nations and ſects; witneſs thoſe of the Egyptians, Greeks, Romans, Hebrews, Chriſtians, and Mahometans.

The Egyptians had ſix principal feſtivals, *viz.* the firſt, celebrated at Bubaſtis in honour of Diana; the ſecond, at Buſiris, for the goddeſs Iſis; the third, at Sais, for Minerva; the fourth, at Heliopolis, in honour of the Sun; the fifth, at Buthos, was the feſtival of Latona; and the ſixth was celebrated at Pampremis, in honour of Mars. The feſtival at Bubaſtis was peculiarly ſolemn. The people flocked thither from all parts, and the Nile was for ſeveral days overſpread with barges, decked with ornaments, and accompanied with muſic. The number of ſpectators at this feſtival was computed to be 700,000; who abandoned themſelves to mirth and revelling, and who conſumed on this occaſion more wine than they uſed throughout the whole year. At the feſtival of Buſiris, the ſacrifices were followed with a flagellation, from which neither men nor women were exempted. The feſtival of Minerva at Sais was diſtinguiſhed by the great number of lamps which were kept burning during the night. The whole ceremony in the feſtival of Heliopolis, and that of Buthos, was to offer ſacrifices upon that occaſion to the Sun and to Latona. But that which they celebrated at Pampremis in honour of Mars, was attended with this ſingularity; the prieſts bore upon a four-wheeled chariot the ſtatue of that god, incloſed in a ſmall chapel of gilt wood; and while they endeavoured to force the chariot and ſtatue into the temple of that divinity, men armed with clubs ſtood in the way to hinder it, and as the prieſts likewiſe had arms, an engagement enſued, it which it muſt naturally be ſuppoſed many people loſt their lives; though the Egyptians maintained that no perſon died of the wounds which were received on that occaſion.

The firſt feaſts among the Greeks were celebrated in ſolemn aſſemblies of the whole nation, on occaſion of their games, as the Olympic, the Pythian, the Iſthmian, and Nemæan; in proceſs of time they had many others, the principal of which are enumerated in the courſe of this work. See Potter's Arch. vol. i. cap. 19, 20.

The Romans alſo had abundance of ſtated feaſts in honour of their deities and heroes: ſuch were the Saturnalia, Cerealia, Lupercalia, Liberalia, Neptunalia, Conſualia, Portumnalia, Vulcanalia, Palilia, Divalia, &c. See SATURNALIA, &c.

They had alſo feaſts inſtituted occaſionally; as Carmentalia, Quirinalia, Terminalia, Floralia, Compitalia, Lemuria, Vernalia, beſide other moveable and occaſional ones; as to give thanks to the gods for benefits received; to implore their aſſiſtance, or to appeaſe their wrath, &c. as the Paganalia, Feralia, Bacchanalia, Ambarvalia, Amburbalia, Suovetaurilia, and divers others, particularly denominated *feriæ*; as Sementinæ, Latinæ, &c. See each of theſe feaſts and feriæ in its proper place.

The feaſts were divided into days of ſacrifice, and days of banqueting and feaſting; days of games, and days of reſt, or feriæ.

There being but little hiſtory wrote, or at leaſt publiſhed in thoſe days; one end of feaſts was to keep up the remembrance of paſt occurrences.

The principal feaſts of the Jews were the feaſts of trumpets, that of the expiation, of tabernacles, or the dedication, of the paſſover, of pentecoſt, and that of purification. The modern Jews have other feaſts marked in their calendar of modern inſtitution.

The Mahometans, beſides their weekly feaſt, or ſabbath, which is kept on Friday, have two ſolemn feaſts, the firſt of which is called the Feaſt of Victims, and celebrated on the tenth day of the laſt month of their year; and the ſecond, called Bairam. The Chineſe have two ſolemn feaſts in the year, in memory of Confucius, beſides others of leſs note on other days of the year.

Feasts among us are either *immoveable* or *moveable*.

Feasts, *Immoveable*, are thoſe conſtantly celebrated on the ſame day of the year; the principal of theſe are Chriſtmas-day, or the Nativity; the Circumciſion, Epiphany, Candlemas, or the Purification; Lady-day, or the Annunciation, called alſo the Incarnation and Conception; All Saints, and All Souls; beſides the days of the ſeveral apoſtles, St. Thomas, St. Paul, &c. which with us are feaſts, though not *feriæ*. See each feaſt under its proper article.

Feasts, *Moveable*, are thoſe which are not confined to the ſame day of the year. Of theſe the principal is Eaſter, which gives law to all the reſt, all of them following, and keeping their proper diſtances from it; ſuch are Palm-Sunday, Good-Friday, Aſh-Wedneſday, Sexageſima, Aſcenſion-day, Pentecoſt, and Trinity-Sunday. See Easter, Sexagesima, Pentecost, Trinity, &c.

The four feaſts which our laws take ſpecial notice of are, the Annunciation of the bleſſed Virgin Mary, or Lady-day, the 25th of March; the Nativity of St. John the Baptiſt, held on the 24th of June; the feaſt of St. Michael the Archangel, on the 29th of September; and that of St. Thomas the Apoſtle, on the 21ſt of December: on which quarterly days rent on leaſes is uſually reſerved to be paid, 5 and 6 Ed. VI. cap. 3. 3 Jac. I. cap. 1. 12 Car. II. cap. 30.

Beſide theſe feaſts, which are general, and enjoined by the church, there are others local and occaſional, enjoined by the magiſtrate, or voluntarily ſet on foot by the people; ſuch are the days of thankſgiving for delivery from wars, plagues, &c. Such alſo are the vigils or wakes in commemoration of the dedications of particular churches. See Vigil, &c.

The prodigious increaſe of feaſt-days in the Chriſtian church commenced towards the cloſe of the fourth century, and was occaſioned by the diſcovery that was then made of the remains of martyrs and other holy men, for the commemoration of whom they were eſtabliſhed. Theſe, inſtead of being ſet apart for pious exerciſes, were abuſed in indolence, voluptuouſneſs, and criminal practices. Many of them were inſtituted on a pagan model, and perverted to ſimilar purpoſes.

Feast *of the Dead*, is a ſolemn religious ceremony in uſe among the ſavages of America, ſome of whom thus teſtify their reſpect for the deceaſed every eight years; and others, as the Hurons and Iroquois, every ten years.

Feast is alſo uſed for a banquet, or a ſumptuous meal, without any immediate view to religion. The uſe of the word, in this ſenſe, ariſes hence; that a part of the ceremony of many of the ancient feſtivals, both thoſe of the Heathens and the *agapæ* of the Chriſtians, was good eating; though Mr. Huet chooſes to derive the word from *feſtinare*, which in an ancient Latin verſion of Origen's Comment on Matthew, ſignifies *to feaſt*: "Ut veniens illus Jeſus feſtinet cum diſcipulis ſuis." In all antiquity, both ſacred and profane, ſacrifices were little more than religious feaſts.

It has been often obſerved by authors, that there is no nation in the world comes near the Engliſh in the magnificence of their feaſts. Thoſe made at our coronations, inſtallments, conſecrations, &c. tranſcend the belief of all foreigners; and yet it is doubted whether thoſe now in uſe are comparable to thoſe of our forefathers.

The Perſians never diſcourſe and deliberate of their moſt important affairs but in the middle of their feaſts.

FEATHARD, in *Geography*, a poſt town of the county of Wexford, Ireland, which was formerly flouriſhing, and ſent two members to parliament, but which has now fallen to decay, and has loſt its privilege as a borough by the union. It is a ſeaport, ſeparated by a ſmall neck of land from Waterford harbour, 81 Iriſh miles S. by W. from Dublin, and 14 S. from New Roſs. See Fethard.

FEATHERS, in *Comparative Anatomy*, conſtitute the peculiar covering of the claſs of birds. In no other tribe of animals are they met with; for the plumes which belong to ſome of the lepidopterous inſects are different from the feathers of birds, both with reſpect to their ſtructure and mode of growth. No bird is entirely deprived of feathers, although ſome ſpecies want them on certain parts of the body. The turkey and vulture have the head and part of the neck uncovered. The oſtrich and the wading birds have bare thighs: thoſe birds which have ceres, combs, or pieces of fleſh on the head, have thoſe parts without feathers, as in the bald coot, ſeveral gallinaceæ, &c. The aptenodytes want feathers even on the wings. Many birds have patches or ſpots about the ſide of the head, upon which there are no feathers.

The feathers which make the proper clothing of the bird are of two kinds, the *down* and *common ſhort feathers*; the former is placed under the common feathers: it gives an entire covering to ſome water birds at a very early age; of this the young gooſe is a familiar example. The down is deſigned to defend the bird againſt cold and wet; and hence it is ſo abundant upon the lower ſurface of thoſe birds that frequent the water.

Although the common feathers cover the whole body, they do not grow from every part of the ſkin: they are thickeſt upon the ſhoulders and loins, along the under part of the neck and breaſt, and do not exiſt upon the lateral lines of the neck or breaſt, or about the umbilicus. This arrangement, and their being directed downwards and backwards, allows them to cover the body more neatly, and to remain unruffled during the motions of the bird.

The *large feathers*, or *quills*, ſituated upon the wings and tail, ſhould rather be conſidered as inſtruments of motion than as an integument: thus we find them ſtrong and unyielding in their texture in birds of flight, more eſpecially thoſe that have heavy bodies, as the ſwan, gooſe, turkey, &c. while they are wanting in the wings of thoſe birds that do not fly, as the oſtrich, aptenodytes, &c.

There are other long feathers that differ both from the quills and common feathers, with reſpect to their ſtructure and poſition. Of theſe we may mention thoſe of the creſt of the peacock, and ſome of the crane kind, the hypochondriac feathers of the birds of paradiſe, the rump feathers of the peacock, &c. theſe ſeem deſigned for ornament alone.

There are many other varieties of feathers, but as theſe are more the concern of the naturaliſt than of the anatomiſt, we ſhall not dwell upon them at preſent, and hereafter only notice ſuch peculiarities in the external appearance of feathers as illuſtrate the ſtructure of theſe parts.

The anatomy and mode of growth are eſſentially the ſame in all kinds of feathers; but we ſhall take our deſcription chiefly from the large feathers, or quills, as being the moſt convenient for the purpoſe.

Previous to the appearance of the firſt feathers, the ſkin of birds is in a degree covered with hairs, except under the belly: theſe grow in tufts, or faſciculi, each containing about ten or twelve hairs. Cuvier ſtates theſe tufts to be implanted in a bulb or follicle, which, as he conceives, contains the rudiments or ſheath of the feather. When the ſheath is protruded from the ſkin, it carries with it the faſciculus of hairs, which then appears to ariſe from its extremity. In general, the hair very ſoon falls off from the feather, but in ſome of the accipitrine birds it is found attached for a conſiderable time to the end of the feather, reſembling fine down.

All feathers are originally contained in *tubular ſheaths;* theſe penetrate the ſkin, and become apparent, uſually a few days after the bird leaves the ſhell. The quills are firſt obſerved; after theſe, the down makes its appearance, and then the common feathers. Theſe laſt are found to be arranged in a quincunx order.

The ſtructure of the ſheath is exceedingly curious: it is round, or tubular; the extremity, which is affixed in the ſkin, is blunt and perforated, in order to give paſſage to the bulb or vaſcular part of the feather; the external end is originally cloſe, and of a pointed ſhape. The parietes of this tube appear to be of an horny nature, although they are thin and extremely fragile: it readily ſplits into lamina, more eſpecially at the external extremity; it is thicker, ſofter, and leſs brittle towards the end connected with the ſkin.

The root of each ſheath is accommodated in a correſponding excavation of the integuments: this is lined by a reflection of the cuticle, which appears, after reaching the bottom of the *cell,* to return outwards, by paſſing on the proper ſheath of the feather, in which ſituation it is extremely thin and delicate. The cells which encloſe the ſheaths of the feathers are uſually very deep in the wings and tail; their internal lining is alſo ſtrong in that ſituation, and they adhere to the perioſteum.

If the ſheath of the feather be opened at a very early period, it will be found to contain a *vaſcular pulp,* (of which more hereafter); and around this may be ſeen ſome colouring matter, in a ſoft and almoſt liquid ſtate, which, if examined, will be found compoſed of a number of little thin proceſſes, or laminæ, already poſſeſſing the form of the *barbs* of the future feather; theſe are therefore the firſt parts which are produced; they ſoon acquire more ſtrength and firmneſs, and become attached to the *ſhaft* or *ſtalk* of the feather, which is the part next ſecreted.

As ſoon as the point of the feather is completely formed, it perforates the external end of the ſheath, which is eaſily ruptured. The feather in this way gradually increaſes, to accommodate which the ſheath alſo enlarges, and becomes on the feathers of the wing and tail a conſiderable tube.

In proportion as the feather is formed it paſſes out of the torn end of the ſheath, which becomes further lacerated by this means, and dries from expoſure to the air, and falls off in ſhreddy plates or ſcales, ſhewing its original ſtructure to have been laminated.

The barbs, while encloſed in the ſheath, are coiled round, in order to gain room; but on paſſing out unfold and take their proper figure.

After the ſhaft and barbs of the feather are entirely formed, the tubular part, or that which in quills is called the *barrel,* is produced. Cuvier deſcribes this part as being formed by the conſolidation and drying of the ſheath in which the ſhaft grew; but it appears to us to be ſecreted, like the other parts of the feather, by the vaſcular pulp. The tube, in a full-grown feather, always appears to be the continuation of the back part of the ſhaft. The ſheath, however, adheres more cloſely to the tube than the reſt of the ſhaft, and hence that ſhreddy membrane which is obſervable on the barrel of a quill before it is cleaned.

The *vaſcular ſubſtance,* or *pulp,* ſo often already alluded to, poſſeſſes a very ſingular ſtructure. Cuvier calls it a gelatinous cylinder; but although almoſt ſo ſoft and pulpy as to merit that name, it is an organiſed body, conſiſting of numerous cells, and provided with a large ſupply of blood. An injection of a coloured fluid from any of the neighbouring arteries renders the pulp of the feather entirely red, and ſeems to pervade every part of it, as if it was ſhed into it, or extravaſated in its ſubſtance.

We have failed to trace any branches of nerves into the pulp, although they can be eaſily diſſected as far as its origin or root: in this circumſtance it reſembles the vaſcular bulbs of hair and ſpines, and the pulps of the teeth, into the ſubſtance of which, we believe, no perſon has yet clearly purſued the branches of nerves.

The pulp, after fulfilling its purpoſe, *viz.* the ſecretion of the feather, undergoes a ſingular change of ſtructure: it loſes all vaſcularity, becomes perfectly dry and tranſparent, and puts on the appearance of a number of empty membranous cones, or funnels, inſerted the one into the other. This change has been aſcribed to the part being dried by expoſure to the air; but, that it is effected by a proceſs of abſorption, and by the ceſſation of vaſcular action in the arterial branches, is fully proved by the cleanneſs and the diſappearance of all colour in the degenerated pulp. The above change goes on gradually, beginning at the extremity of the pulp, fartheſt from the root of the feather, and keeps regular pace with the growth of the feathers. As the pulp dies or degenerates along the grooved ſide of the ſhaft, it is rubbed off; but in the tube of the feather it is preſerved, and makes that well-known jointed membranous body which we take out of the barrel of the quill in making a pen.

The converſion of the vaſcular pulp into dry membranous cells neceſſarily produces a conſiderable vacancy in the tubular portion of the feather, which is ſupplied by *air.* The means by which this air is obtained, and its chemical compoſition, have not heretofore been known. In making ſome experiments, with the view of analyſing the air contained in quills, we diſcovered how it is admitted into the tube. Some quills, plucked from a living gooſe, being introduced into a quickſilver bath, and their ends being cut off while in the bath, a ſufficient quantity of air was obtained by turning their open ends up into an inverted jar. While this was doing, it was obſerved, that if the open end of the quill was puſhed downwards into the bath, the quickſilver roſe in the barrel, as in a thermometer. This led to the concluſion, that there muſt be an opening through which air could paſs out, and of courſe alſo into the barrel of the quill: ſome further examination detected a foramen ſituated at the upper part of the barrel, juſt where the groove of the ſhaft terminates. This opening is extremely ſmall, while the quill is fixed in the wing, and becomes almoſt entirely cloſed by the drying of the feather after it is plucked: it is the remnant of the paſſage in which the portion of the vaſcular pulp that went to the inner, or grooved ſide of the ſhafts, was originally ſituated: for the pulp is divided at its external extremity into two branches, one of which goes on in the continuation of the tube in the back of the ſhaft, and the other belongs to the grooved, or inner ſide of the ſhaft.

The above obſervations put it beyond all doubt that the hollow portions of feathers are ſupplied with air from the atmoſphere, inſtead of being ſecreted, as ſome have ſuppoſed. As this air cannot be expelled and removed; and as it is in a degree expoſed to the influence of the blood of the vaſcular pulp, it was to be preſumed, that it underwent the ſame change as air which had paſſed through the organs of reſpiration. With the view of aſcertaining the fact, the following experiments were made upon a conſiderable portion of air collected under quickſilver, in the manner already mentioned, from the quills of a living gooſe.

Some nitrous gas was firſt admitted into the inverted jar, containing the air of the quills, and produced a very ſlight diminution of the column of air. Some weak ſolution of ammonia was next introduced, which diminiſhed the quantity of air very conſiderably: this was ſuppoſed to proceed from a ſolution of ſome nitrate of mercury, which had formed on the ſurface.

A ſecond quantity of air was collected in a glaſs tube in a ſimilar manner. On admitting a portion of lime water, and ſhaking the tube, the water became ſlightly turbid, and no material diminution of the column of air was obſerved. Nitrous gas was next introduced, when the red fumes were inſtantly formed: in order to get rid of the ſuperfluous nitrous gas, a quantity of the ſolution of ſulphat of iron was paſſed up into the tube; a diminution in the bulk of the original air was now evident, and amounting, as was ſuppoſed, to about the one-ſixth of the whole. It was calculated that this portion of air contained carbonic acid gas in the proportion of about one-fifteenth part. Theſe experiments were made with the aſſiſtance of the beſt chemiſt of the preſent age. We have ſince repeated them nearly in the ſame manner, and have obtained ſimilar reſults. The air admitted into feathers loſes a portion of its oxygen, and acquires a certain quantity of fixed air; but it is not ſpoiled in the ſame degree as if it had paſſed through the lungs, nor to the ſame extent that, from reaſoning on the ſubject, we had been prepared to expect.

Feathers, when fully formed, beſides the *degenerated pulp* upon which they grew, uſually conſiſt of three parts, the *tube* or *barrel*, the *ſhaft* or *ſtalk*, and the *barbs*, with their *barbules*.

The *tube* is a cylinder of a horny ſubſtance; it is tranſparent, on account of its only containing air, and the dry membranous cells which remain from the vaſcular pulp; its ſize is in general ſmall in proportion to that of the whole feather, except in the quills, where it is of a conſiderable ſize. It is largeſt in the large anſerine and gallinaceous birds, as the turkey, ſwan, gooſe, &c.; and hence the quills of theſe birds are the fitteſt to be made into pens. The tube, when minutely examined, appears to conſiſt of two layers, or laminæ; the external is a circular plate, and exhibits ſome ſlight linear impreſſions running round the barrel in a tranſverſe direction; it is likewiſe more denſe and tranſparent than the internal, which has its parts diſpoſed in a longitudinal direction, and is ſmooth on the internal ſurface.

The cavity of the barrel is continued a little way into the back part of the ſhaft, in which it is gradually loſt, and in ſome birds of flight, as the eagle, hawk, ſtork, &c. it is continued for a very conſiderable diſtance into the ſhaft. No part can be better contrived for uniting the advantages of ſtrength and levity than the barrel of quills.

The *ſhaft* is likewiſe compoſed of a circular and a longitudinal layer, or plate; it, however, appears opaque, in conſequence of being filled with a pithy ſubſtance. This laſt is often of a white colour; it reſembles very much the medulla of vegetables in a dried ſtate, but is more compact and cloſe in its ſtructure. The ſhaft is the principal part of moſt feathers. The back, or external ſide of the ſhaft, is ſmooth; the oppoſite, or inner ſurface, preſents a groove, which runs along the middle of the ſhaft for its whole length, giving it the appearance of having been originally compoſed of two pieces. The two ſides, or intermediate ſurfaces, of the ſhaft, are lighter in their texture than the external and internal ſurfaces.

The *barbs* are implanted along the two edges of the external ſurface, or back of the ſhaft. Upon the exiſtence, ſize, colour, and form of theſe, chiefly depend the character and appearance of the feather.

The barbs, when minutely examined, are ſeen to ſend off *proceſſes* from the edge of their poſterior ſurface, exactly in the ſame manner as they ariſe themſelves from the ſhaft: every barb, therefore, may be properly conſidered as a ſhaft in miniature.

Sometimes both the barbs and *barbules* are wanting, as in the quills of the caſſowary, of which the ſhafts are long, ſmooth, and pointed, reſembling the ſpines of the porcupine.

In looſe floating feathers, as thoſe of the oſtrich, &c. the barbs are not cloſely applied to each other, and give off uſually barbules on each ſide, which have no immediate connection with one another. In general, however, the barbules of one barb are inſerted or interwoven with thoſe of the next barb, ſo that the feather preſents a continuous ſurface to the air or water. When the feathers are ruffled, the connection of the barbules is deſtroyed, and the adjuſtment of the feathers conſiſts in laying the barbs neatly the one beſide the other, by which the barbules fall into each other's interſtices.

The adheſion between the barbs of the wing-feathers in many birds of flight and water-birds is rendered very firm. In the gooſe, for inſtance, the barbs of the quills are plates or laminæ, which have each a concave and convex ſurface. The barbs, therefore, are received the one into the other, and are beſides united by a row of barbules along their upper or poſterior edge. A degree of the ſame ſtructure is found in the wings of all birds that fly. The intention of the barbs adhering together is the ſame as the feathers being laid one upon another; by both theſe circumſtances the bird is enabled to preſent an unbroken ſurface to the impulſe of the air during flight, and defend its body from being wet. The quills of the wing and tail appear to have, in general, but one row of barbules, which being placed obliquely upon the poſterior edge of the barbs, are enabled to paſs acroſs and touch each other.

The feathers that form the creſt of the peacock have no barbules in their middle and inferior part. The feathers of the creſt of the balearic crane are twiſted in a ſpiral manner, and their barbs are only fine hairs. The creſt of the little egret (ardea garzetta) is compoſed of ſimilar feathers. The tuft of feathers at the bottom of the neck of the male turkey may be alſo regarded as barbleſs.

The barbules are long, diſtinct, and unattached to each other in the hypochondriac feathers of the birds of paradiſe, the rump feathers of the peacock, thoſe on the thighs of the mycteria and balearic crane, the feathers of the toucan, and thoſe placed around the ears of the owl, &c.

The feathers of the nocturnal birds of prey have the barbs covered with long ſilky down, from which ariſes the ſlow and ſilent flight of thoſe birds ſo neceſſary to their habits of life.

The feathers of the bulfinch, the purple throated flycatcher (muſcicapa rubricollis), the Tanagra ſepticolor, thoſe of the head of the red-headed manakin, and of the ramphaſtes momota, &c. have the barbs fine and ſilky.

The rump-feathers of the golden thruſh, thoſe of the tail of the jay, and of the neck of the common duck, have the barbs ſet cloſe, and furniſhed with long, fine, ſoft barbules, diſpoſed upon the ſurface in ſuch a manner as to reſemble ſatin.

In ſome foreign birds, as the humming-birds, the galbulas and trogons, paradiſea aurea, &c. the barbs of the feathers are broad and ſmooth upon the ſurface, and being of a brilliant colour, produce the appearance of poliſhed metals.

In the ruby necked humming-bird the feathers of the head and throat, and thoſe of the head and belly of the amethyſtine humming-bird, are ſo extremely brilliant as to reſemble precious ſtones, as the names of theſe birds imply. This effect is produced by the barbs which terminate the ſhaft being ſo very denſe and highly poliſhed. The barbs of the tail-feathers in the wood-pecker are ſingularly ſtrong, it being by the tail that theſe birds ſuſtain themſelves in a great meaſure when taking their prey.

The appearance of ſealing-wax on the wings of the waxen chatterer (ampelis garrulus) ariſes from the end of the ſhaft being without barbs, and formed into a ſolid round diſk.

In the down of all birds the ſhafts are extremely fine and delicate, and often imperceptible. The barbs are long, diſtinct, and floating: and the barbules are long, looſe, and ſilky.

The chemical compoſition of feathers agrees ſo nearly with that of hairs, that we need not enter into particulars upon this part of the ſubject. Feathers, however, contain a leſs proportion of mucilage, and receive leſs moiſture from the body; but although feathers are ſo dry, even when attached to the living bird, they loſe much of their pliancy and freſhneſs after being ſome time plucked.

In the *Plate* deſigned to illuſtrate the *anatomy and mode of growth of feathers*, *fig.* 1. repreſents a portion of ſkin of a bird recently hatched, upon which the hairs are ſeen that precede the appearance of the feathers. *Fig.* 2. ſhews one of the young ſheaths, bearing on its extremity ſome of theſe hairs. *Fig.* 3. is a portion of the wing on which the ſheaths of the quills are ſhewn of different ſizes. The cells are laid open, to expoſe the roots of the feathers and the vaſcular pulps paſſing into them; *a* the ſubſtance of the wing; *b b b b* the feather-ſheaths; *c c c* the pulps penetrating the baſe of the ſheaths; *d d* the lining of the cells turned back. *Fig.* 4. is the end of a ſheath, ſhewing the foramen by which the pulp enters the feather. *Fig.* 5. exhibits the ſheath ruptured at its external extremity, through which the end of the feather is ſeen to protrude; *a* the ſheath, ſhewing the appearance of being compoſed of circular fibres; *b* the feather. *Fig.* 6. ſhews the ſame feather removed from the ſheath; *a* the vane or ſhaft, with the barbs imperfectly unfolded; *b* a part of the tubular portion of the ſhaft. *Fig.* 7. repreſents the pulp taken out of the ſheath, and that part which had formed the ſhaft and barbs decayed and dry; *a* the pulp ſtill ſoft and vaſcular; *b* the part which having done its office is degenerated; *c* the feather. *Fig.* 8. is a magnified view of the pulp, ſeparated from all its connections. *Fig.* 9. is a view of the pulp laid open, in order to expoſe the blood veſſels. *Fig.* 10. exhibits the pulp as it exiſts when completely degenerated. *Fig.* 11. is the lower portion of a quill, to ſhew the foramen for admitting air into the barrel; *a* the groove of the inner ſide of the ſhaft leading to the opening; *b* indicates a ſpeck, which marks the ſituation of the foramen. *Fig.* 12. is the quill of a ſtork laid open at the back part, in order to expoſe the continuation of the tube into the ſhaft. *Fig.* 13. is given as an example of a looſe floating barb, with the barbules on each ſide, and not intended for attachment to the adjoining ones: this view is magnified. *Fig.* 14. is a magnified repreſentation of a barb of a gooſe's quill; *a* the convex ſurface which lies in the correſponding convexity of the next barb; *b* the ſingle row of ſtiff oblique barbules.

FEATHERS. The chemical compoſition of feathers appears, by Mr. Hatchett's excellent experiments (Phil. Tranſ. vol. xc.), to be nearly the ſame as that of hair, nail, and cuticle, and conſiſts of inſpiſſated albumen mixed with a very minute portion of gelatin, and a little animal oil. The proportion of inſpiſſated albumen is ſo large, that feathers may be boiled for many days in water with ſcarcely any loſs, the albumen being inſoluble in this liquid, and the gelatin being ſo ſmall that the liquor gives no precipitate with tan, and very little with nitro-muriat of tin.

FEATHERS, in *Commerce*, make a conſiderable article, particularly thoſe of the oſtrich, heron, ſwan, peacock, gooſe, &c. for plumes, ornaments of the head, filling of beds, writing-pens, &c.

Geeſe are plucked in ſome parts of Great Britain five times in the year; the firſt plucking is at Lady-day for feathers and quills; and the ſame is renewed for feathers only four times more between that and Michaelmas. (See FEN and GOOSE.) In cold ſeaſons many geeſe die by this barbarous cuſtom. Thoſe feathers that are brought from Somerſetſhire are eſteemed the beſt, and thoſe from Ireland the worſt. Eider down is imported into this country from Denmark, and is furniſhed by thoſe ducks that are inhabitants of Hudſon's bay, Greenland, Iceland, and Norway: Hudſon's bay alſo affords a very fine feather, ſuppoſed to be of the gooſe-kind. The down of the ſwan is brought from Dantzick, whence we have alſo a great quantity of cock and hen feathers. The beſt method of curing feathers is to lay them in a room in an expoſure to the ſun, and when dried to put them in bags, and beat them well with poles to diſcharge the duſt.

FEATHER-*bed*,
FEATHERS, *dry-pulled*, } See BED.
FEATHERS, *ſcalded*,

FEATHERS, in *Agriculture*, are ſometimes employed as manure, where they can be collected in any quantity; but, when uſed in this way, the pens, ſtumps, and other refuſe of them are chiefly the parts had recourſe to, being procured from the ſhops of the poulterers, &c. in large towns.

FEATHER, in the *Manege*, a ſort of natural frizzling of the hair found in many parts of a horſe's body, but more commonly between the eyes. In ſome caſes it reſembles an ear of barley, and in others an oilet-hole. Many are of opinion, that when the feather is lower than the eyes it is a ſign of a weak eye-ſight; but this remark is not certain.

FEATHER-*edged Boards*, in *Rural Economy*, are ſuch boards as are ſawn thinner on one edge than the other, in order to lap over each other, being much employed in building ſmall farm-ſheds, &c. where great expence is to be avoided.

Feather, *Prince's*, in *Gardening*, a common name of a ſpecies of the amaranthus. See Amaranthus.

Feather, *Roman*, called in French *epée Romaine*, is a feather upon a horſe's neck, being a row of hair turned back and raiſed, which forms a mark like a ſword-blade juſt by the mane.

Feather, *Mid*, in the *Engliſh Salt-works*. See Mid.

Feather, *Sea*. See Gorgonia.

Feathers, *Foſſil*, in *Natural Hiſtory*. Different writers have deſcribed organic remains, or reliquia, found in the ſtrata, under the name of feathers, ornitholithi, &c. Moſt of the drawings of pretended foſſil feathers which we have ſeen, have had a conſiderable reſemblance to the iron-ſtone foſſil which Mr. Parkinſon has figured in the fifth plate, (fig. 5.) of the firſt volume of his Organic Remains, and he conſiders it as a kind of leaf or vegetable production, and we think with good reaſon.

Feather-*out*, in *Geology*, is a term which has been of late uſed by Mr. W. Smith and others, in deſcribing ſuch ſtrata as do not end abruptly, or in the face of a ſudden hill, but whoſe lower beds advance ſo far beyond the ſuperior ones, as to end by imperceptible degrees; a caſe which frequently occurs with ſome particular ſtrata, and gives much trouble to a mineralogical ſurveyor in tracing their ſuperior and inferior edges, and deſcribing the ſurface they include on a map. In denudated diſtricts, it is very common to find ſtrata, which are of pretty uniform hardneſs, feathering-out ſo far, that it is difficult to trace their limits, except by the ſlight and almoſt imperceptible tablets which the harder beds occaſion, as mentioned by Mr. Farey, Philoſophical Magazine, vol. xxxiii. p. 262.

FEATHERED Columbine. See Thalictrum.

FEATLY, Daniel, in *Biography*, was born at Charlton in Oxfordſhire, in 1582. In 1594 he was admitted a ſcholar of Corpus Chriſti college, where he took his degree of B. A. in 1602. He purſued his theological ſtudies with great ardour; and on account of his learning and poliſhed manners was appointed chaplain to the embaſſy ſent to the court of France, where he reſided three years, and obtained a diſtinguiſhed reputation as a preacher. Upon his return, in 1613, he took his degree of B. D. and was preſented with the rectory of Northill in Cornwall, and immediately after was appointed domeſtic chaplain to Dr. Abbot, archbiſhop of Canterbury, who in a ſhort time preſented him with the rectory of Lambeth. This was followed by other preferments of conſiderable worth. In 1625 he married, and quitted the palace at Lambeth for a houſe at Kennington, of which he became poſſeſſed in right of his wife. During the civil wars he had nearly loſt his life by ſome enthuſiaſtical ſoldiers who had conceived the opinion of his holding popiſh principles. Though he twice eſcaped their fury, his property was very much deteriorated by their ravages. In 1643 he was nominated one of the aſſembly of divines, not only on account of his learning; but becauſe he was zealouſly attached to the Calviniſtic doctrines. This latter circumſtance induced the aſſembly not only to treat him with great reſpect, but to permit him to ſpeak freely his own opinions in favour of "epiſcopacy," and againſt the "covenant." He was by his own friends deemed orthodox and loyal; but lord Clarendon and others will not allow him that praiſe, on account of his attending againſt archbiſhop Laud when on trial. Lord Clarendon aſſerts that the king ſent him a letter commanding him to follow the example of the other epiſcopal divines who had quitted the aſſembly, which occaſioned his writing to archbiſhop Uſher, aſſigning reaſons why he could not obey the royal mandate. This correſpondence was by ſome means laid before parliament, and was the ruin of Featly; who was found guilty of a breach of an ordinance which prohibited the members of the aſſembly from divulging their opinions without conſent of one or both houſes. He was accordingly deemed a betrayer of the parliamentary cauſe, impriſoned, ſtripped of his preferments, and expelled the aſſembly. His ſpirits were not broken by this uſage, but his health began rapidly to decline; he ſupplicated parliament to be permitted to exchange his priſon for apartments in Chelſea college, for the ſake of change of air: this favour he obtained, but it was then too late; he died in 1644. His character is given in few words by Wood, who ſays that "he was moſt ſeriouſly and ſoundly pious and devout." Neal's Hiſt. of Puritans by Toulmin.

FEAZING, at *Sea*, is the ravelling out of the cable or any great rope at the ends.

FEBABO, in *Geography*, a town of Africa, and capital of a diſtrict in the Libyan deſert, inhabited by the Tibboo; 160 miles S. of Augela. N. lat. 26° 50′. E. long. 22° 5′.

FEBRICULA, in *Medicine*, the diminutive of *febris*, ſignifying a ſlight fever, has been ſometimes applied to the hectic fever, and ſometimes to the low nervous fever, ſo denominated by Dr. Huxham. In the latter acceptation principally we have a treatiſe on the "Febricula, or Little Fever," by ſir Richard Manningham. See Nervous *Fever*.

FEBRIFUGE, from *febris*, *fever*, and *fugo*, *I drive away*, a term which is applicable to every remedy for fever, but was originally employed to denote the quality of thoſe medicines which were believed to have ſome peculiar or ſpecific power in arreſting febrile diſeaſes. The word, however, is now ſeldom employed; becauſe no remedy poſſeſſed of any ſpecific anti-febrile power is known. Antimonial medicines, indeed, and the neutral ſalts, in conſequence of their diaphoretic quality, are ſometimes called febrifuges; but the term is not applied to them with more propriety than to the purgatives which are given, or even to the gruel which the patients drink. If there be a remedy, which can be ſaid directly to ſuppreſs febrile action, it is, we believe, *cold water*, freely applied to the ſurface, and taken internally. (See Cold.) Hence the term "febrifugum magnum," uſed a century ago by the reverend Dr. Handcock, although it called forth the raillery and ridicule of the faculty, was, perhaps, not leſs juſt than emphatical. (See his treatiſe, entitled "Febrifugum Magnum, or Common Water the beſt Cure for Fevers," London, 1723.) The cinchona, or Peruvian bark, has been termed the greateſt febrifuge, probably on account of its efficacy in the cure of intermittent fevers, or agues, but, ſtrictly ſpeaking, it is a *preventive* in theſe caſes; ſince its efficacy conſiſts in preventing the return of the fever, by ſtrengthening the body in the interval; and not in allaying the fever itſelf, over which it has no power. The ſecret preparation of antimony, which Dr. James employed, and which was ſufficiently popular for many years, as a febrifuge, to enrich the inventor and his family, poſſeſſes no other power in allaying fever, than its operation as a purgative and diaphoretic. See Fever.

FEBRIS. See Fever.

Febris *Amphemerina*, from ἀμφι and ἡμέρα, *a day*, an appellation given by ſome of the moderns to that form of remittent fever, in which ſimilar remiſſions and exacerbations occur daily, in order to diſtinguiſh it from the daily intermittent,

mittent, which is called febris quotidiana. (See Sauvages, Noſol. Method. claſs ii. order ii. genus 6.) It has been alſo denominated by Latin writers quotidiana continua. (See Sennertus de Febribus, lib. ii. cap. xiv.) "Eſt febris perpetuo quidem durans," ſays this author, "et nunquam ad ἀπυρεξίαν deveniens, ſingulis tamen diebus exacerbationes ſuas habens a pituitâ ſanguini permixta." It is the ſynechees or continent fever of Morton, erroneouſly ſo called: and the febris latica of ſome writers in barbarous Latin. The terms ἀμφημερινα, *amphemerina*, as well as *cathemerina*, and *methemerina*, derived from the ſame root, with the addition of the prepoſitions κατα and μετα, were applied by the Greeks to this fever, as well as the quotidian intermittent. See Remittent.

Febris *Anginoſa*, a term applied to fevers accompanied by a ſore throat, or angina. See Cynanche.

Febris *Deſæcatoria*, the ſame with *depuratoria*, a term uſed by Sydenham, Queſnay, and other humoral pathologiſts, to denote ſuch a fever as terminates by a critical diſcharge, which was ſuppoſed to rid the ſyſtem of morbid humours. See Depuratoria.

Febris *Elodes*. See Elodes.

Febris *Ephemera*. See Ephemera.

Febris *Epialos*. See Epialos.

Febris *Gaſtrica*, an appellation applied to thoſe modifications of fever in which the ſtomach and bowels are more particularly affected; as with pain, diarrhœa, eſpecially when the ſtools are of a morbid appearance, or fetid, &c. (See Burſerius, Inſt. Med. Pract. vol. i.) The ſame variety of fever has alſo been denominated febris ſtercoralis, and by Queſnay fievre excrementeuſe. (Traite des Fievres, tom. ii.)

Febris *Hemitritæa*, ἡμιτριταια, the ſame with ſemi-tertian. See Fever, *Semi-tertian*.

Febris *Lypiria*. See Lypiria.

Febris *Phricodes*, from φρίκη, *febrile chill*, called alſo febris horrida and horrifica, a variety of fever in which the rigors or chills are frequent. See Phricodes.

Febris *Synochus*, alſo *Synocha*, different modifications of continued fever, the former term being applied to the milder, the latter to the more violent, inflammatory or ardent ſpecies. See thoſe words.

Febris *Tritæophia*, a remittent fever with the remiſſions and exacerbations occurring only on the alternate days; it differs from the tertian intermittent, as the febris amphimerina differs from the quotidian. See Remittent.

Febris *Tetartophia*, a remittent fever, with the remiſſions and exacerbations on the fourth day from the commencement, that is, with an interval of two days between each remiſſion; and differing from the quartan, as the preceding article from the tertian intermittent. The tritæophia and tetartophia have alſo been denominated tertiana continua, and quartana continua. See Remittent.

Febris *Typhodes*. See Typhus.

FEBRUA, or Februata, in *Mythology*, an appellation given to Juno as the goddeſs of purification, and as preſiding over women in the pains of labour and childbirth. She was ſo denominated, becauſe the pontiffs paid her a peculiar worſhip on the firſt day of February.

Februa, in *Antiquity*, a feaſt held by the Romans in the month of February, in behalf of the manes of the deceaſed.

Macrobius tells us that ſacrifices were here performed, and the laſt offices paid to the ſhades of the defunct. (Saturn. lib. i. cap. 13.) And from this feaſt it was that the month of February took its name.

The deſign of theſe ſacrifices is ſomewhat controverted: Pliny ſays they were performed to render the infernal gods propitious to the deceaſed; though ſome of the moderns have imagined that they were intended to appeaſe the deceaſed themſelves, and were offered immediately to them as a ſort of deities. What confirms the former ſentiment is, that Pluto himſelf is ſurnamed Februus. They laſted twelve days.

The word is of an ancient ſtanding in the Latin tongue; from the very foundation of the city we meet with *februa* for *purifications*, and *februare*, *to purge* or *purify*. Varro, (De Ling. lib. v.) derives it from the Sabines; Voſſius and others from *ferveo*, *I am hot*, becauſe purifications were chiefly performed with fire and hot water. Some go higher, and even deduce the words from פּוּר, *phur*, or *phavar*, which in the Syriac and Arabic has the ſame ſignification with *ferbuit*, or *efferbuit*, and might probably likewiſe ſignify *to purify*; for *phavar*, in Arabic, denotes a preparation given to women in child-bed to bring away the after-birth, and other impurities remaining after delivery, much as among the Romans, who gave the name Februa to the goddeſs ſuppoſed to preſide over the delivery of women. Ovid. Faſt.

FEBRUARY, Februarius, in the *Roman Chronology*, the ſecond month of their year, ſo called from *Februa*, a feaſt held therein.

In the firſt ages of Rome, February was the laſt month of the year, and preceded January, till the decemviri made an order that February ſhould be the ſecond month of the year, and come after January. See Biſſextile.

FECAMP, in *Geography*, a town of France, in the department of the Lower Seine, and chief place of a canton, in the diſtrict of Le Havre, nine miles S.W. of Dieppe. The place contains 7000, and the canton 14,981 inhabitants, on a territorial extent of 82½ kiliometres, in 13 communes. The principal commerce conſiſts of linen, ſerges, lace, leather, and hats: the herring fiſhery employs many veſſels: and ſmaller boats fiſh along the coaſt. N. lat. 49 46′. E. long. 0° 28′.

FECES. See Fæces.

FECIALES, or Foeciales, an order of prieſts or officers conſiſting of twenty perſons, among the ancient Romans, appointed to proclaim war, negociate peace, &c.

Feſtus derives the word from *ferio*, *I ſtrike*, as *ferire fœdus* ſignifies *to conclude a treaty*; and accordingly, inſtead of *feciales*, he would have it wrote *feriales*. Others derive it from *fœdus*, which was anciently written *fedus*; or from *fides*, *faith*; others from *facio*, *feci*, *I make*, &c. becauſe they made war and peace. Voſſius chooſes to derive it from *fatu*, of the verb *fari*, *to ſpeak*: in which ſenſe the *feciales* ſhould be the ſame with *oratores*; which ſentiment is alſo confirmed by the authority of Varro, who ſays they were called indifferently, *feciales* and *oratores*. De Vit. Popul. Roman. lib. ii.

The feciales were a ſort of heralds or kings at arms, who, when the Romans had any diſpute with their neighbours, were ſent firſt to demand the thing pretended to be uſurped, or require ſatisfaction for the injury alleged to be done. If an anſwer was not returned by them that was ſatisfactory to the people and the ſenate, they were diſpatched again to declare war, and the like in treating of peace, the feciales being the only perſons appointed to negociate between the ſenate, &c. and the enemy.

Plutarch, in the Life of Numa, and Halicarnaſſeus, lib. ii. obſerve, that they were firſt inſtituted by that prince. The latter adds, that they were choſen out of the beſt families in Rome; that their office, which was reputed a ſort of ſacerdotium, or prieſthood, only ended with their life; that their perſons were ſacred and inviolable, as thoſe of other prieſts; that they were even charged to ſee the republic did not declare war unjuſtly; that they were to receive the complaints and remonſtrances of nations who pretended to have been any way injured by the Romans; that if thoſe complaints were found juſt, they were to ſeize the criminals, and deliver them up to thoſe they had offended; that they were inveſted with the rights and privileges of ambaſſadors; that they concluded treaties of peace and alliance, and took care they were executed; and, laſtly, aboliſhed them if they were found not to be equitable. Livy, lib. i. cap. 24. aſcribes their inſtitution to Ancus Martius, in the year of Rome 114. See alſo Aul. Gell. lib. xvi. cap. 4.

But Varro aſſures us, that in his time moſt of theſe functions of the feciales were ſet aſide; as thoſe of the ancient heralds at arms are among us at preſent; though Plutarch obſerves, that they had ſtill ſome authority in his time.

The feciales were crowned with *verbena, vervain*, when they went to declare war; their head was covered with a veil, over which the crown was applied; in this equipage they proceeded to the frontiers of the new enemy's country, and threw a bloody dart or javelin into the ground within the ſame. In Livy, and other ancient authors, we have the formula uſed in ſuch declarations.

FECKENHAM, John de, in *Biography*, the laſt mitred abbot who ſat in the houſe of peers, was born of poor parents, who reſided in a mere cottage on Feckenham foreſt, in Worceſterſhire, from which place he derived his name, that of his family being "Howman." His natural abilities induced the pariſh prieſt to educate him, and then to obtain for him an admiſſion into the monaſtery at Eveſham. When he was eighteen years of age, he was ſent to Glouceſter college, Oxford; where he reſided a ſufficient time to improve himſelf in academical learning, and then he was recalled to his abbey. Upon the diſſolution of this place, in 1536, he had a yearly penſion of one hundred florins allowed him during his life. He now returned to Oxford, and in a ſhort time took his degree, and was appointed chaplain to Dr. Bell, biſhop of Worceſter. He was afterwards chaplain to Bonner, biſhop of London, and, in 1549, when Bonner was deprived of his biſhopric, his chaplain was committed to the Tower of London. The cauſe of his impriſonment was firſt promiſing, and then refuſing, to adminiſter the ſacraments after the Proteſtant manner. He was afterwards, to uſe his own expreſſion, "borrowed from priſon to take part in different diſputations on the points at iſſue between the Proteſtants and Papiſts," which were held at the houſes of ſome perſons of high rank, and was carried into Worceſterſhire, where he ſtill held a benefice to maintain ſolemn public debates with Hooper, the biſhop of that dioceſe. Theſe diſputations producing no change in his religious opinions, he was moſt ſhamefully remanded to the Tower, where he was kept till the acceſſion of queen Mary, in 1553. He was now made chaplain to the queen; and alſo chaplain to Bonner, by whom he was preſented to the prebend of Kentiſh Town, in St. Paul's cathedral. He was deputed to lady Jane Grey, to attempt her converſion two days before ſhe was executed, but his miſſion proved to be entirely fruitleſs. From the prebendary of St. Paul's, he was, in the year 1554, raiſed to the deanery; and received other valuable preferment. In the ſame year he was appointed to diſpute againſt Cranmer, Ridley, and Latimer, before thoſe exemplary characters were committed to the flames by order of the bloody queen, and her ſtill more infamous prelates. Feckenham, it is believed, was no party in theſe horrible crimes, and abhorred even the office of attempting to change the opinions of men, whom in his heart he could not but reſpect. He was kind and humane, and diſtinguiſhed himſelf in performing a thouſand good offices for the afflicted and perſecuted Proteſtants. He went ſo far in this cauſe as to offend his bigoted miſtreſs, who probably began to be ſuſpicious of his principles. In 1556 he was created D.D. out of reſpect to his learning, piety, benevolence, and other virtues, without being called on to perform the accuſtomed exerciſes. In the ſame year, queen Mary reſtored the monaſtic foundation of Weſtminſter Abbey, and appointed Feckenham abbot of the ſame, with epiſcopal power over the monks. When Elizabeth came to the crown in 1558, ſhe did not require to be reminded of her obligations to this worthy man, who had pleaded for her liberty when impriſoned by her ſiſter, but offered him the higheſt promotion in the church, provided he could conform to the changes then in contemplation. This his conſcience obliged him to refuſe: he went much farther; he thought it his duty to oppoſe the reformation in the houſe of peers, where he ſat as a mitred abbot in the loweſt place on the biſhop's form. For his ſteady attachment to his own principles, and for the eloquence with which he pleaded againſt the innovations of the times, he was committed to the Tower in 1560, and continued in that priſon till 1663, when he was removed to the cuſtody of Dr. Horne, biſhop of Wincheſter, who probably engaged to convert him from his errors: a taſk much too difficult for the prelate, who, it appears, in a few months, ſent him back to the Tower. Shortly after, at the ſolicitation of his friends, he was removed to the Marſhalſea, from which he ſoon obtained a complete diſcharge. In 1574, he was again impriſoned, and releaſed upon giving bond for his appearance when called on. It muſt be obſerved, that this mode of giving and taking bond is often reſorted to as an apology for the government, when they know that they have ſtretched the limits of their power, and by ſubmitting to give bond or bail for appearance, the aggrieved and injured perſon, in truth, juſtifies the conduct of thoſe who have inflicted the injury. Feckenham, at length, wearied with frequent proſecutions, acknowledged the queen's ſupremacy, but could be perſuaded to go no farther, and he was again impriſoned at the caſtle of Wiſbeach, where he ſpent the remainder of his days, and died in 1585. Camden calls him "a learned and good man, that lived long, did a great deal of good, and always ſolicited the minds of his adverſaries to benevolence." Fuller ſtyles him a man cruel to none, courteous and charitable to all who needed his help. Burnet and others bear their teſtimony likewiſe to the excellence of his character. Biog. Brit.

FECULA, in *Chemiſtry*. This term is uſually applied to any pulverulent matter extracted from any part of a vegetable, ſimply by breaking down its texture, waſhing with water, and ſubſidence. It is therefore a moſt minutely divided ſubſtance, capable of being ſuſpended in cold water, but not diſſolved.

The moſt important of theſe is the *amylaceous fecula*, a nutritive inſipid ſubſtance contained abundantly in grains, ſeeds, and roots, and which, when extracted, purified, and dried, forms the common *Starch*, the manufacture of which will be deſcribed under that article.

Moſt parts of vegetables will furniſh this fecula, but it is particularly found in grains, ſeeds, and roots, united with an extractive and ſaccharine matter, ſometimes with gluten and vegetable albumen, with mucilage, and oil. Of roots, the tuberous and bulbous are thoſe which contain the moſt fecula; the medullary part of trees and plants alſo abound with it.

The extraction of the fecula is very ſimple, but it cannot always be obtained free from colour and taſte. The root or grain muſt firſt be broken down into a pulp by raſping or other mechanical means, and then waſhed with cold water, which becomes immediately turbid. This is to be haſtily poured off from the fibrous part of the pulp through a coarſe ſieve, and allowed to remain at reſt for a few minutes, during which the fecula ſubſides to the bottom in the form of a very fine cloſe-grained powder, but without any tenacity or coheſion, and of the conſiſtence of very fine wetted ſand. The ſupernatant liquor always remains ſomewhat turbid, and generally coloured with mucilage or extract. The fecula ſhould be waſhed repeatedly with abundance of cold water, till this comes from it quite inſipid and colourleſs.

It ſhould be obſerved, however, that it is only from a few of the grains and roots of plants that the extraction of the fecula is thus eaſily effected; for where this ſubſtance is intimately united with oil and mucilage, as in the almond, and many other kernel ſeeds, the whole is rendered uniformly diffuſible in water nearly in an equal degree, and the fecula will not be depoſited pure by mere ſubſidence, nor indeed is there any way by which it can be obtained very pure when in this combination.

The chemical properties of pure fecula (taking fine ſtarch as an example), are the following:

It is a white powder, nearly, if not entirely, inſipid, ſomewhat adhering to the tongue, but not ſoluble in the mouth. When examined with a lens in a good light it appears compoſed of ſmall ſemi-tranſparent grains, with a ſattiny gloſs, and ſomewhat of a cryſtalline arrangement. It is not eaſily moiſtened with cold water, but when rubbed with this fluid it makes an incoheſive maſs, which, on drying, cracks into ſmall pieces. When wetted and kept in a moderate warmth, the mixture ſlightly ferments and turns ſour.

Boiling water, however, acts very differently on fecula, for it diſſolves that ſubſtance ſpeedily and totally into a thick, tenacious, tranſparent jelly, which becomes ſtill more tenacious by long boiling, as is ſeen in the ordinary domeſtic uſe of ſtarch. When liquid ſtarch is ſlowly dried, it ſhrinks in every direction as the water evaporates, and finally becomes a tranſparent brittle ſubſtance, exactly reſembling gum-mucilage.

Moſt of the acids diſſolve fecula with eaſe, eſpecially when aſſiſted with heat, and with nearly the ſame products and appearances that attend the action of the ſame acids on mucilage.

The alkalies alſo diſſolve fecula readily, but the preciſe chemical effects of theſe agents have not been much examined.

When ſtarch is heated ſtrongly in the open air, it firſt becomes yellow, then brown, and red, ſoftens, puffs up, exhales a white pungent acid ſmoke, and leaves a bulky ſoft coal. The products of its diſtillation *per ſe* are, a water loaded with pyromucous acid, ſome drops of a red-brown oil, much carbonic acid, and hydrocarbonous gas. The aſhes of the coal, when fully calcined, contain a little potaſh and phoſphat of lime.

Starch, when kept dry, and ſecluded from the air, will remain long unaltered, though at laſt it runs into clots, and acquires a ſour muſty ſmell.

In chemical properties the amylaceous fecula bears the ſtrongeſt reſemblance to mucilage.

Of the green Fecula of Plants.—This ſubſtance, which has been the ſubject of much curious inveſtigation, muſt be carefully diſtinguiſhed from the amylaceous fecula laſt deſcribed, to which indeed it has no other reſemblance than in the mere circumſtance of being ſometimes obtained in a fine pulverulent form by ſpontaneous ſubſidence.

Many of the green ſucculent vegetables, when preſſed moderately, afford a turbid green juice, which, when filtered, gives a clear but tenacious juice, that paſſes through the filter, whilſt there remains behind a green pulp, which is the ſpecies of fecula in queſtion. Rouellé was the firſt who pointed out the nature of this fecula, ſhewing that it was totally different from the amylaceous fecula, but bore a ſtrong reſemblance to the gluten of wheat, mixed, however, with a kind of reſinous ſubſtance ſoluble in alcohol, to which the green colour is chiefly owing.

Prouſt has alſo given ſome valuable obſervations on this ſubject (Journal de Phyſique, tom. 56.) of which the following is an abſtract.

When any of the green turbid juice of plants, (ſuch as of hemlock, creſs, cabbage, &c.) is heated, it becomes ropy, and ſoon coagulates in part, forming a tough, green, glutinous maſs, that ſeparates from the liquor, which laſt now loſes its colour and remains limpid. The heat of 145° is ſufficient to ſeparate all this fecula, which is leſs than what is required to coagulate albumen, one circumſtance that eſtabliſhes ſome difference between this fecula and albumen, to which it has been likened by Fourcroy. If the coagulated fecula is gently dried, it hardens into an elaſtic horny ſubſtance, which will not again unite with water. If this fecula, either before or after coagulation, be kept under water in warm weather, it becomes offenſive in a day's time, and has the nauſeous ſmell and other circumſtances attending the putrefaction of animal matter. The water in which this fecula has long been kept contains ſulphuretted hydrogen, and carbonat of ammonia.

This fecula is precipitated from the native juice by almoſt any neutral ſalt, which, probably, is merely owing to the ſuperior affinity of the ſalt for the water in which the fecula is held diſſolved.

When the entire green feculous precipitate, formed by heating the recent juice, is treated with alcohol, a portion only diſſolves therein, leaving about 80 *per cent.* of the whole precipitate untouched. The alcoholic ſolution, evaporated to dryneſs, leaves a ſoft green ſubſtance, ſomewhat reſembling a reſin, but differing from it in not being ſeparated from the alcoholic ſolution on addition of water. Alcohol, added to the entire juice of the plant recently expreſſed, produces a white precipitate, and leaves a green reſinous ſolution. Oxymuriatic acid deſtroys the green colour, both of the entire juice and of the alcoholic ſolution.

On the whole, it ſeems probable that the green fecula of the herbaceous vegetables conſiſts of two parts, namely, of a green ſubſtance, ſoluble in alcohol, and very ſimilar to the reſins; and of another principle, coagulable by a very gentle heat, ſuſceptible of putrefaction, like animal matter, producing much ammonia when heated, ſoluble in alkalies, and which bears a very ſtrong analogy with animal gluten.

FECULENT, or FÆCULENT, is applied to the blood and other humours, where they abound in fæces or dregs, or have not the proper and uſual degree of purity.

FECUNDATION *of* PLANTS, in *Vegetable Phyſiology*, is now generally believed to be accompliſhed by the action of the *pollen* of the *anthers* upon the *ſtigma*. (See ANTHERÆ.) This doctrine, having been previouſly aſſerted by ſeveral phyſiologiſts towards the end of the ſeventeenth century, was variouſly illuſtrated and finally eſtabliſhed by Linnæus towards the year 1732. His ſubſequent publications all tend to confirm it, eſpecially his prize diſſertation, publiſhed by the Imperial Academy at Peterſburgh in 1760, tranſlated into Engliſh, with notes, by the author of the preſent article in 1786. Whether the hypotheſis advanced in that work, that the ſtamens, or male organs, derive their origin from the cortical part of the plant, and the piſtils, or female ones, from the medullary ſubſtance, be founded in truth, is not to our preſent purpoſe. There are many facts and analogies which ſupport that theory; and what theory, in the hands of an ingenious man, is deſtitute of ſuch ſupports? The idea is altogether ſpeculative; and the doctrine of vegetable impregnation, which we ſhall now briefly explain, is entirely independant of it.

As far as the flowers of any plant have been clearly aſcertained and diſſected, they are found to conſiſt of two eſſential kinds of organs, the ſtamens and piſtils. The eſſential part of the former is the anther, a capſular body containing the pollen; which laſt, even after it is diſlodged from the anther, is found to be alſo in general capſular, though in ſome inſtances of a glutinous ſubſtance. In either caſe the pollen finally diſcharges ſomething, in the form of a vapour or eſſence, by which its final purpoſe is anſwered. The eſſential part of the piſtil or piſtils, on the other hand, is the ſtigma belonging to each. This is formed ſo as to receive and retain the pollen, being either downy or concave, often irritable, and eſpecially furniſhed with a peculiar viſcid moiſture of its own, which cauſes the pollen, when of a dry nature, to explode, and when otherwiſe, to give out its eſſential ſubſtance, ſo as to be communicated through the medium of the ſaid peculiar moiſture, to the rudiments of the ſeeds, which by that means alone are enabled to bring to perfection the latent embryo of the future plant within them, or, in other words, to become prolific. It has been aſcertained that ſeeds, however apparently perfect in all their other parts, have no embryo unleſs the pollen has acted upon them as above-mentioned. (See Embryo and Corculum.) That the pollen is not of an excrementitious nature, and has functions to perform after it has left the anther, is evident from its elaborate ſtructure, and highly elaſtic, and apparently active, contents, which are ſubſequently diſcharged. That its functions, whatever they may be, are not performed by any clandeſtine communication with the infant ſeeds, through the other parts of the flower, is demonſtrated by the great numbers of flowers which have the ſtamens in one individual, and the piſtils in another, of the ſame ſpecies, growing on different ſtalks or even diſtinct roots. That the ſtigma is no leſs important an agent than the pollen, appears from its vitality being retained till it has received that ſtimulus, and no longer, while the parts immediately connected with the ſtigma, deſtined to contain, protect, or hereafter to tranſport, the growing ſeeds or fruit, remain in full vigour till their deſtination is accompliſhed. Thus the ſtyles of many umbelliferous plants, and various others, after their ſtigmas are entirely withered, become lengthened, hardened, or recurved, ſo as to form hooks by which the ripe ſeeds ſtick to the coats of animals, and are by that means widely diſperſed. Other ſtyles become feathery crowns or wings, through whoſe ſupport the ſeeds are wafted away by the wind, as in moſt compound flowers. In every caſe the ſtigma, however elaborate an organ originally, will be found to have long ſince diſappeared, its "fountains of life" having been dried up as ſoon as the ends of its creation were accompliſhed. That the female organs of a flower are, during their growth, before fecundation, independant of the male ones, or ſtamens, is proved by removing the latter, and impregnating their appropriate piſtils with pollen from another bloſſom of the ſame ſpecies, which will then as effectually perfect their ſeeds as if they had received pollen from the anthers which naturally belong to them. This laſt experiment is moſt ſatisfactorily performed on flowers that laſt but one day, as the various ſpecies of *Glaucium* or Horned-poppy.

Innumerable collateral circumſtances confirm the doctrine of vegetable fecundation here advanced. If the pollen be cauſed to explode prematurely by adventitious moiſture, before it reaches its final deſtination at the ſtigma, its purpoſe is defeated, and the appropriate piſtils prove barren. This happens to corn and fruit-trees occaſionally, from ſuperabundant and uninterrupted rain. Cold alſo is hurtful, as benumbing the vital energy of the ſtigma and its concomitant parts. Exceſſive, irregular, or unhealthy nouriſhment ſometimes changes the nature of the ſtamens and piſtils, ſo effectually as to transform them into other parts of a flower, chiefly petals, thereby entirely defeating their natural purpoſe, and producing thoſe beautiful monſters called double flowers, which generally return to a natural ſtate, if reſtored to their natural ſoils and ſituations. Accidental or artificial croſs fecundation, by application of the pollen of one flower to the ſtigma of another nearly akin, thereby producing a mule offspring, more or leſs reſembling both its parents, but, like animal mules, only tranſiently, imperfectly or not at all, prolific, is perhaps the moſt concluſive proof of the truth of this doctrine. Linnæus performed ſuch an experiment on the *Tragopogon pratenſis*, whoſe flowers are yellow, by ſprinkling its ſtigmas with pollen taken from *Tragopogon porrifolius*, whoſe flowers are dark purple. The offspring bore purple flowers, yellow at their baſe, than which nothing could be more concluſive; and the many varieties, or ſeemingly new ſpecies, of Cape Geraniums, which come up ſpontaneouſly from ſeed ripened in our gardens, and ſooner or later decline and diſappear, afford no leſs evident confirmation of the ſexes and fecundation of vegetables. S.

FECUNDITY, or Foecundity, *Fertility*, or that quality of a thing which denominates it fruitful.

The fecundity of divers plants is very extraordinary. M. Dodart has an expreſs diſcourſe on this ſubject, in the Memoirs of the Academy of Science; wherein he ſhews, that, at a moderate computation, an elm, one year with another, yields 329,000 grains or ſeeds, each of which, if properly lodged, would grow up into a tree: now an elm ordinarily lives 100 years, conſequently, in the courſe of its life, it produces near 33,000,000 ſeeds, all which ariſe from one ſingle ſeed.

He ſhews farther, that the ſame elm, by frequently cutting off its head, &c. might be brought to produce 15,840,000,000 ſeeds, and, conſequently, that there are ſo many actually contained in it.

Fecundity *of Fiſh*. See Fish.

FECUNSUM, in *Geography*, a town of Japan, on the N. coaſt of Niphon; 28 miles N. of Noto.

FECURI, a town of Japan, in the iſland of Niphon, on the gulf of Jedo; 65 miles S. of Jedo.

FECYUS Mons, in *Ancient Geography*, a mountain of Gallia Narbonnenſis, ſituated on the bank of a lake, near the ſea, at the mouth of the Rhône, in the country of the Volſci Arécomici.

FEDALA, in *Geography*, a ſea-port town of Africa, in Morocco, on a bay of the Atlantic, forming the road belonging to this town, ſcarcely ſufficient to ſhelter a few ſmall veſſels; 8 leagues S. of Monſooria. The above-mentioned bay is partly formed by a little point of land which projects into the ſea, and which has been improperly denominated an iſland. In the year 1773 the reigning emperor, having permitted a great quantity of corn to be brought out of the matadores contiguous to this road, determined to avail himſelf of the opportunity thus offered for building a city, by obliging the merchants, who wiſhed to have any part of the corn, to build ſome houſes; and thus the town of Fedala was begun in a very advantageous ſituation; but no ſooner was the corn diſpoſed of than the town was abandoned;

doned ; ſo that it was ruined before it was finiſhed. The road of Fedala being defended by the coaſt, which, on the ſouthern ſide, perceptibly extends to the weſt, ſhips may ſafely anchor here in winter ; but, in ſummer, when the winds blow ſtrong from the N.N.W., the ſwell of the ſea is very incommodious.

FEDER Sea, a lake of Germany, in the circle of Swabia, about 12 miles in circumference ; communicating with the Danube by a river called Krautzach; the lake is a little to the eaſt of Buchau.

FEDERATION, or Confederation, applies principally to a certain coalition among powers, generally adjunctly ſituated, and nearly equal in power, for the purpoſe of maintaining their independence, or for the conqueſt of ſome obnoxious people, with whom none of the parties could cope unleſs aided by the forces of his neighbours. This excellent policy has been on many occaſions reſorted to as the means of ſelf-defence, and, when duly maintained, has rarely failed to accompliſh its intent ; but, unhappily, we experience in this branch of politics all thoſe evils inſeparably attendant upon every combination of perſons whoſe views and intereſts are not ſtrictly in uniſon ; jealouſy, ambition, and reſentment for ſuppoſed ſlights, rarely fail to baniſh that harmony, on which alone the ſafety of all muſt depend. Of this, we have a lamentable inſtance in the late diſmemberment of the German empire, of which the ſeveral members allowed themſelves to be ſwayed by hopes and expectations, ſuch as muſt ultimately prove illuſive ; in the mean time they enable him, who ſhould have been conſidered their common enemy, to deſtroy the very foundation of their ſafety, both general and individual, and to extend that power, which had already proved itſelf too extenſive, to admit that Europe ſhould repoſe in peace, or even preſerve its independence.

In like manner we ſee that immenſe federation, formed in the heart of Hindooſtan by the Mahrattas, proceeding with haſty ſtrides towards its diſſolution. There the ſeveral princes allowed themſelves to be actuated by ambition ; each wanted to become the head of a formidable empire ; each viewed his neighbour's dominions with a longing eye, and viewed his every act with ſuſpicion and doubt. Hence it was no difficult taſk to ſet the whole at variance, and to ſow diſcord ſo abundantly among them, as to raiſe an impenetrable barrier againſt reconciliation, and future co-operation.

Though not ſo evidently marked, a certain characteriſtic of this deſcription may be traced in the conduct of thoſe Indian tribes inhabiting the interior of North America. Formerly, to inſult one, was to challenge the whole ; but ſince they have become familiarized to the uſe of ſpirituous liquors, and been taught to look forward to their own ſeparate intereſts, each tribe has been, to a certain degree, eſtranged from the federation, and all have conſequently been, more or leſs, bereft of both property and power. In this caſe, however, we are induced to throw a veil over the privations, and the ſufferings of a people who have contributed ſo little, if at all, to the welfare of the world at large ; viewing them as ferocious, ſanguinary, and treacherous, we may be permitted rather to exult in, than to condemn thoſe encroachments which carry with them civilization and improvement ; we therefore feel no diſpoſition to become their partizans.

With reſpect to that federation or league which has been ſo often attempted, and ſo invariably baffled, for the narrowing our maritime influence, little need be ſaid. So long as our miniſters remain faithful to their truſt, we may confide to the Britiſh navy the charge of ſupporting that exalted character for which it is not indebted to empty panegyric, but to its own ſubſtantial merits.

The Britiſh empire, while its three component parts, *viz.* England (including Wales), Scotland, and Ireland, though governed by one king, had their reſpective parliaments, and conſequently ſeparate eſtabliſhments and different laws ; could be conſidered only as a federation. A very curſory review of paſt events in thoſe ſeveral portions of the united kingdom muſt ſatiſfy every reflecting mind, that human wiſdom could not have deviſed a more prudent, or a more neceſſary meaſure, than the abolition of thoſe diſtinct forms of legiſlation, upon which our enemies ever depended for ſupport. It is true the minds of all are not as yet reconciled to the combination, but we may ſafely venture to predict, that poſterity will do juſtice to the ſagacity and integrity of that miniſter who bound our whole population to each other, by mutual advantage ; a much ſtronger tie than could poſſibly be effected by *federation*.

FEDIA, in *Botany*, a name which originated with Adanſon, and ſeems to be derived from *Fedus*, an ancient word for *Hædus*, a kid. This derivation might at leaſt be probable, if the *Fedia* of Adanſon, like that of ſubſequent authors, included the Lamb's Lettuce, but it conſiſts of *Valeriana ſibirica* only, to which the name is not in that ſenſe appropriate, except by a very lax concatenation of ideas. Still leſs ſurely can it be deduced from *fœdus*, filthy, fœtid, or mean.—Adanſon Fam. des Pl. v. 2. 152. Gærtn. t. 86. Vahl. Enum. v. 2. 18. Michaux Boreali-Amer. v. 1. 18. (Valeriana; Linn. Gen. 22. Schreb. 29. Willd. Sp. Pl. v. 1. 175. Sm. Fl. Brit. 37. Juſſ. 195. Valerianella ; Tourn. t. 52. Rivin. Monop. Irr. t. 5. Locuſta ; ibid. t. 6. Polypremum ; Adanſ. loc. cit.) Claſs and order, *Triandria Monogynia*. Nat. Ord. *Aggregatæ*, Linn. *Dipſaceæ*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, very ſmall, with three or four teeth, at length variouſly dilated, permanent. *Cor.* of one petal, funnel-ſhaped ; tube gibbous ; border five-cleft, regular or irregular, bluntiſh. *Stam.* Filaments three, ſometimes four, five, or ſix, inſerted into the corolla, awl-ſhaped, erect, nearly as long as the border ; anthers roundiſh. *Piſt.* Germen inferior, of three cells ; ſtyle thread-ſhaped, the length of the ſtamens ; ſtigma notched. *Peric.* Capſule coriaceous or membranous, not burſting, crowned with the calyx, of two abortive cells and one fertile. *Seed* ſolitary, ovate, ſmooth.

Eſſ. Ch. Calyx ſuperior, with three or four teeth. Corolla of one petal, five-cleft. Capſule crowned, without valves, with one fertile cell. Seed ſolitary.

Perhaps this genus may properly be ſeparated from *Valeriana*, but it is a queſtion of ſome difficulty, their natural affinity being very great, and the ſtructure of the parts of fructification in both extremely various. *Fedia* conſiſts of 12 ſpecies in Vahl's *Enumeratio Plantarum*, that author raiſing to the rank of ſpecies, ſeveral heretofore eſteemed varieties of *Valeriana Locuſta*, Linn. Sp. Pl. 47. Engl. Bot. t. 811. Among theſe are *V. dentata*, Sm. Fl. Brit. 1385. Engl. Bot. t. 1370.

F. *cornucopiæ* (*Valeriana cornucopiæ* ; Linn. Sp. Pl. 44. Sm. Fl. Græc. Sib. t. 32.) is one of the handſomeſt, but it is one that moſt betrays a ſtrict relationſhip to *Valeriana*, and perhaps ought to combine the two genera. If every *Valeriana* had that feathery crown to the fruit, of which no traces are found in the flower, and which makes ſo ſtriking a character in moſt of the ſpecies, the diſtinction would be obvious and certain, and when they are all properly examined, in flower and in fruit, it may be found to hold good. If not, we preſume *Fedia* can ſcarcely be ſupported.

FEDOA, in *Ornithology*, the great Godwit, a ſpecies of *Scolopax*, which ſee.

FEDOA, is alſo a name given by Willughby and Ray to the Stone-Curlew or thick-kneed buſtard, the CHARADRIUS *Oedicnemus*.

FEE, FEUD, *Feudum*, *Feodum*, or *Fief*, an eſtate, land, tenement, lordſhip, or the like, held of a ſuperior lord, on condition of fealty, homage, or other acknowledgment.

The word is derived by ſome authors from *fœdus*, as ariſing from a treaty or alliance made with the lord; but the opinion of Selden ſeems the beſt authorized, who deduces it from the Saxon, *feoh*, *ſtipendium*, the fee being a kind of prebend to live upon; and accordingly we find, that in ancient times it was uſed for the wages and appointments of officers. It is obſerved by Pontopiddan, in his Hiſtory of Norway, that in the northern languages *odh* ſignifies *property*, and therefore *feedoh*, or *feudum*, will denote *ſtipendiary property*.

The term fee is properly applied to lands and tenements, which we hold in perpetual right, on condition of an acknowledgment of ſuperiority in a higher lord. See TENURE.

The writers on this ſubject divide all land and tenements wherein a man has a perpetual eſtate to him and his heirs into allodium and feudum.

Allodium is defined to be a man's own land, which he poſſeſſes merely in his own right, without acknowledgment of any ſervice or payment of any rent to another; and this is property in the higheſt degree.

Feudum, or fee, is that which we hold by the benefit of another, and for which we do ſervice or pay rent, or both, to the chief lord; in which ſuperior the ultimate property of the land reſides. And therefore ſir Henry Spelman defines a feud or fee to be the right which the vaſſal or tenant hath in lands, to *uſe* the ſame, and take the profits to him and his heirs, rendering to the lord his due ſervices: the mere allodial *propriety* of the ſoil always remaining in the lord. This allodial property no ſubject in England has; it being a received, and now undeniable, principle in the law, that all the lands in England are holden mediately or immediately of the king.

Originally a feud was only an eſtate for life; and thoſe to whom it was granted were called *vaſſalli*, who by ſuch means were brought to a ſtricter diſcipline and obedience to the princes, and were bound to ſerve them in wars.

The origin of fees or feuds is one of the darkeſt and moſt intricate points in modern hiſtory. Some attribute the invention to the Lombards. Sir Thomas Craig inclines to this opinion, and ſays, that the Lombards, after they were ſubdued by Charlemagne, not only retained their ancient cuſtoms, but at the return of that emperor into France tranſmitted them with him into the remoteſt parts of that kingdom. In reality, the conſtitution of feuds had its original from the military policy of the Northern or Celtic nations, the Goths, Huns, Franks, Vandals, and Lombards, who ſpread themſelves over Europe at the declenſion of the Roman empire. This is rendered probable by the demand which the Cimbri and Teutones, nations of the ſame original, are recorded to have made on the Romans on their firſt irruption into Italy, about a century before the Chriſtian era. They demanded of the Romans, "Ut martius populus aliquid ſibi terræ daret, quaſi ſtipendium: cæterum, ut vellet, manibus atque armis ſuis uteretur;" *i. e.* they deſired feuds to be allowed them, which they were to hold by military and other perſonal ſervices. (L. Florus, lib. iii. cap. 3.) Having brought this conſtitution from their own countries, they continued it in their reſpective colonies as the moſt likely means to ſecure their new acquiſitions; and for this purpoſe the victorious general allotted large diſtricts of land to the ſuperior officers of the army; and theſe again diſtributed ſmaller parcels to the inferior officers and more deſerving ſoldiers. However, the feudal policy was only brought by degrees into that ſtate, which we find eſtabliſhed in the empire under Conrade the Salic, who was the firſt emperor that rendered fiefs hereditary, and in France under Hugh Capet. Sir Thomas Craig has diſtinguiſhed four ſtates of the feudal law; its infancy, comprehending the period between the firſt overflowing of the northern nations and the year 650; its childhood, the time in which fiefs, which were before annual, or at moſt for life, were extended to the ſons of the vaſſal, and no farther, *viz.* from the year 650 to the year 800, when Charlemagne was crowned emperor; its adoleſcence, from the times of Charlemagne to thoſe of Conrade II. or the Salic, who began his reign in the year 1024, and not only confirmed the inheritance of fiefs to the ſons and grandſons of the vaſſals, but permitted one brother to ſucceed another in his paternal eſtate: but even after the alteration made by Conrade, it was not uncommon in Germany to grant fiefs only for life; a charter of this kind occurs as late as the year 1376; and its maturity from this period forward, when feuds were permitted to deſcend to collaterals as far as the ſeventh degree. Others find ſome appearance of the duties of a vaſſal to his lord, in the ancient relations between the patron and his client; and others look for its riſe in the Roman *Beneficia*.

The emperors, it ſeems, diſtributed lands among the ancient legions on condition of their holding themſelves ready at all times to take up arms in defence of the frontiers of the empire, which affords us a good image enough of feuds, though in all probability their firſt origin ſhould be traced higher; but in proceſs of time their nature was changed, and duties were annexed to them which originally were not.

Du-Moulin makes no doubt, but that thoſe diſtributions of land called *benefices*, were the firſt matter of fees; for which reaſon he uſes the terms *benefice* and *feud* promiſcuouſly, as if they were the ſame thing; and yet there was a good deal of difference between them, as there was neither fealty nor homage, nor the other feudal rights annexed to the benefice; and that the benefice was not hereditary.

Probably benefices, (ſee BENEFICE,) began then to be called feuds, when they became hereditary; and when thoſe of whom the benefices were held began to demand faith or fealty from them. This fealty ſeems to conſtitute the *fee*; the word fee itſelf ſignifying, in the ancient Norman language, *faith*.

There is no fixing the preciſe era when theſe changes commenced; for fees, ſuch as they now are, were not eſtabliſhed all at once; but in different countries they took place at different times, and in different manners.

The great lords, after the deſtruction of the Roman empire, having in ſeveral parts uſurped the property of their benefices, laid likewiſe hold of the juriſdiction, and made their vaſſals their ſubjects; ſo that each became a ſort of petty ſovereign in his own territory.

Mezeray obſerves, that the donation of fees to the nobleſſe of France commenced under the reign of Charles Martel.

Hugh Capet, when he came to the crown, was himſelf ſo little eſtabliſhed that he durſt not oppoſe thoſe uſurpations, and was forced to ſuffer what he could not redreſs. See Le Fevre, De l'Origine des Fiefs, and Altaſerra's Origines Feudorum primoribus Galliæ. See Feudum.

The origin of fees in England, Camden carries as far back as the time of Alexander Severus. That prince having built a wall in the north of England to prevent the incurſions of the Picts, he ſome time after began to neglect the defence thereof, and gave, as Lampridius, in Vita Alex. Severi, aſſures us, the lands conquered from the enemy to thoſe of his captains and ſoldiers, whom that author calls "limitarios duces, & milites;" *i. e.* captains and ſoldiers of the frontiers; but it was on this condition, that their heirs ſhould continue in the ſervice, and that the lands ſhould never deſcend to private perſons; *i. e.* to ſuch as did not bear arms. That prince's reaſon was, that people, who in ſerving, defended their own, would ſerve with a great deal more zeal than any others. Such, according to Camden, was the riſe of fees in our nation. Britan. p. 651.

However, the feudal polity originally derived from the Northern nations, and gradually eſtabliſhed on the continent of Europe, was not univerſally received in England, though ſome traces of it may be diſcerned in the times of the Saxons, who were firmly ſettled in this iſland as early as the year 600, and incorporated with the national conſtitution, till the reign of William the Norman; and this was done not by the mere arbitrary will and power of the conqueror, but by the univerſal conſent of the common council of the kingdom, on the ſame principle of ſelf-ſecurity which had before induced the other nations of Europe to adopt it. The era of formally introducing the feudal tenures by law was probably the latter end of the year 1086, when the king was attended by all his nobility at Sarum, and all the principal land-holders ſubmitted their lands to the yoke of military tenure, became the king's vaſſals, and did homage and fealty to his perſon. This ingraftment of the feudal tenures and other cuſtoms of Normandy upon the ancient Saxon laws of Edward the Confeſſor, produced a different political ſyſtem in this country, and changed both power and property in many reſpects; for thoſe hereditary eſtates of the Saxon nobility and gentry which were allodial, and not ſubject to any feudal ſervice, were converted into feuds, and other lands which were of a feudal nature, and holden by military ſervice, having been granted only at will, or for a certain number of years, or at moſt for life or lives, and the grants of which were called benefices, were made hereditary fiefs. The feudal rights claimed in conſequence of this eſtabliſhment by the king over his tenants, and by them over their's, were conſiderably mitigated by the charter of Henry I. But, notwithſtanding this charter, former grievances were revived and aggravated by Henry and his ſucceſſors, till in the reign of king John, they became ſo intolerable, that they occaſioned his barons, or principal feudatories, to riſe up in arms againſt him; which at length produced the famous great charter, (ſee Magna Charta,) at Runningmeed, which, with ſome alterations, was confirmed by his ſon Henry III. Upon the whole it appears from the hiſtory of feudal tenures, and the alterations that have taken place with regard to them, in the ſucceſſive reigns of Henry I., John, Henry III., and Charles, that the liberties of Engliſhmen are not (as ſome arbitrary writers would repreſent them) mere infringements of the king's prerogative, extorted from our princes, by taking advantage of their weakneſs; but a reſtoration of that ancient conſtitution, of which our anceſtors had been defrauded by the art and fineſſe of the Norman lawyers, rather than deprived by the force of the Norman arms. See Conquest.

Although the barbarous nations, which framed the feudal ſyſtem, and from which it ſeems to have originated, ſettled in their new territories at different times, came from different countries, ſpoke various languages, and were under the command of ſeparate leaders, the feudal policy and laws were eſtabliſhed, with little variation, in every kingdom of Europe. Hence ſome have concluded, that all theſe nations, notwithſtanding ſo many apparent circumſtances of diſtinction, were originally the ſame people. It may, however, with greater probability, be aſcribed to the ſimilar ſtate of ſociety and of manners to which they were accuſtomed in their native countries, and to the ſimilar ſituation in which they found themſelves on taking poſſeſſion of their new domains. As the conquerors of Europe had their acquiſitions to maintain, not only againſt ſuch of the ancient inhabitants as they had ſpared, but againſt the more formidable inroads of new invaders, ſelf-defence was their chief care, and ſeems to have been the ſole object of their firſt inſtitutions and policy. Inſtead of thoſe looſe aſſociations, which, without diminiſhing their perſonal independence, had been ſufficient for their ſecurity, while they remained in their original countries, they ſaw the neceſſity of confederating more cloſely together, and of relinquiſhing ſome of their private rights in order to obtain public ſecurity. Every freeman, therefore, upon receiving a portion of the lands which were divided, bound himſelf to appear in arms againſt the enemies of the community. This military ſervice was the condition upon which he received and held his lands; and as they were exempted from every other burden, that tenure, among a warlike people, was deemed both eaſy and honourable. The king, or general, who led them to conqueſt, had the largeſt portion allotted to him; and he parcelled it out among thoſe who entered into an obligation to bear arms in his defence. His chief officers imitated his example, in diſtributing portions of lands among their dependants, upon the ſame condition. Thus, a feudal kingdom reſembled a military eſtabliſhment rather than a civil inſtitution. The names of a ſoldier and a freeman were ſynonymous. Every proprietor of land, girt with a ſword, was ready to march at the ſummons of his ſuperior, and to take the field againſt the common enemy. The feudal government, however, though admirably calculated for defence againſt the aſſaults of any foreign power, was defective in its proviſions for the interior order of ſociety. The bond of political union was extremely feeble; and the ſources of anarchy were innumerable. The powerful vaſſals of the crown ſoon extorted a confirmation for life of thoſe grants of land which, being at firſt purely gratuitous, had been beſtowed only during pleaſure. They then ſucceeded in having them converted into hereditary poſſeſſions; and at length in rendering them unalienable. The crown vaſſals, after having ſecured the poſſeſſion of their lands and dignities, were led by the feudal inſtitutions to new, and ſtill more dangerous encroachments on the prerogatives of the ſovereign. They obtained the power of ſupreme juriſdiction, both civil and criminal, within their own territories; the right of coining money; together with the privilege of carrying on war againſt their private enemies in their own name, and by their own authority. Subordination was almoſt loſt, and perſons of ſuperior rank aſpired at independence. Hence a kingdom, conſiderable in name and extent, was broken into as many ſeparate principalities as it contained powerful barons. A thouſand cauſes of jealouſy and diſcord ſprang up among them, and gave riſe to as many wars. Every country in Europe, waſted or kept in continual alarm during theſe endleſs conteſts, was filled with caſtles and places of ſtrength, erected for the ſecurity of the inhabitants, not againſt foreign force, but againſt internal hoſtilities. Indeed an almoſt univerſal anarchy prevailed. The guilty eſcaped puniſhment, and the innocent could not find protection. Such was the ſtate of Europe with reſpect to the interior adminiſtration of government from the 7th to the 11th century. This ſyſtem likewiſe prevented nations from acting with vigour in their external operations. Beſides, the feudal anarchy had a fatal influence on the character and improvement of the human mind. Without the protection of regular government, and the certainty of perſonal ſecurity, it cannot be expected that men will make any progreſs in the arts and ſciences, or aim at attaining refinement in taſte or manners. In leſs than a century after the barbarous nations ſettled in their new conqueſts, almoſt all the effects of the knowledge and civility which the Romans had ſpread through Europe diſappeared. The human mind, neglected, uncultivated, and depreſſed, ſunk into the moſt profound ignorance. The inhabitants of Europe during this period were not only ſtrangers to the arts which embelliſh a poliſhed age, but deſtitute of the virtues which abound among people who continue in a ſimple ſtate.

Having curſorily mentioned ſeveral of the diſadvantages and pernicious effects of the feudal ſyſtem, and they were ſufficiently great, we ought not to omit ſome few circumſtances that may be alleged in its favour. This ſyſtem, in its very nature, ſtood oppoſed to the arbitrary power of the crown, and provided for the political liberty of all thoſe who poſſeſſed any portion of landed property. This ſyſtem alſo nouriſhed a manly and vigorous ſpirit, which, however hurtful in ſome of its immediate effects, has been eminently ſerviceable in the progreſs of ſociety. We muſt add, that the feudal ſyſtem cauſed even the clergy, too frequently the tools of abſolute monarchs, to be the great aſſerters and promoters of freedom. This fact is aſcertained by various inſtances that occur in our own hiſtory. The biſhops, in conſequence of the feudal tenures, found it their intereſt to unite with the barons and great landholders in reſiſting the encroachments of our princes; and they did it, in ſeveral caſes, with diſtinguiſhed ability and ſucceſs. The biſhops were particularly inſtrumental in obtaining the famous MAGNA CHARTA (which ſee.) The moſt important and valuable articles of that inſtrument were probably owing to Stephen Langton, archbiſhop of Canterbury. With reſpect to the clergy in general, notwithſtanding the ignorance and bad conduct of too many of them, and the abſurdity of their tenets, they were very uſeful in moderating and reſtraining the diſorderly ſpirit of the feudal times. They often interfered in the cauſe of humanity and juſtice. They were the only depoſitaries of the knowledge and literature that remained in the world; and the monaſtic inſtitutions, in particular, were the chief preſervers of agriculture, and of both the neceſſary and elegant arts.

But to return from this digreſſion. The diſorders in the feudal ſyſtem, together with the corruption of taſte and manners conſequent upon theſe, which had gone on increaſing during a long courſe of years, ſeem to have attained their utmoſt point of exceſs towards the cloſe of the 11th century. From that era we may date the return of government and manners in a contrary direction; and it is not difficult to trace a ſucceſſion of cauſes and events which contributed to aboliſh confuſion and barbariſm, and to introduce order, regularity, and refinement. Among the principal of theſe we recount the Cruſades, the formation of cities into communities, corporations, or bodies politic, and granting them the privilege of municipal juriſdiction; for when the inhabitants of cities obtained perſonal freedom and municipal juriſdiction, they ſoon acquired civil liberty and political power. The feudal ſyſtem, however, did not decline with equal gradations in all parts of Europe. It did not decline ſo faſt in Scotland as in England; nor, while it was a ſeparate kingdom, did their commons ever acquire the ſame power. This was owing to the low ſtate of commerce, induſtry, and arts, among the Scots.

We may obſerve that there are conſiderable remains of the feudal ſyſtem at this day in Europe. In Germany it ſubſiſts, in many reſpects, as much as ever. The huſbandmen of Poland are confined to the glebe; as they are alſo in Bohemia, in Swabia, and in other parts of Germany; and even in France, in ſome provinces remote from the capital; we ſee, ſaid Voltaire in his time, ſome remains of this ſlavery. The moſt viſible traces of this ſyſtem in England are in the forms of law; almoſt all the remains of the feudal ſyſtem in England, except theſe forms, having been aboliſhed in the reign of Charles II. by act of parliament. The feudal law carried with it a ſyſtem of private rights, which ſwallowed up all others wherever it came, and involved likewiſe, in giving effect to theſe rights, a ſyſtem of "forms," which remain even where the original rights are no more. It is particularly worthy of notice, with reſpect to the feudal ſyſtem, that a form of government ſo uniform in its principles ſhould have branched out, as it were, under different circumſtances, into other forms ſo totally different from one another as are the conſtitutions of the ſeveral European ſtates; which were almoſt all, originally, equally feudal, and, therefore, neceſſarily ſimilar to one another. But what is moſt of all remarkable with reſpect to the feudal ſyſtem is, that a form of government, ſo ill calculated to ſecure the moſt valuable ends of ſociety, a conſtitution ſo totally inconſiſtent with ſecurity and liberty, and ſo unfriendly to commerce and ſcience, ſhould, in ſeveral inſtances, have terminated, by the natural courſe of things, in governments under which men enjoy the greateſt ſecurity, together with all deſirable liberty; and where the utmoſt ſcope is given to the genius of man in the extenſion of arts, manufactures, commerce, and ſcience. Lord Lyttelton's Hiſt. of King Henry II. vol. i. p. 59, &c. vol. iii. p. 97, &c. Blackſtone's Comm. vol. ii. cap. 4. Robertſon's Ch. V. vol. i.

All our lands in England (the crown-land, which is in the king's own hand, the right of his crown, excepted) are of the nature of feud or fee. For though many have land by deſcent from their anceſtors, and others have bought lands, yet land cannot come to any, either by deſcent or purchaſe, but with the burden that was laid on him who had the novel fee, or who firſt received it as a benefice from his lord to him, and ſuch as ſhould deſcend from him, or to him it ſhould be otherwiſe conveyed and transferred; ſo that no man has *directum dominium*; *i. e.* the very property or domain in any land but the prince in right of his crown. (Camd. Britan. p. 93.) Though he who has fee has *jus perpetuum*, and *utile dominium*, yet he owes a duty for it; ſo that it is not ſtrictly his own. Indeed, as much is imported by the terms in which we expreſs our higheſt right in lands, &c. the moſt a man can ſay is, "I am ſeiſed of this land in my demain or demeſne as of fee."

The grand and fundamental maxim of all feudal tenure is this; that all lands were originally granted out by the ſovereign, and are therefore holden, either mediately or immediately, of the crown. The grantor was called the proprietor, or *lord*, who retained the dominion or ultimate property of the feud or fee; and the grantee, who had only the uſe and poſſeſſion, according to the terms of the grant, was ſtyled the feudatory, or *vaſſal*, another name for the tenant or holder of the lands. The manner of the grant was by words of gratuitous and pure donation, "dedi et conceſſi," which are ſtill the operative words in our modern deeds of feoffment. This was perfected by the ceremony of corporal inveſtiture, or open and notorious delivery of poſſeſſion in the preſence of the other vaſſals, which perpetuated among them the era of the new acquiſition, at a time when the art of writing was little known; and therefore the evidence of property was repoſed in the memory of the neighbourhood; who, in caſe of a diſputed title, were afterwards called upon to decide the difference, not only according to external proofs adduced by the litigant parties, but alſo by the internal teſtimony of their own private knowledge. The vaſſal or tenant took an oath of fealty (ſee FEALTY), and upon inveſtiture did homage to his lord; (ſee HOMAGE.) This was followed by the ſervice which he engaged to perform to his ſuperior or lord, in recompence for the land which he held. In pure, proper, and original feuds, this ſervice was two-fold; to follow, or do *ſuit* to the lord in his courts in time of peace; and in his armies or warlike retinue, when neceſſity called him to the field. At the firſt introduction of feuds, which were gratuitous, they were precarious, and held at the *will* of the lord; who was then the ſole judge whether his vaſſal performed his ſervices faithfully. Then they became certain, for one or more years. Among the ancient Germans they continued only from year to year; as an annual diſtribution of lands was made by their leaders in their general councils or aſſemblies. (See Tacit. de Mor. Germ. c. 26. and Cæſar de Bell. Gall. l. 6. c. 21.) In proceſs of time, feuds began to be granted for the *life* of the feudatory. But they were not yet hereditary, though occaſionally granted by the favour of the lord to the children of the former poſſeſſor, on payment of a fine or acknowledgment to the lord, which was called a relief. Afterwards feuds were by degrees univerſally extended beyond the life of the firſt vaſſal to his ſons, or to ſuch of them as the lord ſhould name; but as the ſons died off, their ſhares reverted to the lord, without deſcending to their children, or to their ſurviving brothers. But when a feud was given to a man and his *heirs*, in general terms, a more extended rule of ſucceſſion took place; and when the feudatory died, his male deſcendants *in infinitum* were admitted to the ſucceſſion, and in defect of them, ſuch of his male collateral kindred as were of the blood or lineage of the firſt feudatory, and no others. The deſcent being confined to males, originally extended to all the males alike; but this being found inconvenient, and *honorary* feuds (or titles of nobility) being introduced, which could only be inherited by the eldeſt ſon; in imitation of theſe, *military* feuds (or thoſe now deſcribed) began in moſt countries to deſcend according to the ſame rule of primogeniture, to the eldeſt ſon in excluſion of all the reſt. The feudatory could not aliene or diſpoſe of his feud, nor could he exchange, nor mortgage, nor deviſe it by will, without the conſent of the lord. When feuds ceaſed to be military, they began to be bought and ſold, and deviations were made from the old fundamental rules of tenure and ſucceſſion. See TENURE.

It ſhould be obſerved, that our Engliſh lawyers do very rarely (of late years eſpecially) uſe the word fee in this its primary original ſenſe, in contradiſtinction to *allodium* or abſolute property, but generally uſe it to expreſs the continuance or quantity of an eſtate; ſo that a fee in general ſignifies an eſtate of inheritance, being the higheſt and moſt extenſive intereſt that a man can have in a feud; and in that ſenſe of the term it is applicable to, and may be had in, any kind of hereditaments, either corporeal or incorporeal; with this diſtinction, that of a corporeal inheritance a man ſhall be ſaid to be ſeiſed *in his demeſne, as of fee*; of an incorporeal one, he ſhall only be ſaid to be ſeiſed *as of fee*, and not in his demeſne. (Litt. § 10.) Blackſtone's Comm. vol. ii. p. 106.

In the ſtat. 37 Hen. VIII. cap. 16. fee is alſo uſed for lands veſted in the crown; but it is from ignorance of the import of the word; for fee cannot be without fealty ſworn to a ſuperior; but the king owns fealty to no ſuperior but God alone.

Fee is divided in our laws into *fee-abſolute*, called alſo *fee-ſimple*; and *fee-conditional*, alſo called *fee-tail*. See FEUD.

FEE, *Frank*. See FRANK.

FEE *ſimple*, *feudum ſimplex*, is that whereof we are ſeized to us and our heirs for ever. Or it denominates an abſolute inheritance, clear of any condition, limitation, or reſtriction to particular heirs, but deſcendable to the heirs general, whether male or female, lineal or collateral. It is a general rule, that the word *heirs* is neceſſary in the grant or donation, in order to make a fee or inheritance; but this rule does not extend to deviſes by will, nor to fines and recoveries conſidered as a ſpecies of conveyance, nor to creation of nobility by writ, though in creations by patent, the word *heirs* muſt be inſerted; nor to grants of lands to ſole corporations and their ſucceſſors; nor finally, to the caſe of the king, in whom a fee-ſimple will veſt, without the words *heirs* or *ſucceſſors* in the grant.

FEE-*tail*, *feudum taliatum*, is that whereof we are ſeiſed with limitation to us and the heirs of our body. See TAIL.

Fee-tail is of two kinds, general and ſpecial.

Fee-tail general, is where lands and tenements are given to a man and the heirs of his body begotten. So that if a man ſeiſed of ſuch land by ſuch gift marry one or more wives, and have no iſſue by them, and at length marry another, by whom he hath iſſue, this iſſue ſhall inherit the land.

Fee-tail ſpecial, is where a man and his wife are ſeiſed of lands to them and the heirs of their two bodies; where, in caſe the wife die without iſſue, and he marry another by whom he have iſſue, this iſſue cannot inherit the land, and therefore it is called *ſpecial tail*.

This fee-tail ſpecial has its origin from the ſtat. of Weſtm. 2. 13 Edw. I. cap. 1. Before that ſtatute, all land given to a man and his heirs, either general or ſpecial, was reputed in the nature of a fee; and therefore ſo firmly held to him, that, any limitation notwithſtanding, he might alienate it at pleaſure: for redreſs of which inconvenience the ſtatute provides, that if a man gives lands in fee, limiting the heirs to whom it ſhould deſcend, with a reverſion to himſelf and his heirs for default of ſuch former heirs, the form and meaning of the gift ſhall be obſerved.

Eſtates, in general and ſpecial tail, are farther diverſified by the diſtinction of ſexes in ſuch entails; for both of them may be in tail male or female; as if lands be given to a man and *his heirs male of his body begotten*, this is an eſtate in tail male *general*; but if to a man and the *heirs female of his body on his preſent wife begotten*, this is an eſtate in tail female *ſpecial*; and in caſe of an entail male, the heirs female ſhall never inherit, nor any derived from them; nor *e converſo*, the heirs male, in caſe of a gift in tail female. (Litt. § 21. 22.) As the word *heirs* is neceſſary to create a fee, ſo the word *body*, or ſome other words of procreation, are neceſſary to make it a fee tail, and to aſcertain to what heirs in particular the fee is limited; though in wills and teſtaments greater indulgence is allowed. The incidents to a tenancy in tail, under the ſtatute Weſtm. 2. are chiefly theſe (Co. Litt. 224.): 1. That a tenant in tail may commit waſte on the eſtate-tail by felling timber, pulling down houſes, or the like, without being impeached or called to account for the ſame. 2. That the wife of the tenant in tail ſhall have her dower or thirds of the eſtate-tail. 3. That the huſband of a female tenant in tail may be tenant by the courteſy of the eſtate-tail. 4. That an eſtate-tail may be barred or deſtroyed by a fine, by a common recovery, or by lineal warranty deſcending with aſſets to the heir. By ſubſequent ſtatutes, eſtates-tail may be aliened, are liable to forfeiture for high treaſon, and are chargeable with reaſonable leaſes, and with ſuch debts as are due to the crown on ſpecialties, or have been contracted with fellow ſubjects in a courſe of commerce.

Fee, *Baſe*, or *qualified*, is a conditional fee that has a qualification ſubjoined to it, and which muſt be determined whenever this qualification is at an end; as in the caſe of a grant to A. and his heirs, *tenants of the manor of Dale;* whenever the heirs of A. ceaſe to be tenants of that manor, the grant is entirely defeated. Blackſtone's Comm. vol. ii. chap. 7. See Entail.

Fee-*expectant, feudum expectativum*. See Estate, and Expectant.

Fee-*farm*, or *ferm, feudi-firma*, or *feo-firma*, is a tenure of lands by which they are holden to a perſon and his heirs for ever, under a certain annual rent.

Fee farm takes place upon the creation of a tenancy, when the lord reſerves to himſelf and his heirs either the rent for which it was before let to farm, or at leaſt a fourth part of the rent, and that without homage, fealty, or other ſervices, more than are eſpecially compriſed in the feoffment. Yet it would appear by Fitzherbert, that the third part of the value may be appointed for the rent, or the finding of a chaplain to ſay divine ſervice, &c. And the nature of it is this; that if the rent be behind, and unpaid for the ſpace of two years, then the feoffer or his heirs have action to recover the lands as their demeſnes.

Fee-*farm rents of the Crown*, are ſuch rents as iſſue to the kings of England from their ancient demeſnes, many of which were alienated from the crown in the reign of Charles II.

Fee is alſo uſed for the compaſs or circuit of a manor or lordſhip. Thus Bracton, "in eadem villa, & de eodem feodo."

Fee is alſo uſed for a perpetual right incorporeal: as to have the keeping of the perſons in fee, rent granted in fee, and office held in fee, &c.

Fee, *Knight's*. See Knight's *Fee*.

Fee alſo ſignifies a reward or ordinary due given a perſon for the execution of his office, or the performance of his part in his reſpective art or ſcience.

Thus, the lawyer, barriſter, and phyſician, are ſaid to have their fees; *i. e.* conſiderations for the pains taken with the client or patient. If a perſon refuſe to pay an officer his due fees, the court will grant an attachment againſt him, to be committed till the fees are paid; and an attorney may bring an action of the caſe for his fees againſt the client that retained him in his cauſe. With us, ſome have ſaid that a counſel can maintain no action for his fees, which are given not as *locatio vel conductio*, but as *quiddam honorarium;* not as a ſalary or hire, but as a mere gratuity, which a counſellor cannot demand without injury to his reputation. This, however, has been held otherwiſe. F.N.B. 121. 1 Brownl. 73. 31 H. VI. c. 9.

Fees alſo denote ſeveral perquiſites or allowances paid to public officers by perſons who have buſineſs with them. The fees due to the officers of the Cuſtom-houſe are expreſsly mentioned in a ſchedule or table, which is hung up to view in the ſaid office, and in all other places where the fees are to be paid; and if any officer ſhall offend, by acting contrary to the regulations therein contained, he ſhall forfeit his office and place, and be for ever after incapable of any office in the Cuſtom-houſe.

The ſmallneſs of the ſalaries of divers of the king's ſervants is compenſated by the perquiſites or fees of honour. The fees paid to the ſeveral officers by every perſon upon his being knighted amount to 78*l.* 13*s.* 4*d.* And if it be done within the verge of the court, there is 3*l.* more to the ſix pages of the bed-chamber, which brings it to 81*l.* Every knight of the moſt noble order of the garter pays, upon his inſtallment, if Prince of Wales, 66*l.* 13*s.* 4*d.*; if a duke 20*l.*; if a marquis 16*l.* 18*s.* 4*d.*; if an earl 12*l.* 13*s.* 4*d.* The fees due for the entrance into the houſe of lords are as follows:

	£.	s.	d.
Prince of Wales -	30	0	0
An Archbiſhop -	27	0	0
A Duke - -	27	0	0
A Marquis -	19	6	8
An Earl - -	14	0	0
A Viſcount -	12	0	0
A Biſhop - -	14	0	0
A Baron - -	9	0	0

Theſe fees are paid by every peer on his firſt introduction to the houſe, both on his original acceſſion to a title, and his advancement to a higher one, and by every biſhop upon his firſt conſecration, and upon any future promotion.

The homage-fees due on the acceſſion of a peer are,

	£.	s.	d.
Prince of Wales -	703	6	8
Ditto, as Earl of Cheſter	203	3	4
A Duke - -	350	3	4
A Marquis - -	272	10	7
An Earl - -	203	3	4
A Viſcount - -	159	7	4
A Baron - -	150	5	4

Beſides the ſum charged in the king's books, every biſhop pays, on his conſecration or promotion, as homage-fees, 112*l.* 10*s.* 4*d.* and an archbiſhop double this ſum.

FEED, in *Rural Economy*, the portion or quantity of oats or other ſort of grain or provender, which is given to a horſe or other animal at one time. The term alſo implies the fattening of different ſorts of live ſtock, as neat cattle, ſheep, &c.

FEEDER, in *Engineery*, is a cut or channel, ſometimes called a carriage or catch-drain, by which a ſtream or ſupply of water is brought into a canal: ſometimes the ſtream of water itſelf, which is ſo ſupplied to a canal, is called a feeder. See Canal.

Feeders, in *Rural Economy*, ſignify by graziers thoſe neat cattle which are bought in expreſsly for the purpoſe of being fed off.

Feeders *of a Vein*, in *Mining*, are the ſhort croſs veins which appear to branch from it in ſome inſtances, and are ſo called from the vulgar notion that theſe feed or ſupply the vein with ore: *ſtrings* and *leadings* are ſometimes uſed as terms for theſe ſmall croſs veins.

FEEDING, in *Rural Economy*, the act or proceſs of fattening any ſort of live ſtock on a farm.

Feeding *of Cattle*, the proceſs of rendering them in a ſtate proper for the butcher. It likewiſe ſignifies the foddering of them.

Feeding *Houſe*, or *Shed*, is that ſort of farm-building which is conſtructed for the purpoſe of fattening neat cattle. It ſhould have a dry warm ſituation, be capable of free ventilation, and be well ſupplied with proper conveniences for the reception of food and water. See Cattle *Sheds*.

Feeding *Grounds*, ſuch lands as are ſet apart for the fattening of different ſorts of live ſtock. They are chiefly thoſe of the rich deep paſture kinds.

Feeding-*Piece*, a field or portion of graſs land which is employed for the purpoſe of grazing animals. It is advantageous to have ſuch a piece near to the houſe.

Feeding-*Down*, the practice of eating down graſs lands with different ſorts of live ſtock. In *new lays* ſome prefer mowing the few firſt years, from the ſuppoſition that grazing is more injurious to them; but the ſuperiority of theſe different practices has not yet been fully aſcertained. See Laying *down to Graſs*, and Pasture.

Feeding-*Ground*, in *Mining*, is uſed by ſome miners to denote certain kinds of ſoil or rock, which are ſuppoſed to feed or to ſupply ore to veins in their vicinity: it is a certain fact, that ſome beds of limeſtone in Derbyſhire, called *bearing-meaſures*, have generally ore in the veins which interſect them, when often the ſame veins contain little or no ore between the meaſures above or below theſe bearing meaſures.

Feeding, *Foul*, in the *Manege*. See Foul.

FEEJEE, in *Geography*, an iſland in the Southern Pacific ocean, about three days' ſail from Tongataboo, in the direction of N.W. by W. It is repreſented as a high but very fruitful iſland; abounding with hogs, dogs, and fowls, and all the kinds of fruits and roots that are found in any of the others, and as being much larger than Tongataboo, to the dominion of which it ſeems to be ſubject, as the other iſlands of the Archipelago are; although, on the other hand, Feejee and Tongataboo frequently make war upon each other; and the inhabitants of the latter appear to be much afraid of thoſe of the former, who were really formidable on account of their peculiar dexterity in the uſe of bows and ſlings, and alſo on account of the ſavage practice prevalent among them of eating the enemies whom they killed in battle. The more northerly part of this numerous group was diſcovered by Taſman in 1643; and it is the ſame cluſter of iſlands and reefs that was explored by the Duff Miſſionary ſhip, and where ſhe experienced the greateſt dangers that attended her voyage. Theſe iſlands were named by Taſman "Prince William's Iſland," and "Heemſkirk's ſhoals." They extend northward to the latitude of 15° 33′. Captain Bligh fell in with the eaſternmoſt of them in W. long. 178°, and purſuing a north-weſtern courſe he found the group to extend 4° weſtward from the firſt iſlands. He ſaw ſeveral of them that had from 30 to 40 leagues of coaſt, which appeared fertile and pleaſantly variegated with hills and vallies. In 1792 he paſſed to the north of the firſt iſlands diſcovered by him in 1789; and having croſſed his former tracks, he doubled the ſouthernmoſt iſland of the group in S. lat. 19° 15′. E. long. 178°. The canoes of the iſlanders attempted to overtake him, ſeemingly with hoſtile deſigns. The moſt weſtern part of this group was diſcovered by captain Barber in 1794, in his paſſage from Port Jackſon to the N.W. coaſt of America. He ſaw ſix of the iſlands, the largeſt of which he placed in E. long. 175° 15′. The natives, who ſeemed unaccuſtomed to trade, exhibited hoſtile appearances; and actually attempted to board his ſhip. It is not certain whether all theſe iſlands are connected with, or independent of, each other; but they are thought to be ſubject to Tongataboo. The inhabitants, however, are of a diſtinct race, ſpeak a different language, and, beſides ſpears and clubs, make uſe of bows and arrows in battle. In this reſpect they reſemble moſt of the iſlanders who inhabit the larger countries to the weſtward, and differ from all that have yet been diſcovered to the eaſtward of the group. The natives of the Friendly iſlands regard the people of Feejee as ſuperior to themſelves both in military proweſs and mechanical ingenuity; their weapons and clothing being wrought in a more maſterly ſtyle; and ſome manufactures, eſpecially that of earthen veſſels, being carried on at Feejee, which are not attempted at Tongataboo. They had alſo dogs at Feejee, when there were none in the Friendly iſlands. The ſtature of the Feejeeans is ſuperior, their complexions are darker, and their hair approaches to wool. They moreover retain the practice of eating the bodies of enemies whom they have killed, which is now abhorred by all the lighter race, except the inhabitants of New Zealand.

FEEL, in the *Manege*, they ſay to feel a horſe in the hand; that is, to obſerve that the will of the horſe is in the rider's hand, that he taſtes the bridle, and has a good *appui* in obeying the bit.

To feel a horſe upon the haunches, is to obſerve that he plies or bends them, which is contrary to leaning or throwing upon the ſhoulders.

FEELERS, Antennæ, in *Natural Hiſtory*, are the horns, as they are uſually called, upon the heads of inſects. See Entomology.

FEELING, in *Phyſiology*, the power in any organ of receiving the impreſſions of external objects, and of conveying theſe to the brain, ſo as to cauſe ſenſation; or of exhibiting the ſame phenomena from alterations in the ſtate of the organ itſelf. In this explanation the word is equivalent to *ſenſibility*, and denotes the capacity of being acted upon, and of acting again on the ſentient principle: thus we ſay that any part has much or little feeling, &c. In a more confined ſenſe, this word ſignifies the ſenſe of touching, which is the particular mode of ſenſibility belonging to the ſurface of the body. The ſubject is explained under the articles Brain, Sensibility, and Skin.

FEESURA, in *Geography*, a town of Africa, in the kingdom of Kaarta; 28 miles W. of Kemmoo.

FEET, a town of Norway, in the government of Aggerhuus; 36 miles N.N.E. of Frederickſtadt.

Feet *Preſentation*, in *Midwifery*, a ſpecies of preternatural or croſs birth, in which, on the burſting of the membranes, during labour, one or both the feet of the child come down into the vagina, inſtead of the head. In this caſe, the pains uſually ceaſe, and do not recur again, until nearly the whole of the liquor amnii is drained away, which frequently is not completed in leſs than three, four, or more hours. This ſuſpenſion of the pains is apt to excite uneaſineſs in the patient, or her attendants, and the accoucheur is often preſſed to give aſſiſtance, which he muſt however avoid doing, until, by the recurrence of the pains, he is ſatisfied that the uterus is contracted, ſo as to come again into contact with the body of the child. He may then gradually, and moderately aſſiſt, during the pains, in drawing down the legs of the child; ſtill keeping in mind the rule to be obſerved in all caſes, where delivery is to be performed by art, not to empty the uterus too haſtily.

When the breech is delivered, the accoucheur will attend to the poſition of the child, and if the belly be placed towards the pubes of the mother, turn it towards the ſacrum, and then complete the delivery in the manner directed under the article Labour, *preternatural*.

FEG, in *Agriculture*, a term uſed provincially to ſignify the tough dead graſs which remains in paſtures after they have been eaten down by ſtock.

FEGALLE, or Fagalo, *Cape*, in *Geography*, a cape on the coaſt of Algiers, called by the Moors "Ras Azintoure." N. lat. 35° 40′. E. long. 0° 54′.

FEGARI, a town of Japan, in the iſland of Niphon; 70 miles S S. E. of Meaco.

FEGESAK, or Vegesak, a town of Germany, in the duchy of Bremen; eight miles N. N. W. of Bremen.

FEGLINA, a town of Naples, in Calabria Citra; ſeven miles S. E. of Coſenza.

FEHRABAD. See Farabat.

FEHRENBACH, a town of Germany, in the lordſhip of Furſtenberg; 16 miles E. of Friburg.

FEHRNBELLIN, a town of Germany, in the Middle Mark of Brandenburg, on the Rhine; 28 miles N. W. of Berlin. N. lat. 52° 53′. E. long. 12° 50′.

FEI, a town of China, of the third rank, in Changtong.—Alſo, a river of Perſia, which runs into the Mes, eight miles S. E. of Suc Sambil, in Chuſiſtan.

FEID. See Faid.

FEIDERSDORF, in *Geography*, a town of Germany, in the principality of Culmbach; eight miles S. W. of Culmbach.

FEIGNED Action, in *Law*. See Faint *action*.

Feigned *Iſſue*. See *Feigned* Issue.

FEILITSCH, in *Geography*, a town of Germany, in the principality of Culmbach; three miles N. E. of Hof.

FEINT, in *Fencing*, a falſe attack, or a ſhew of making a ſtroke or thruſt, in one part, with deſign to induce the adverſary to form a parade for guarding that part, and leaving ſome other part unguarded where the thruſt is really intended.

Feints are either ſingle or double, high or low, without or within, &c. in prime, in tierce, in quart, in demi, and in the whole circle; of one, two, or three meaſures.

The ſimple feint is a mere motion of the wriſt, without ſtirring the foot, &c.

Feint, in *Rhetoric*, a figure whereby the ſpeaker touches on ſomething, in making a ſhew of paſſing it over in ſilence. The Latins call this *prætermiſſio*.

Feint-*Attack*, in the *Military Art*, is a manœuvre reſorted to on a variety of occaſions, but eſpecially when the defences of a town, &c. are to be carried by ſtorm. However eaſy it may appear to diſtract the attention of the defenders, or to attract it to a wrong direction, ſuch is not actually the caſe in general. This ruſe de guerre has been ſo very frequently practiſed, that none but the moſt unguarded commanders are to be deceived by the mere diſplay of an armed force in a quarter where the works are not abſolutely inſignificant, or reduced to a defenceleſs ſtate. A feint-attack, it is to be recollected, muſt aſſume ſuch a form as ſhould give a moſt impoſing air; it ſhould carry with it ſuch evident power, as at the leaſt ſhould reſcue it from deſtruction in the event of the garriſon ſeeing through the device, and either allowing the aſſailants to advance, under the idea of complete ſucceſs, into a ſnare, or making a ſally, ſuch as ſhould leave no room for boaſting of the effect of the enterprize; in either caſe, ruin will generally follow.

The immenſe variety of caſes, and of ſituations, that could be adduced, would, if individually treated in this work, treſpaſs far beyond the ordinary importance of the article among our readers in general; the ſubject might ſwell an ample octavo. We muſt therefore confine ourſelves to obſerving, that feint-attacks generally ſucceed beſt in the dark, and ought in every inſtance, where cavalry is at hand, to be ſupported by ſuch a force of that deſcription as ſhould ſuffice to cover a retreat. If it is known that the place is well-manned, the feint-attack ſhould not be confined to one part; ſeveral ſhews of ſtorming parties ſhould be made, under the previous caution of having a body of cavalry between two ſuch indications, ready to aid either that may be purſued. When a garriſon is weak, there may ariſe much benefit by changing the feint-attack into a feint-retreat; thereby inducing the defenders to quit their works, and to advance within the reach of ſome latent force. Where it is accurately aſcertained that a *feint*, and not a *real* attack is made, the beſt policy is for the defenders either to remain perfectly quiet behind their walls, if the ſituation be ſecure; or to keep up a thin fire, from riflemen, ſo as to make each ſhot take effect, yet at the ſame time reſerving the diſpoſable force under cover, as much as poſſible concealed, ſo as to fall ſuddenly on the aſſailants; who may be expected to puſh forward, under the idea of meeting but little reſiſtance.

Where equal forces are oppoſed, the feint-attack is extremely hazardous; and, even under certain advantages, in point of numbers, cannot be too cautiouſly adopted. If the main aſſault ſhould not be ſucceſsful, the worſt of conſequences may ordinarily be expected; as not only will much loſs be ſuſtained in that quarter, but the means of reſcuing the ſmaller party be completely ſuperſeded by that neceſſity which ſelf-preſervation ever impoſes. We do not mean to deny that the moſt brilliant reſults may attend the meaſure when favourably circumſtanced, but to caution thoſe who, from adventitiouſly reading of the few ſucceſsful iſſues, entertain ſuch ſanguine expectations, as to cauſe their baniſhing all ideas of defeat, from giving too great ſcope to expectation; and, at all events, from indulging in the ſpeculation without the beſt intelligence, the beſt means of approach, and the certainty of being able to effect their retreat. It is to be carried in mind, that in all probability, information of the intended aſſaults will reach the beſieged, ſo as to give ample ſcope for preparation accordingly; or, to ſay the leaſt, that they may be competent to form a correct opinion, regarding the intentions of their opponents; in either caſe much may be apprehended.

FEINTE, an old French muſical term, to expreſs the alteration of any note or interval, by a ſharp or a flat. It is properly the generical term for dieſes and accidental flats. Rouſſeau ſays, "this word is no longer in uſe; but no other is ſubſtituted in its room. The fear of uſing ſuperannuated words daily enervates and impoveriſhes our language; its greateſt enemies are the puriſts. The ſhort, or chromatic keys on a harpſichord, now denominated ſharps and flats, uſed to be called feintes. The keys which are white uſed to be black, becauſe our coarſe and vulgar artiſts never thought of making the clavier black to ſet off the ladies hands. Short eighths in organs and old inſtruments are likewiſe called feintes coupé, or cut keys."

FEIRA, in *Geography*, a town of Portugal, in the province of Beira; 10 miles S. of Oporto.

FEISOUN, a town of Aſiatic Turkey, in the government of Diarbekir; 40 miles N. of Diarbekir.

FEISTRITZ, a town of the duchy of Stiria, four miles N. of Muchrau.—Alſo, a river of the duchy of Stiria, which runs into the Save, nine miles N. E. of Laybach.—Alſo, a town of the duchy of Carinthia; 10 miles N. E. of Saxenburg.

FEI-TCHIN, a town of China, of the third rank, in Chang-tong; 25 miles S. S. W. of Tei-nan.

FEITKINGE, a town of Sweden, in the province of Schonen; ſix miles E. of Chriſtianſtadt.

FEIUM. See Fayoum.

FEKETEBANJA, a town of Hungary; 28 miles N. E. of Zatmar.

FEKETELO, a town of Tranſylvania; 23 miles S. W. of Coloſvar.

FEKETEPATAK, a town of Tranſylvania; 25 miles S. W. of Coloſvar.

FEKETE-PATOR, a town of Hungary, 18 miles S. S.E. of Groſ-Wardein.

FEL, Mad. in *Biography*, a ſinger in the French opera at Paris, of high renown, and durable favour. She was the daughter of an able organiſt at Bourdeaux, born 1716, and received at the great opera in 1733. Her ſweet, pure, and ſilver-toned voice delighted the public 20 years, and would have continued in favour twenty years more, if bad health, and a feeble cheſt, had not obliged her to quit the ſtage in 1759. Mad. Fel ſung equally well in French and Latin, and was one of the French who had beſt ſucceeded in Italian. Her voice was always as young and aſtoniſhing as ever, to the ſmall number of friends to whom ſhe devoted the laſt years of her life, and who cheriſhed her perſonal qualities as much as they did her vocal talents. Laborde.

Fel, in the *Materia Medica of the Ancients*, the name of a fruit much uſed by them in ſtomachic medicines, but very badly deſcribed to us. All that we know of the matter is, that there were three fruits brought from the Indies at that time, and called bel, fel, and ſel; they were all of the ſame virtues, and ſeemed nearly allied to each other in all reſpects. Serapio tells us, that the fruit fel was about the ſize of the piſtachia nut, and ſomewhat reſembled it in ſhape; and Avicenna obſerves, that it was an Indian medicine, bitter, and hot, like ginger; and that it was uſed as a ſtomachic. He alſo ſays the ſame thing of the two other fruits; whence it appears they were nearly the ſame thing.

Fel, in *Medicine*. See Gall.

Fel *Terræ*, *gall of the earth*, a name by which ſome authors have called the ſmall centaury, becauſe of its great bitterneſs.

FELAGUS, in our *Law Books*, was uſed for a companion or friend, who was bound in the decennary for the good behaviour of another. In the laws of king Ina, it is ſaid, if a murderer could not be found, the parents of the perſon ſlain ſhould have ſix marks, and the king forty; if he had no parents, then the lord ſhould have it; "et ſi dominus non habet, felagus ejus." Leg. Inæ, cap. 15.

Felagus is ſaid to be "quaſi fide cum eo ligatus."

FELAPTON, in *Logic*, one of the moods of ſyllogiſms. In a ſyllogiſm in felapton, the firſt propoſition is an univerſal negative; the ſecond an univerſal affirmative; and the third a particular negative.

FELDBACH, in *Geography*, a town in the duchy of Stiria; 14 miles N. of Rakelſburg.

FELDER, a river of Germany, which riſes in Henneberg, and runs into the Werra, 2 miles N.E. of Vacha.

FELDES, a town of the duchy of Carniola; 14 miles N.W. of Crainburg.

Feldes-*See*, a lake of the duchy of Carniola; 2 miles S.W. of Feldes.

FELDKIRCH, County of, a ſmall country of Germany, formerly in the circle of Swabia, but now a part of the Tyroleſe, bounded on the north by the county of Montford, on the eaſt by Pludentz, on the ſouth by the Griſons, and on the weſt by the Rhine.

Feldkirch, the capital of the above-mentioned county, well built, and ſituated on the Ill, near the Rhine. The inhabitants enjoy the privilege of chooſing their own magiſtrates, and of refuſing to ſurrender any who are under the law of the empire, and of not being ſummoned by any provincial judges; 28 miles N.N.E. of Coire. N. lat. 47° 12′. E. long. 9° 48′.

FELDKIRCHEN, a town of the duchy of Carinthia; 13 miles N.W. of Clagenfurt.

FELDSBACH, a river of Auſtria, which runs into the Danube, 3 miles below Grein.

FELDSBERG, a town of Germany, in Carinthia, belonging to the archbiſhop of Salzburg; 4 miles N.E. of Saxenburg.

FELDSBURG, a town of Auſtria; 28 miles N.N.E. of Vienna. N. lat. 48° 42′. E. long. 16° 43′.

FELD-SEE, a lake in the duchy of Carinthia; 8 miles N.W. of Velach.

FELDUAR, a town of Hungary, near the Danube, ſupported by fiſhing in this river; 12 miles S.E. of Symontornya.

FELE, St. a town of Naples, in Baſilicata; 7 miles N.N.E. of Muro.

Fele *Homagers*, was anciently uſed for the faithful ſubjects. But it ſeems the word ſhould be written feal homagers.

FELENBRUNN *(Ober)*, in *Geography*, a town of Auſtria; 3 miles N.W. of Sonneberg.

Felenbrunn *(Unter)*, a town of Auſtria; 8 miles N. of Korn-Neuburg.

FELENGA, a ſmall iſland in the gulf of Venice, near the coaſt of Iſtria. N. lat. 45° 52′. E. long. 14° 4′.

FELETINO, a town of Italy, in the Campagna di Roma; 8 miles N. of Aletri.

FELETZ, a town or diſtrict of Ruſſia, in the government of Orel, on the left ſide of the river Soſſna.

FELIBIEN, Michael, in *Biography*, was born in 1665, and brought up to the church. He joined at an early age the congregation of Benedictine monks, and is author of many books on practical piety; but is more particularly known for his "Hiſtory of the Abbey of St. Denis," adorned with figures, and illuſtrated with learned diſſertations. Through the fame which he acquired by this work, he was choſen by the magiſtrates of Paris to write the hiſtory of that capital. In 1713 he publiſhed his proſpectus of the intended work, and proceeded in the labour till he was arreſted in his progreſs by the hand of death in 1719. It was afterwards completed in five volumes folio, and publiſhed in 1725. Moreri.

Felibien, James, was born, in 1636, at Chartres, and by intenſe application became a proficient in biblical knowledge, He obtained conſiderable preferment in the church, and in 1695 was promoted to the archdeaconry of Vendome, in which city he died, in 1716, at the age of 80. His principal work as an author was entitled "Pentateuchus Hiſtoricus, ſive quinque libri hiſtorici, Joſue, Judices, Ruth, primus et ſecundus Regum, cum Commentariis ex fonte Hebraico, verſione 70 interpretum, et variis auctoribus collectis," 4to, 1703. This was intended as a continuation of Janſenius's commentary on the Old Teſtamont. It was written with ſo much freedom and boldneſs, that it was ſuppreſſed by a decree of council. The author obtained leave to republiſh it, having firſt pruned away its objectionable paſſages. The copies of the original publication are now extremely ſcarce, and objects of great curioſity. Moreri.

FELICE, St. in *Geography*, a town of Italy; 17 miles N.N.E. of Modena.—Alſo, a town of Spain, in the province of Leon.

FELICIEN, St. a town of France, in the department of the Ardeche, and chief place of a canton in the diſtrict of Tournon; 9 miles W. of Tournon. The place contains 1,589, and the canton 8,079 inhabitants, on a territory of 147½ kiliometres, and in 9 communes.

FELICITA, or Felice, St. a town of Italy, in the Campagna, near the coaſt of the Mediterranean, at the foot of mount Circelli, ſuppoſed to be built on or near the ſcite of the ancient Circei, but not well inhabited; 10 miles S.W. of Terracina.

FELICITY, in *Mythology*, a deity both among the Romans and the Greeks. The Romans had multiplied their divinities to a great number before they elevated Felicity to this rank. It was above 600 years after the building of Rome, that Lucullus, upon his return from the war with Mithridates and Tigranes, built a temple to her. Pliny adds (l. 35. c. 12.), that this general enjoined the ſtatuary Archeſilaus to make the ſtatue of that goddeſs; but that they both died before it was finiſhed. Lepidus, general of the cavalry, had alſo, according to Dion (l. 44.) dedicated a temple to that goddeſs. The Greeks, likewiſe, honoured the ſame goddeſs under the name of Eudaimonia and Macaria. Felicity is often repreſented upon the Roman medals, either under the figure of a woman holding in her hand the cornucopia, or under ſome other ſymbol, with the legend "Felicitas Publica," or "Felicitas Aug. Felicitas Temporum."

FELICUDA, in *Geography*, one of the Lipari iſlands, anciently called *Phœnicuſa*. N. lat. 38° 34′. W. long. 14° 2′. This iſland, as well as Alicuda, which are the two extreme Liparian iſlands towards the weſt, diſplay proofs of their having anciently contained volcanoes. In Felicuda there is a ſpacious cavern, called the Grotto of the Sea-ox, which, from an aperture of 40 feet high, opens into a hall near 200 feet long, 120 broad, and 65 high. This cavern is formed of lava, and is only acceſſible by ſea. Spallanzani (vol. iii. p. 99.) ſuppoſes, that it was occaſioned by the action of the gaſes in the lava, when fluid; as there are examples in Ætna of caverns, much deeper, produced by a ſimilar cauſe.

FELIPE, St. a town of Mexico, in New Biſcay; 36 miles N.W. of Parrel.—Alſo, a town of Mexico, in the province of Mechoacan; 100 miles N. of Mechoacan.—Alſo, a town of Spain, in the province of Valencia, ſituated on the declivity of a mountain, at the foot of two caſtles; which form an amphitheatre. It was formerly called *Xativa*, and was once one of the moſt beautiful towns in Spain; but as it took part with Charles III. in 1707, Philip V. ordered it to be demoliſhed, and cauſed a new town to be built, which he called St. Felipe; 29 miles S.S.W. of Valencia. N. lat. 39°. W. long. 0° 46′.—Alſo, a town of South America, in the province of Venezuela; 70 miles S. of Venezuela.—Alſo, a town of New Mexico, in New Navarre; 85 miles W. of Caſa Grande.—Alſo, a bay called St. Jago, on the N. coaſt of Terra Auſtralis del Eſpiritu Santo, diſcovered by Quiros in 1606. S. lat. 14° 55′. E. long. 167° 8′.—Alſo, a town of New Mexico, on the Bravo; 40 miles S. of Santa Fé.—Alſo, a town of Brazil, formerly called "St. Luis de Marignon," capital of the juriſdiction of Maranhao. S. lat. 2° 30′. W. long. 45° 36′.—Alſo, a town of Brazil, in the juriſdiction of St. Paul.—Alſo, a town of the iſland of Cuba; 55 miles S.E. of Havanna.

FELIS, in *Zoology*, a genus of quadrupeds in the order Feræ, the eſſential character of which conſiſts in having fore teeth, the intermediate ones equal; grinders three on each ſide; tongue beſet with briſtles backwards; and the claws retractile.

This ferocious tribe, conſiſting altogether of about 23 ſpecies, beſides an amazing number of varieties, is diſtinguiſhed by their ſharp and formidable claws, which are lodged in a ſheath, and are capable of being extended or drawn in at pleaſure. They lead a ſolitary and ravenous life, and never unite for mutual defence or ſupport like thoſe of the herbivorous kinds of animals, but ſeek their food alone, and are frequently enemies to each other. Though differing greatly in ſize and colour, they are allied to each other in diſpoſition, being fierce, rapacious, and artful, and are endued alſo with conſiderable ſtrength. They run with ſpeed, eaſily climb trees, and when falling from a height alight on the feet. They are carnivorous, and refuſe vegetables, unleſs extremely preſſed by hunger. When in ſight of their prey, they wave their tails, and ſeize it by a ſudden ſpring. The females bring forth ſeveral young at a birth, and have eight teats, four of which are pectoral, and four abdominal.

Species.

Leo. Tail long; body pale tawny. *Felis leo*, Linn. *Felis cauda elongata, corpore helveolo*, Schreb. *Felis cauda in floccum deſinente*, Briſſ. *Leo*, Geſner, &c. *Lion.*

The form of the lion is ſtrikingly bold and majeſtic, correſponding with the generoſity of his nature; and from the magnitude of his ſize, his ſtrength, agility, and courage, he reigns the ſuperior of all other quadrupeds. A lion of the largeſt dimenſions meaſures about eight or nine feet in length, from the noſe to the baſe of the tail, and the latter itſelf nearly four feet. Thoſe of ſmaller ſize, when full grown, are about five feet long, independently of the tail. The aſpect of the lion, when he preſents his front full to the view of the obſerver, is impreſſively grand; his head large and rounded, his forehead ſquare, his ſhaggy flowing mane, which he can erect at pleaſure, ſurrounding his awful front, his huge eye-brows, his round and fiery eye-balls, his pendulous lips, and formidable armament of his teeth, conſpire altogether to render his appearance terrific. The ears of the lion are ſmall, and of a rounded form; his face covered with ſhort and cloſe hair, of a pale tawny colour; the mane, deſcending from the upper part of the head, falls over the ſhoulders, and hangs down almoſt to the knees; the belly and breaſt are covered likewiſe with long hair. The reſt of the body is covered with very ſhort hair, excepting the point of the tail, which is furniſhed with a buſhy tuft. The hinder parts of the lion are rather diſproportionate to the front, his poſterior limbs being comparatively longer, and the latter have beſides a naked appearance when contraſted with the ſhaggineſs of its anterior aſpect. The legs are fleſhy and muſcular; the length of the claws is about an inch and a quarter, very hooked, and of a whitiſh colour; the claws being retractile, can be extended or withdrawn into the membranaceous ſheath at pleaſure, and their points are generally acute, as they are never extended, except when the animal ſeizes on its prey.

The lioneſs is ſmaller than the lion, being ſcarcely three-fourths the ſize of the latter; ſhe is alſo deſtitute of the mane, and her fur is of a whiter caſt on the ſides and belly.

It has been obſerved generally, by ſome writers, that in warm climates quadrupeds uſually attain to a far more conſiderable ſize, and are naturally ſtronger than in the cold or temperate climates, and that they are likewiſe more fierce and hardy, as their natural qualities ſeem to correſpond with the ardour of the climate. This remark can apply only to certain tribes, or at leaſt admits of many exceptions; but with regard to the lion in particular is ſtrictly true. The lions, naturally the inhabitants of the hotter regions of the earth, thrive beſt in the burning waſtes of the torrid zone; in thoſe deſarts whence mankind are driven by the rigorous heat of the climate, the lion reigns ſole maſter; its diſpoſition ſeems to partake of the ardour of its native ſoil, and under the influence of a ſcorching ſun it becomes larger, more powerful, fierce, and terrible than in other parts of the globe. It is thus that the lions of mount Atlas, whoſe ſummits are oftentimes covered with ſnows, are neither ſo ſtrong nor ſo ferocious as thoſe of Biledulgerid or Zaara, or the deſarts in the interior of the vaſt continent of Africa. In thoſe barren waſtes the lion is the dread of travellers, and the ſcourge of the neighbouring provinces. Happily the ſpecies is not numerous, and is ſaid to be diminiſhing in number; for if we may credit the teſtimony of thoſe who have traverſed theſe regions within the ſpace of the laſt century, the number of lions is not near ſo conſiderable as they were formerly, and their number indeed appears to decreaſe daily. The Romans brought many more lions out of Libya in one year for their public ſpectacles than could be found at this time in the country. Scylla, the dictator, for example, exhibited during his prætorſhip a hundred lions; but in this reſpect he was far excelled by Pompey the Great, who brought together in the grand Circus no leſs than ſix hundred animals of this ſpecies, three hundred and fifteen of which were males: and it is recorded alſo of Cæſar the dictator, that he collected altogether no leſs than four hundred for the ſame purpoſe, that of public exhibition. It is remarked by modern writers, that the lions of Turkey, Perſia, and the Indies are leſs numerous than formerly; and indeed we are aſſured by the beſt of the late French travellers, that there are at preſent no lions throughout Turkey.

As this formidable and courageous animal makes a prey of moſt other animals, and is himſelf the prey of none, this diminution in the number of the ſpecies can be attributed only to the increaſed population of mankind: and it is alſo well obſerved, that the courage of this animal diminiſhes, and its caution and timidity become greater as it approaches the habitations of the human race. The quality of his courage, though natural, is exalted or depreſſed according to the ſucceſs with which he is accuſtomed to employ his force. In thoſe regions, the excluſive empire of which has been reſigned to him by man, the lion is alone formidable. Accuſtomed to meaſure his ſtrength by that of all other animals which he encounters, the habit of conqueſt renders him haughty and intrepid. Having never experienced the ſtrength of man, or the power of his arms, inſtead of betraying fear at his approach, the lion diſdains and ſets him at defiance. Wounds irritate but do not terrify him; neither is he diſmayed at the ſight of numbers. A ſingle lion of the deſart has been known to attack a whole caravan; and if, after a violent and obſtinate engagement, he found himſelf weakened, he retreats fighting, and always keeping his face to the enemy. But acquainted with man, and the power of his arms, or ingenuity, he loſes his natural fortitude, and feels ſenſible of his inferiority; and hence the lion, in the neighbourhood of the villages of the Indians and Africans, has been known to fly before women, and even children, and ſuffer itſelf to be driven by them from its lurking-place.

This alteration in the diſpoſition of the lion ſufficiently demonſtrates that it will admit of a certain degree of education. The page of hiſtory informs us of lions yoked in triumphal chariots; that of Mark Antony, when he appeared in the ſtreets of Rome, accompanied by his miſtreſs Cytheris, was drawn by lions; and other inſtances of a ſimilar nature might alſo be adduced. Lions have been occaſionally trained to the arts of war, or the chaſe, by the ancients, and it is affirmed of theſe, that they never employed their ſtrength or courage but againſt their enemies. The lion (ſays Buffon) when taken young, and brought up amongſt domeſtic animals, is eaſily accuſtomed to live, and even ſport innocently with them. He is gentle and careſſing to his maſter, and if he ſometimes reſumes his natural ferocity, he ſeldom turns his rage againſt his benefactors. He has alſo been known to diſdain the inſults, and pardon the offenſive liberties of weaker animals. When led into captivity, he diſcovers ſymptoms of uneaſineſs, without anger or peeviſhneſs; on the contrary, he aſſumes the habits of gentleneſs, obeys his maſter, careſſes the hand that feeds him, and ſometimes ſpares the animals that are thrown to him for prey. By this act of generoſity he ſeems to conſider himſelf as for ever bound to protect them; he lives peaceably with them, allows them a part of his food, and will rather ſubmit to the inconveniencies of hunger than deſtroy the fruits of his own beneficence.

Notwithſtanding this generoſity and placability of diſpoſition, it ſhould however be remembered, that the paſſions of the lion are impetuous and vehement, and it is not to be expected, that on all occaſions the impreſſions of education will be ſufficient to counterpoiſe them. We are well aſſured, from ocular obſervation, that the keepers of theſe animals frequently play with them, and with a degree of familiarity, little ſhort of temerity, put their hands in their mouths, pull out their tongue, or hold them by the teeth, or even beat them, all which the animal ſeems to bear with ſullen compoſure. But it is nevertheleſs dangerous to let the lion ſuffer from hunger, or provoke him by ill-timed teazings; the mildneſs of his temper is liable to irritation, and has been known to reſent the imprudent chaſtiſements of his keeper. Labat informs us of a gentleman who kept a lion in his chamber, and employed a ſervant to attend it, and who as uſual mixed his careſſes with blows. This was borne by the lion for ſome time. One morning, however, the gentleman was awakened by an unuſual noiſe in his room, and drawing his curtains aſide he perceived it to proceed from the lion, which was growling over the body of the unhappy man, whom it had juſt killed, and had ſeparated his head from his body. The terror and conſternation of the gentleman may be eaſily conceived; he flew out of the room, and fortunately obtained ſufficient aſſiſtance to ſecure the animal from committing further miſchief.

The appearance of the lion is truly expreſſive of the magnanimous qualities of his nature, his gait is ſtately, his looks determined, his eyes glowing with peculiar luſtre, inſpire terror, and his voice is tremendous. The force of his muſcular ſtrength is apparent from his prodigious leaps and bounds, which often exceed twenty feet; by the lively motion of his tail, a ſingle ſweep of which is ſufficient to throw a man to the ground; by the facility with which he moves the ſkin of his face, and the faculty of erecting and agitating the hair of his mane when irritated.

Lions are very ardent in their amours; when the female is in ſeaſon, ſhe is often followed by eight or ten males, who roar inceſſantly, and enter into furious engagements till one completely overcomes the reſt, takes peaceable poſſeſſion of her, and carries her off to ſome ſecret receſs. All the paſſions of the lion, the ſoft paſſion of love not excepted, are exceſſive. From the reports of the French naturaliſts, the amours of theſe animals differ in no reſpect from thoſe of the common cat, and frequent opportunities have occurred of late years in the menagerie of the muſeum of natural hiſtory in Paris to verify the truth of this obſervation; they are not on thoſe occaſions more cordial than the cat, and like that animal growl and wrangle as though offended with each other, the female eſpecially. The lioneſs is naturally weaker and more timid than the lion, but ſuch is the ſtrength of her attachment for her young, that for their ſupport ſhe becomes more ferocious and terrible than the lion himſelf, makes her excurſions with more boldneſs, attacks and deſtroys without diſtinction all other animals, and carries them reeking to her cubs, whom ſhe thus inſtructs to ſuck their blood, and tear their fleſh. She brings forth her young in the moſt ſecret and inacceſſible places, and when afraid that her retreat will be diſcovered, endeavours to conceal the traces of her feet, by returning frequently on her ſteps, or effacing them by bruſhing the ground with her tail. When the danger is great, ſhe will ſometimes tranſport her young from one place to another in her mouth, or if obſtructed in this attempt to ſave them ſhe becomes furious, and defends them to the laſt extremity.

The length of time the lioneſs goes with young is variouſly ſtated by different writers; Ælian ſays two months, and Philoſtratus ſix months; among the moderns the period of geſtation is ſaid to be five months, and the beſt authors ſeem to agree in this concluſion. From very recent obſervation, it nevertheleſs appears that neither of the above ſtatements is correct; it has been clearly aſcertained by La Cepède, that the lioneſs goes with young one hundred and eight days, or rather more than three months and a half. The number of young brought forth by the lioneſs at a time is alſo generally miſrepreſented. Ariſtotle believed that at the firſt birth the lioneſs conſtantly produced either five or ſix young; moſt commonly only five; and at each ſucceeding litter progreſſively one leſs, till ſhe brought forth but a ſingle whelp, and after that ſhe became barren. This early naturaliſt was deceived, but his information is nevertheleſs more juſt than that of other ancient writers before his time, who ſuppoſed the lioneſs never produced but a ſingle litter, the young, inſtead of being brought forth as in other animals, tearing an opening through the ſide of their mother, and thus effecting their eſcape, at the expence of her life. Among the writers of later times it is uſually admitted that the lioneſs has ſeveral litters in her life, and at each birth produces about three or four whelps. The lioneſs occaſionally breeds in a ſtate of confinement in Europe, inſtances of which are known in Britain; but whether the time of geſtation in theſe animals has been well determined by the obſervation of Engliſh naturaliſts ſeems rather doubtful. A lioneſs in the menagerie at Paris, about two months gone with young, produced an abortive birth of two fœtuſes, the ſkin of which was perfectly ſmooth, the hair not having at that period began to grow. Twenty-one days after this the female was in heat, and was known to receive the embraces of the lion five ſeveral times in the ſame day. From that time every ſymptom of pregnancy appeared; and on the 108th day after, at ſeven in the morning, the pains of birth commenced; at five in the evening, the uſual hour of repaſt, the lioneſs in vain attempted to eat the food preſented to her, the pains, almoſt every inſtant repeated, compelling her to abandon it. The keeper, obſerving this, entered the den, and made the animal ſwallow ſome olive oil, which ſeemed rather to relieve her; about ten o'clock ſhe brought forth a living whelp; in half an hour after another, and a third at a quarter paſt eleven. The above were all males. This occurred in November 1801. About the end of March following the male was again admitted to the ſame lioneſs, and on the 15th of July 1802, ſhe had a litter of two female whelps, ſo that the period of geſtation in the latter inſtance was much the ſame as in the former.

The lions, when firſt born, are rather larger than a half-grown kitten; at leaſt three or four we have ſeen that were brought forth in the Tower did not exceed that ſize, or about a foot in length from the back of the head to the origin of the tail. Their colour is a mixture of reddiſh and grey, with a number of ſmall brown bands, which are moſt diſtinct on the dorſal ſpine, and near the origin of the tail; and theſe ſtripes ſcarcely diſappear in the whelps a twelvemonth old, and they continue at the teat about the ſame time. The mane of the male begins to make its appearance when the animal is about three years, or three years and a half old: the age of maturity is ſaid to be about the ſixth or ſeventh year, in the female at the ſixth year.

Naturaliſts are not agreed as to the ordinary period of life in this animal, which is variouſly ſtated, at from about 20 to 50 years or more. Buffon, reaſoning from the ſize and conſtitution of the lion, and the time required for his arriving at his full growth, concludes that it ought to be about 25 years, or ſeven times the ſpace of three or four years, as it has been aſſerted of the lion that he acquired maturity in three or four years after his birth. It is, however, aſcertained, that in ſome inſtances the lion lives much beyond that time. The great lion called Pompey, which died in the Tower, is recorded to have lived in captivity above 70 years; and one brought from the river Gambia died there a few years ſince at the age of 63.

The lion ſeldom quits his den, or goes abroad in the middle of the day, but commences his depredations at twilight, and returns before the morning. The roaring of the lion, when in queſt of prey, is ſaid by Buffon to reſemble the ſound of diſtant thunder, and, being echoed by the rocks and mountains, appals the whole race of animals, and puts them to ſudden flight; but he frequently varies his voice into a hideous ſcream, or yell. The lion, when hungry, will attack any animal that preſents itſelf; but he is ſo formidable that all endeavour to avoid him, and this circumſtance often obliges him to conceal himſelf, and lie in wait, that he may take his prey by ſurpriſe. For this purpoſe he crouches on his belly in ſome thicket till his prey approaches, and then with a prodigious leap he ſeizes it at the firſt bound. Should he miſs the object, we are told he deſiſts from farther purſuit, and, turning back towards the place of his ambuſh, meaſures the ground ſtep by ſtep, and again lies in wait for another opportunity.

The lurking place of the lion is generally choſen near a ſpring, or by the ſide of a river, where he has an opportunity of ſurpriſing ſuch animals as reſort to the water to quench their thirſt. In burning deſerts, where rivers and fountains are denied, they live in a perpetual fever, a ſort of madneſs fatal to every animal they meet with. The lion is ſuppoſed to be deſtitute of ſcent in that ſuperior degree which moſt animals of prey poſſeſs, and to hunt by the eye alone. Many hiſtorians have even repreſented him as incapable of finding his prey except by accident, and that he is obliged to the jackal, a quadruped of excellent ſcent, for the diſcovery of it. This is an erroneous ſuppoſition; the jackal does not attend the lion to provide for him, but, being a ſmall and feeble creature, follows his track to pick up the refuſe of ſuch animals as the lion deſtroys, and does not condeſcend entirely to devour. The ſtrength of the lion is ſo prodigious, that it is even affirmed a ſingle ſtroke of his paw is ſufficient to break the back of a horſe, and that he carries off a middle-ſized ox, or buffalo, with eaſe. The lion is ſaid to devour as much food at once as will ſerve him for two or three days, and when ſatiated to remain in a ſtate of reſt or retirement in his den, till impelled again by hunger to leave it, and prowl in ſearch of prey. The reverſed briſtles with which his tongue is beſet are ſo large and ſtrong, that he readily lacerates the ſkin of other animals; and his teeth ſo powerful, that he breaks and cruſhes the bones with perfect facility, and often ſwallows them with the fleſh. It is eſtimated that about fifteen pounds of raw fleſh is ſufficient for the ordinary ſubſiſtence of each lion daily. He endures hunger better than thirſt, and laps in drinking like a dog.

The roaring of the lion is ſtrong and loud, but when he is irritated his cry is ſhorter, repeated more ſuddenly, and is ſtill more terrible than the roaring; beſides which, at ſuch times he beats his ſides with his tail, ſtamps with his feet, erects and agitates the hair of his head and mane, moves the ſkin of his face, ſhews his teeth, and lolls out his tongue. According to Dr. Sparrman, "the roaring of the lion conſiſts in a hoarſe inarticulate ſound, which at the ſame time ſeems to have a hollowneſs in it, ſomething like that proceeding from a ſpeaking trumpet. The ſound is between the German *u* and an *o*, being drawn to a greater length, and appearing as if it came from out of the earth; at the ſame time, that after liſtening with the greateſt attention, I could not exactly hear from what quarter it came. The ſound of the lion's voice does not bear the leaſt reſemblance to thunder, as M. de Buffon, tom. ix. p. 22. from the voyage of Boullaye de Goux, affirms it does. In fact, it appeared to me neither peculiarly piercing nor tremendous; yet, from its ſlow prolonged note, joined with nocturnal darkneſs, and the terrible idea one is apt to form to one's ſelf of this animal, it made me ſhudder, even in ſuch places as I had an opportunity of hearing it in with more ſatisfaction, and without having the leaſt occaſion for fear. We could plainly perceive by our cattle when the lions, whether they roared or not, were reconnoitering us at a ſmall diſtance. For in that caſe the hounds did not dare to bark in the leaſt, but crept quite cloſe to the Hottentots; and our oxen and horſes ſighed deeply, frequently hanging back, and pulling ſlowly with all their might at the ſtrong ſtraps with which they were tied up to the waggon. They likewiſe laid themſelves down on the ground and ſtood up alternately, appearing as if they did not know what to do with themſelves; or rather, juſt as if they were in the agonies of death. It is indeed a wonderful circumſtance that the brute creation ſhould have been taught merely by nature to be in dread of the lion; for our horſes and oxen were all from places where I am certain they could have no knowledge of this dreadful adverſary of theirs; ſo that in this we muſt admire the bounty of providence, which, while it has ſent ſuch a tyrant as the lion amongſt the animal creation, has likewiſe taught them to diſcern and diſtinguiſh it with trembling and horror."

We might naturally conclude that the roaring of the lion would prove ſerviceable to the other animals, by operating as a warning for them to betake themſelves to flight; but as he puts his mouth to the ground when he roars, the ſound is diffuſed equally to a conſiderable ſurrounding diſtance, and it is hence impoſſible to diſtinguiſh the preciſe ſpot from whence it iſſues. This increaſes the alarm; the intimidated animals fly backwards and forwards in all directions, and being dark, very often run to the very place from whence the ſound proceeds, and which they meant to avoid. When the lion walks, his gait is ſtately, grave, and ſlow, though in an oblique direction. His movements are not, however, equal, but conſiſt of leaps and bounds, which prevent him from ſtopping ſuddenly, and make him often overleap his mark. Should he chance to miſs his prey, the Hottentots affirm that he turns ſlowly round towards the place where he lay in ambuſh, proceeding thither ſtep by ſtep, and, as it were, meaſuring the exact length between the two points, in order to find how much he exceeded or fell ſhort of the mark to which his leap had been directed.

The character of the lion for courage and generoſity is to be admitted, according to Dr. Sparrman, with conſiderable abatement. "It is not in magnanimity, ſays this writer, as many will have it to be, but in an inſidious and cowardly diſpoſition, blended with a certain degree of pride, that the general character of the lion conſiſts; though hunger muſt naturally have the effect of now and then inſpiring ſo ſtrong and nimble an animal with uncommon intrepidity and courage. Moreover, being accuſtomed always itſelf to kill its own food, and that with the greateſt eaſe, as meeting with no reſiſtance, and even frequently to devour it reeking and weltering in its blood, it cannot but be eaſily provoked, and acquire a greater turn for cruelty than generoſity; but, on the other hand, not being accuſtomed to meet with any reſiſtance, it is no wonder that, when it does, it ſhould ſometimes be faint-hearted and creſt-fallen. A yeoman, a man of veracity (Jacob Kok, of Keehoe river), related to me an adventure he had, in theſe words: "One day walking over his lands with his loaded gun, he unexpectedly met with a lion. Being an excellent ſhot, he thought himſelf pretty certain, in the poſition he was in, of killing it, and therefore fired his piece. Unfortunately he did not recollect that the charge had been in it for ſome time, and conſequently was damp, ſo that his piece hung fire, and the ball, falling ſhort, entered the ground cloſe to the lion. In conſequence of this he was ſeized with a panic, and took directly to his feet; but being ſoon out of breath, and cloſely purſued by the lion, he jumped up on a little heap of ſtones, and there made a ſtand, preſenting the butt end of his gun to his adverſary, fully reſolved to defend his life as well as he could to the utmoſt. My friend did not take upon him to determine whether this poſition and manner of his intimidated the lion or not: it had, however, ſuch an effect upon the creature, that it likewiſe made a ſtand, and, what was ſtill more ſingular, laid itſelf down at the diſtance of a few paces from the heap of ſtones, ſeemingly quite unconcerned. The ſportſman in the mean while did not dare to ſtir a ſtep from the ſpot: beſides, in his flight, he had the misfortune to loſe his powder-horn. At length, after waiting a good half hour, the lion roſe up, and at firſt went very ſlowly; and ſtep by ſtep, as if he had a mind to ſteal off, but as ſoon as it got to a greater diſtance it began to bound away at a great rate."

The ſame author relates alſo another occurrence to the ſame effect, but which, being attended with circumſtances more remarkable than the former, has been more frequently repeated; the ſtory is intereſting, and ought not to be omitted. "An elderly Hottentot, ſays this writer, in the ſervice of a Chriſtian, near the upper part of Sunday river, on the Cambdebo ſide, perceived a lion following him at a great diſtance for two hours together. Thence he naturally concluded that the lion only waited for the approach of darkneſs in order to make him his prey, and in the mean time could not expect any other than to ſerve for this fierce animal's ſupper, inaſmuch as he had no other weapon of defence than a ſtick, and knew that he could not get home before it was dark. But as he was well acquainted with the nature of the lion, and the manner of its ſeizing upon its prey, and at the ſame time had leiſure between whiles to ruminate on the ways and means in which it was moſt likely that his exiſtence would be put an end to, he at length hit upon a method of ſaving his life. For this purpoſe, inſtead of making the beſt of his way home, he looked out for a *kilpkrans* (ſo they generally call a rocky place, level and plain at the top, and having a perpendicular precipice on one ſide of it), and ſitting himſelf down on the edge of one of theſe precipices, he found, to his great joy, that the lion likewiſe made a halt, and kept the ſame diſtance as before. As ſoon as it grew dark, the Hottentot, ſliding a little forwards, let himſelf down below the upper edge of the precipice upon ſome projecting part or cleft of the rock, where he could juſt keep himſelf from falling. But in order to cheat the lion ſtill more, he ſet his hat and cloak on the ſtick, making with it, at the ſame time, a gentle motion juſt over his head, and a little way from the edge of the mountain. This crafty expedient had the deſired ſucceſs. He did not ſtay long in this ſituation before the lion came creeping ſoftly towards him like a cat, and miſtaking the ſkin cloak for the Hottentot himſelf, took his leap with ſuch exactneſs and preciſion, as to fall headlong down the precipice directly cloſe to the ſnare which had been ſet up for him."

This is not the only inſtance of the lion being enſnared by a ſtratagem of this kind. In the out-houſes and waſte grounds about farms, where a lion has been upon the watch for ſome animal and miſſed it, or where they have reaſon to expect one, they ſet up the figure of a man, cloſe by the ſide of ſeveral loaded guns; ſo that theſe diſcharge themſelves into the body of the beaſt at the very inſtant that he ſprings, or throws himſelf upon the dreſſed figure. This is done with ſo much eaſe and ſucceſs, that they ſcarcely ever think it worth the trouble in Africa to take the lions alive, nor are they often at the pains to conſtruct pit-falls for their capture.

Dr. Sparrman remarks, as a ſingular trait in the hiſtory of the lion, that though, according to many, it always kills his prey immediately if it belongs to the brute creation, it contents itſelf, however provoked, with merely wounding the human ſpecies in the firſt moment of ſeizure; or at leaſt to wait ſome time before he gives the fatal blow to the unhappy victim. In ſeveral places through which the traveller paſſed, the natives mentioned to him by name a father and two ſons, who were ſaid to be ſtill living, and who, being on foot near a river on their eſtate in ſearch of a lion, were unexpectedly ſurpriſed by him; the foremoſt was thrown down by him, but the other two had juſt time to ſhoot the lion dead on the ſpot, after it had lain almoſt acroſs the youth ſo nearly and dearly related to them, without having done him any particular injury. He alſo ſaw, near the upper part of Duyven-hoek river, an elderly Hottentot, who at that time had under one eye, and beneath the cheek-bone, the ghaſtly marks of the bite of a lion, which did not condeſcend to give him any other chaſtiſement for having, in company with his maſter, hunted him with intrepidity, though without ſucceſs. It was related likewiſe of a farmer and captain in the militia named Bota, who had lain for ſome time under a lion, and had received ſeveral bruiſes from the beaſt, beſides being bitten very much in one arm, but who in a manner had his life given him by this noble animal. "I do not rightly," ſays Dr. Sparrman, "know how to account for this merciful diſpoſition towards mankind. Does it proceed from the lion's greater reſpect and veneration for man, as being an equal to, or even a mightier tyrant than, himſelf among the animal creation? Or is it merely from the ſame caprice which has ſometimes induced him not only to ſpare the lives of men or brute creatures, who have been given up to him for prey, but even to careſs them and treat them with the greateſt kindneſs? Whims and freaks of this kind have, perhaps, in a great meaſure, acquired the lion the reputation it has for generoſity; but I cannot allow the ſpecious name, ſacred only to virtue, to be laviſhed on a wild beaſt. Slaves, indeed, and wretches of ſervile minds, are wont with this attribute to flatter their greateſt tyrants; but with what ſhow of reaſon can this attribute be beſtowed upon the moſt powerful tyrant among quadrupeds, becauſe it does not exerciſe an equal degree of cruelty upon all occaſions? That the lion does not, like the wolf, tiger, or ſome other beaſts of prey, kill a great deal of game or cattle at one time, perhaps proceeds from this, that while he is employed in attacking one or two of them, the remainder fly farther than it accords with the natural indolence of this beaſt to follow them. If this be called generoſity, a cat may be ſtyled generous with regard to rats; as I have ſeen this creature in the fields, among a great number of the latter, where ſhe could have made a great havoc at once, ſeize on a ſingle one, and run off with it. The lion, and the cat likewiſe, very much reſemble each other, in partly ſleeping out, and partly paſſing away, in a quiet inactive ſtate, a great part of their time in which hunger does not urge them to go in queſt of their prey."

The ſtrength of the lion, according to the ſame intereſting traveller, is very conſiderable. He was informed that this animal was once ſeen at the Cape to take an heifer in his mouth, and though the legs of the latter dragged on the ground, yet he ſeemed to carry her off with the ſame eaſe that a cat does a rat; and it had likewiſe in its courſe to leap a broad dyke, which it accompliſhed without difficulty. This happened near Boſhieſman river; the lion was perceived by a hunting party of Hottentots dragging his prey from the plain to a neighbouring woody hill; they however purſued, and forcing the lion to leave it, made a prize of it themſelves. The lion is however ſaid to be not ſufficiently powerful to overcome an animal of ſuch ſtrength and ſize as the buffalo, without having recourſe both to agility and ſtratagem. With this view it ſteals on the buffalo, and faſtens with both its paws upon the mouth and noſtrils of the beaſt, and keeps ſqueezing them cloſe together, till at length the creature is ſtrangled, wearied out, and dies. Attacks of this kind have been witneſſed by the coloniſts, and the buffaloes have ſometimes eſcaped, bearing at the ſame time the marks of the lion's claws about their mouth and noſe. The lion on ſuch occaſions ventures, however, to aſſail the buffalo at great peril; for if another buffalo ſhould approach, he would not fail to attack the lion, and the ſtrength of the two buffaloes would be more than ſufficient to overpower their aſſailant. The lion, it is ſaid, unleſs preſſed with hunger, will not always attack the buffalo; a traveller had once an opportunity of ſeeing a female buffalo with her calf, defended by a river at her back, keep for a long time at bay five lions which partly ſurrounded her; but did not, at leaſt as long as the traveller looked on, dare to attack her. There is an inſtance alſo recorded of a lion being trampled to death by a herd of cattle, which he was urged to attack (probably by hunger) in the broad day light.

At the Cape the lion is frequently hunted by the coloniſts both for the ſake of the fleſh, which, though poſſeſſing a ſtrong and diſagreeable flavour, is eaten by the negroes; and alſo for the ſkin, which thoſe people uſe as a mantle, or a bed. In the day time, and on the open plain, from ten to ſixteen dogs will eaſily overcome a lion of the largeſt ſize. Nor is there any neceſſity that the dogs with which the lion is hunted ſhould be very large, and trained up to the ſport, as Buffon thinks they ought to be, the object being perfectly well accompliſhed with the common farm-houſe dogs. As the lion is leſs ſwift than the dogs, the latter eaſily approach him, when, from a greatneſs of ſoul, and a ſullen degree of magnanimity, the lion turns round, and waits for the attack, ſhaking his mane, and roaring with a ſhort and ſharp tone, or ſits down to face them. The hounds then ſurround him, and ruſhing upon him all at once, are thus, by their united efforts, able to ſubdue, or tear him in pieces: he has ſeldom time to give more than two or three ſlight ſtrokes with his paws, each of which is attended with the death of one of his aſſailants.

Buffon aſſerts that the lion may be hunted on horſeback, but that the horſes muſt be trained to it, which, however, Dr. Sparrman aſſures us, is not the caſe, as the coloniſts hunt the lion with common hunting horſes; the latter he deſcribes to be as eager in purſuit of this formidable animal as in that of the antelope. "Our horſes," ſays he, "the very ſame as had ſeveral times, in the manner above-mentioned, ſhewn their diſquietude when the lion happened to be in the vicinity of them, and which were not in the leaſt trained to the chaſe, once exhibited a ſpirit in the purſuit of two large lions equal to that which they had ſhewn at other times in chaſing the timid gazels; though in fact hunting horſes ſeem to partake much more of their maſter's pleaſure in the chaſe. I remember in particular, at Agter Bruntjes Hoogtee, I rode a horſe, which, by a tremulous ſound iſſuing from its cheſt, cocking up its ears, and prancing and capering, diſcovered, in an unequivocal manner, its ardour in the chaſe, whenever it came in ſight of the larger kind of game. There have even been inſtances of hunting horſes, who, when the hunter has jumped off their backs in order to diſcharge his piece, but has miſſed his mark, have, in their eagerneſs for the chaſe, not allowed him time ſufficient to mount again, but followed the game alone for hours together, cloſe at its very heels, in all its turnings and windings." This ardour for the purſuit of the lion is only ſhewn, however, we are to remember, according to Dr. Sparrman, by the horſes trained to the purpoſes of hunting; for he has told us on another occaſion, that their common horſes, as well as their oxen, ſighed deeply, and betrayed ſuch ſymptoms of fear, as even to lie down panic-ſtruck when the lions were reconnoitering them; and theſe aſſurances ſeem ſtrongly to confirm the obſervation of Buffon; namely, that it is neceſſary the horſes with which the lions are hunted ſhould be trained to the purpoſe, or be at leaſt accuſtomed to the purſuit of beaſts of prey, and the perils attendant on their chaſe. It furthermore appears from the ſame author, that it is only on the plains that the hunters ever venture to go out on horſeback in this chaſe. If the lion remains in the coppice or wood on a riſing ground, they endeavour to teaze him with the dogs till he comes into the plain. They alſo go in parties of two or three together, or even more, in order to aſſiſt and reſcue each other, in caſe the firſt ſhot ſhould not take place. When the lion ſees the hunters at a great diſtance, it is allowed univerſally that he flies from their approach with all poſſible ſpeed, in order to eſcape; but if they chance to diſcover him at a ſmall diſtance only from them, he retires with ſullen dignity, and at a ſlow pace, as though he were above betraying by his actions any ſymptom of apprehenſion. This, therefore, alſo ſhews, that when purſued with vigour, he is ſoon provoked to reſiſtance, or at leaſt diſdains any longer to fly. He ſlackens his pace, and at length only ſlides ſlowly off, ſtep by ſtep, at the ſame time watching his purſuers obliquely, till he finally makes a full pauſe, and, turning round upon them, ſhakes his mane, roars with a ſhort and ſharp tone, expreſſive of his indignation, and appears ready to ſeize on them, and tear them in pieces. This is the moment for the hunters to be on the ſpot, or within a convenient diſtance, to commence the attack; not in a body, but at proper intervals from each other. The foremoſt huntſman, or he that is moſt advantageouſly poſted, and has the beſt mark of that part of the lion's body neareſt his heart or lungs, muſt be the firſt to jump off his horſe, and, ſecuring the bridle by putting it round his arm, diſcharge his piece; then, in an inſtant recovering his ſeat, muſt ride obliquely athwart his companions; and in fine, giving his horſe the reins, muſt truſt entirely to the ſpeed and fear of the latter to convey him beyond the reach of the lion, ſhould he have only wounded him, or abſolutely miſſed him. Under either of theſe circumſtances a fair opportunity preſents itſelf for ſome one of the other hunters to jump off his horſe immediately, as he may then diſcharge his piece with effect, and ſave his companion. If this ſhot ſhould miſs likewiſe, a third ſportſman rides after the lion, which at that time is in purſuit of the firſt or ſecond, and, ſpringing off his horſe, fires his piece as ſoon as he arrives within a proper diſtance, and the animal preſents itſelf in a favourable poſition. In the event of the lion turning again and attacking this purſuer, the other hunters return to his reſcue with their pieces ready charged, having loaded them on horſeback while flying from the wild beaſt. No inſtance, it is ſaid, has ever been known of any misfortune happening to the hunters in chaſing the lion on horſeback. The remote parts of Africa are moſt expoſed to the ravages of wild beaſts, and the coloniſts in thoſe diſtricts, from the habits of hunting them, become excellent markſmen. The lion, which has the boldneſs to ſeize on their cattle, the moſt valuable part of their property, and that ſometimes even at their doors, is as odious to them as he is dangerous and injurious; and hence they conſequently ſeek out his lurking places, and purſue him with the greateſt ardour and delight.

It is rather with the view of exterminating theſe formidable beaſts of prey that the Africans hunt them; though, as already obſerved, the fleſh is eaten by the negroes: the greaſe alſo, which is of a penetrating nature, is uſed in medicine, and their ſkin ſerves as a cloak or mantle, and was formerly worn as ſuch only by perſons of diſtinction. On ſome occaſions alſo lions ſeem to conſtitute a part of the eſtabliſhed pomp of royalty in the eaſtern world. The monarch of Perſia, as appears from the travels of Mr. Bell, has on the days of audience two large lions, ſecured by means of golden chains, on each ſide the entrance of the hall of ſtate.

The anatomy of the lion is deſcribed by Bartholinus in 1671, and in the Tranſactions of the Royal Society of Peterſburgh for 1771.

TIGRIS. Tail long; body varied with long dark ſtreaks. *Tigris maculis virgatis*, Ludolf. *Felis flava, maculis longis nigris variegata*, Briſſ. *Cauda elongata, corpore maculis omnibus virgatis*, Schreber. *Tigris*, Geſner, &c. *Tigre*, Buffon. *Royal tiger*.

It is difficult to form any juſt concluſion either as to the ſize or beauty of this tremendous animal from the individuals retained captive from early life in our menageries; and where, from the ſmallneſs of their dens, and conſequent uncleanlineſs, their want of exerciſe, and of thoſe habits of life which render them robuſt, their growth muſt naturally be ſuppreſſed, and their robe exhibit an infinitely leſs degree of brilliancy than when they roam at large in their native deſerts.

The ſize of this animal, according to ſome authors, is larger, and, according to others, rather ſmaller than the lion; and in this reſpect the compariſons by different travellers vary materially, ſome affirming that it is the ſize of the deer, others of the horſe, and ſome again even of the buffalo. There indeed appear to be two or more diſtinct animals confounded under the general name of tiger, in the ſame manner as the panther has been called the leopard, and the congouar the panther; and all, as well as the jaguar, are indiſcriminately termed tigers by various writers, a circumſtance that has given riſe to no ſmall degree of confuſion. The true tiger is the largeſt and moſt powerful of theſe animals, and which has obtained the appellation of the royal tiger in teſtimony of this pre-eminence. Buffon relates, on the authority of M. de Lalande Magon, that the latter had ſeen a tiger in the Eaſt Indies fifteen feet in length, including the tail; but this even is inferior to others recorded by travellers. L'Abbé Richard ſays they have tigers at Tonquin eighteen feet in length. The height of the tiger, according to Fouche d'Obſonville, is four feet ten inches, and the length nine feet from the front to the baſe of the tail; and Grandpré, in his voyage to India, deſcribes tigers as large as oxen.

Tigers are peculiar to Aſia, and are not, as ſome authors ſuppoſe, inhabitants of the new continent; and moreover they are confined to the warmer parts of Aſia, and principally to India and the Indian iſlands, though the ſpecies extends as far north as China and Chineſe Tartary. They abound moſt in Malabar, Bengal, and the kingdom of Siam, and Tonquin.

A more beautiful animal than the tiger does not exiſt; he is as unrivalled for the brilliancy and elegance of his fur, as he is diſtinguiſhed for his ferocity, and the want of every quality which, as a beaſt of prey, could palliate the nature of his diſpoſition. His whole figure is expreſſive of the powers of his ſtrength and activity. The head is ſhort and roundiſh, the ears ſhort, and the armament of his teeth truly formidable. The general colour of his fur is a deep tawny, or yellow orange, which is of a deeper hue on the back than the ſides; and the face, throat, and underſide of the belly are nearly white: the whole body is traverſed by numerous perpendicular ſtripes of black, and the tail is alſo annulated with the ſame. In different individuals the colours vary in the brightneſs of the yellow-orange, which conſtitutes the ground-colour of the fur, and the intenſity of the bands of black, with which it is relieved; theſe bands are in ſome parts double, in others ſingle, and are fewer in number about the head and under parts of the body than on the upper. The tiger is the moſt rapacious of all carnivorous animals; fierce without provocation, and cruel without neceſſity, his thirſt for blood is inſatiable; although glutted with carnage he is not appeaſed; he ſeizes, and tears in pieces every animal with equal fury and rapacity, nor ever deſiſts ſo long as a ſingle object remains in ſight that he can vanquiſh; he lays waſte the country he inhabits; flocks and herds fall indiſcriminately victims to his fury, his cruelty, and cunning; he attacks the elephant, the rhinoceros, and even braves the lion himſelf; he neither fears the ſight nor the oppoſition of men, whom he frequently makes his prey, and is even ſaid to prefer human fleſh to any other. The tiger ſeems to have no other inſtinct than a conſtant thirſt after blood, and which often ſtimulates him to devour his young, or the cubs to tear the mother in pieces for defending them. Sometimes he lies in wait on the banks of rivers, where the heat of the climate obliges other animals to repair for drink, but from the velocity of his flight he is equal to the chace of the fleeteſt animals, and oftentimes purſues them to their inevitable deſtruction.

The ſtrength of the tiger is ſo great, that when it has killed a deer, a horſe, or even a buffalo, it carries off the prize with ſuch eaſe, that it ſeems no impediment to its flight. This it does to prevent interruption, as it can devour the ſlaughtered animal in the woods more at its leiſure. The moment the animal he attacks is overcome, it plunges its head into the body, as if to ſatiate itſelf with the blood; and when large it commonly tears out the entrails to facilitate its conveyance to the retreats of its lurking place.

Neither force, reſtraint, nor violence can ſubdue the ferocity of the tiger; he is equally irritated with good as bad treatment, and is ſo inſenſible of its keeper, that he would equally tear the hand that feeds him, as that by which it is chaſtiſed. It is nevertheleſs admitted that the tiger, when very young, has much playfulneſs and ſome docility. In Bewick's quadrupeds it is related, that a young male tiger, lately brought from China in the Pitt Eaſt Indiaman, at the age of ten months, was ſo far domeſticated, as to allow every kind of familiarity from the people on board. It ſeemed to be quite harmleſs, and was as playful as a kitten. It frequently ſlept with the ſailors in their hammocks, and would ſuffer two or three of them to repoſe their heads upon its back as upon a pillow, whilſt it lay ſtretched out upon the deck. In return for this it would, however, now and then ſteal their meat. Having one day taken a piece of beef from the carpenter, he followed the animal, took the meat out of its mouth, and beat it ſeverely for the theft, which puniſhment it ſuffered with all the patience of a dog. It would frequently run out on the bowſprit, climb about the ſhip like a cat, and perform a number of tricks, with an agility that was truly aſtoniſhing. There was a dog on board the ſhip with which it would often play in the moſt diverting manner. From theſe circumſtances, one might be led to ſuppoſe that the diſpoſition of the tiger, like that of many other animals, was capable of ſome degree of culture. But, as this author remarks, it ought to be remembered, that at the time this one was taken on board the ſhip it was only a month or ſix weeks old; and when arrived in this country it had not quite completed a year. How much longer its good humour might have continued it is impoſſible to ſay; but it is not to be doubted that its innocent playfulneſs would not have formed a part of its character when arrived at maturity, at leaſt there is every reaſon to conclude this, when we recollect that moſt of thoſe tigers kept in our menageries have been made captives when very young, and muſt neceſſarily acquire that ferocity of character which ſo invariably diſtinguiſh them from inſtinct only, not from their habits or manners of life.

As the tiger attacks all animals, without exception, it has not unfrequently to ſuſtain the moſt arduous conflicts with the rhinoceros, the elephant, and even the lion; and its combat with either occaſionally proves fatal to one or both of the combatants.

It is affirmed of the tiger, that if it happens to miſs his aim he does not purſue his prey, but, as if aſhamed of his diſappointment, runs off with ſpeed. In the beginning of the laſt century ſome ladies and gentlemen, being on a party of pleaſure under the ſhade of ſome trees near the banks of a river in Bengal, obſerved a tiger preparing for its fatal ſpring, when a lady, with almoſt unexampled preſence of mind, furled a large umbrella in the face of the animal, which inſtantly retired, and thus gave an opportunity of eſcaping from ſo terrible a neighbour. Another party had not, however, the ſame good fortune, but in the height of their entertainment loſt, in an inſtant, one of their companions, who, being ſeized and carried off by a tiger, was never heard of more. Another diſtreſſing accident, of a ſimilar kind, took place ſo lately as the year 1792, the particulars of which, as related by an eye-witneſs, muſt be ſtrong in the recollection of many readers. The unfortunate victim of this event was Mr. Munro, the ſon of ſir Hector Munro. "We went," ſays the writer of the narrative, "on ſhore at Sangar iſland to ſhoot deer, of which we ſaw innumerable tracts, as well as of tigers; notwithſtanding which, we continued our diverſion till near three o'clock, when, ſitting down by the ſide of a jungle to refreſh ourſelves, a roar like thunder was heard, and an immenſe tiger ſeized on our unfortunate friend, and ruſhed again into the jungle, dragging him through the thickeſt buſhes and trees, every thing giving way to his monſtrous ſtrength; a tigreſs accompanied his progreſs. The united agonies of horror, regret, and fear ruſhed at once upon us. I fired on the tiger; he ſeemed agitated; my companion fired alſo, and, in a few minutes after this, our unfortunate friend came up to us bathed in blood. Every medical aſſiſtance was vain, and he expired in the ſpace of twenty-four hours, having received ſuch deep wounds from the teeth and claws of the animal as rendered his recovery hopeleſs. A large fire, conſiſting of ten or twelve whole trees, was blazing by us at the time this accident took place, and ten or more of the natives with us. The human mind can ſcarce form any idea of the ſcene of horror. We had hardly puſhed our boat from that accurſed ſhore, when the tigreſs made her appearance, almoſt raging mad, and remained on the ſand all the while we continued in ſight." A ſimilar fate attended one of the ſervants in the retinue of Grandpré, a French traveller in India, a tiger, ruſhing on the party, ſeized him, and carried him off.

Marſden ſays, the number of people killed by the tigers in ſome parts of India is incredible. In Sumatra the natives are ſo infatuated that they ſeldom kill them, as they have a notion that they are animated by the ſouls of their anceſtors; and from this weak and ſuperſtitious idea ſuffer themſelves to be devoured without attempting by their united ſtrength to deſtroy theſe rapacious creatures. In other parts of India, where the uſe of fire-arms is unknown, the devaſtations committed by the tigers exceed all calculation; in the provinces of the mountainous and woody tracts of the Tonquin, for example, whole villages are depopulated by them. L'Abbe Richard ſpeaks of a ſingle tiger entering one of thoſe villages and deſtroying four or five and twenty perſons, there being no fire-arms to reſiſt him, and the inhabitants endeavouring to eſcape death by flying in all directions, ſuch as were purſued became an eaſy prey to the deſtructive monſter. The woods of Sundry, and others adjacent to the banks of the Ganges, and its tributary rivers, are celebrated as the reſort of tigers, and it is dangerous to navigate thoſe waters cloſe along the ſhore, the tigers having ſometimes even the audacity to plunge into the water to attack the men in their boats.

Pliny has incurred the cenſure of ſome modern writers for deſcribing the tiger as an animal of tremendous ſwiftneſs, "animal tremendæ velocitatis;" which they ſay is applicable to his ſpring when darting on his prey, and not to the ſwiftneſs of his pace when running. In this remark they are contradicted by two travellers of authority, namely, Pere Gerbillon, and Mr. Bell, the firſt of whom ſpeaks of it as an animal of vaſt ſwiftneſs, and the other ſaw a race between a tiger and a ſwift horſe, whoſe rider eſcaped merely by ruſhing into the midſt of a circle of armed men. One point does not, however, appear to have been conſidered; it is not unlikely that the animal ſpoken of by Pliny under this appellation may be the tiger of the moderns; yet, from the very ſlight account he has left us, this is not certain: (vid. lib. viii. c. 18.) and if it be really the animal intended, there is ſtill no cauſe to diſtruſt its accuracy, for the tiger muſt be a creature of amazing ſpeed. The accounts given by writers of the attachment ſhewn by the tigreſs to her young, the manner in which ſhe defends them, or if carried away endeavours to regain them, and the fury of her conduct for their loſs, is a repetition only of the obſervations made by Pliny, or with little variation. She is at all times furious, but when robbed of her young her rage riſes to the utmoſt extremity. She then braves every danger, and purſues her plunderers, who are uſually mounted on the ſwifteſt horſes, ſo cloſely, that they are often obliged to releaſe one in order to retard her: this ſhe ſtops to convey to ſome thicket or place of ſafety, and then again haſtens after the hunters, who may be compelled to drop another of her cubs in the ſame manner in order to eſcape with the reſt. The hunters on this arduous occaſion are generally provided with boats on the neareſt river, or the ſhore of the ſea, to which they retreat with all ſpeed, the tigreſs purſuing them to the water's edge, and when her hope of recovering them is loſt, ſhe expreſſes her agony by the moſt hideous howlings.

The amours of theſe animals are ferocious in the extreme: it has not hitherto been well aſcertained how long the tigreſs goes with young, but it is commonly believed to be about the ſame period as the lion: they have about four or five young at each litter.

Among the Chineſe the ſkin of the tiger is held in much higher eſteem than it is by Europeans, and forms an article of dreſs for perſons of particular diſtinctions; and it beſides ſerves as a covering for the ſeats and cuſhions in the houſes of the great, and in their halls of public juſtice. The Indians pretend that the fat of the tiger is an univerſal remedy for all external ailments. The tongue, dried and reduced to powder, is a ſpecific for diſeaſes of the nerves; their eyes have alſo ſome imaginary virtues, and probably many other parts of the animal are alike conſidered as ſovereign remedies for different maladies of the human frame.

Hunting the tiger is a favourite diverſion of the great in the eaſtern parts of the world, and is always conducted with much pomp and ceremony. When the monarch, princes, or nobles hunt the tiger, they are uſually mounted on elephants; and their retinue, conſiſting of hunters and ſoldiers, attend, ſome on horſeback and others on foot. Combats between the tiger and the lion, or the elephant, are alſo, on ſome grand occaſions, the amuſements of thoſe eaſtern nations. They conſider the tiger as a more powerful animal than the elephant, and therefore cover the head of the latter with a kind of ſhield previouſly to the engagement. Sometimes the tiger is matched againſt two elephants at once, inſtead of one, and even then the iſſue may be doubtful from the ſuperior dexterity of the tiger. Tachard has given an account of a battle of this kind at Siam, of which he was an eye-witneſs. The heads, and part of the trunks of the two elephants, were defended from the claws of the tiger by a covering made for the purpoſe. They were placed in the midſt of a large incloſure. One of them was ſuffered to approach the tiger, which was confined by means of cords, and received two or three heavy blows from the trunk of the elephant upon its back, which beat it to the ground, where it lay for ſome time as if it were dead; but though this attack had greatly abated its fury, it was no ſooner untied, than, with a horrible roar, it made a ſpring towards the trunk of the elephant, but which that animal dexterouſly avoided by drawing it up, and, receiving the tiger on his tuſks, threw him up into the air. The other elephant was then allowed to aſſiſt, and after giving it ſeveral heavy blows, would undoubtedly have killed it, if an end had not been put to the combat. Under ſuch reſtraints we cannot be ſurpriſed the reſult was unfavourable to the tiger. We can only be aſtoniſhed at its ſtrength and fierceneſs, that after being diſabled by the firſt attack of the elephant, and whilſt yet held by its cords, it would venture to continue ſuch an unequal conflict.

Tigers are deſtroyed by various means, beſides that of hunting, or combat; divers contrivances, machines, and toils having been invented by the more ingenious tribes of Indians for this purpoſe. One, the moſt ſimple and effectual, ſeems to be that of faſtening an animal to a tree in the known track of the tiger, which they eaſily diſcover by the footſteps, and placing near the ſpot a veſſel filled with water ſaturated with arſenic; the tiger, after devouring its victim, eagerly drinks the water to quench his thirſt, and thus inevitably becomes poiſoned and dies.

Pardus. Tail long; body marked above with orbicular ſpots, beneath with ſtripes. Schreber. *Panthera*, Geſn. *Panthère*, Buff. *Panther*.

Leopardus. Tail moderate; body fuſcous, with nearly contiguous black ſpots. Erxleb. Schreb., &c. *Leopard*, Buff.

The difference between the panther and the leopard is ſo very trivial and ambiguous, that it has been long conſidered doubtful among naturaliſts whether they are in reality ſpecifically diſtinct or not; and indeed it ſeems to be ſo nearly decided of late years that they are the ſame by the beſt writers, that we cannot entirely refuſe our aſſent to this concluſion. The panther is the largeſt of theſe two animals, and in point of ſize ranks next to the tiger, meaſuring about five or ſix, and, in ſome inſtances, ſeven feet, from the noſe to the origin of the tail, and the tail itſelf nearly three feet. The hair is ſhort and ſmooth, and the general colour fine tawny yellow, thickly marked over the upper parts of the body, ſhoulders, and thighs, with roundiſh black ſpots, diſpoſed into circles, conſiſting of four or five ſpots, with ſometimes a ſingle dot in the middle. On the face and legs the ſpots are ſingle. The breaſt and belly are white, the former with duſky tranſverſe ſtripes, the latter, and alſo the tail, with large irregular ſpots of black. The head is moderate in length, the ears pointed, the eyes pale yellow, and its whole aſpect fierce and cruel.—The leopard is about four feet in length from the noſe to the origin of the tail, and the latter about two feet long. The predominant colour is yellowiſh, of a paler hue than that of the panther, and more inclining to luteous; the ſpots with which it is diverſified are alſo black, and diſpoſed in circles, but are ſmaller, cloſer, and leſs diſtinct than in the panther, and the ſpace in the centre of the rings, formed by the diſpoſition of the marginal ſeries of ſpots, is uſually plain. This is the general appearance of the two above-mentioned animals, but they vary in colour, and alſo in the ſize and form of the ſpots, and ocellated marks in different individuals. The ſuppoſed varieties of the panther and leopard, deſcribed by ſome travellers and other writers, cannot be mentioned with implicit confidence; ſuch are the *black leopard*, and *leſſer leopard*.

Both the panther and the leopard abound in the interior of Africa, from Barbary to the remoteſt parts of Guinea, and are the ſcourge of every country they inhabit. The panther, from its ſuperior ſize and ſtrength, attacks the larger quadrupeds, and is extremely deſtructive among the camels and horſes; the leopard commits dreadful havoc among the herds and flocks of goats, ſheep, and other animals, and the different kinds of game.

Theſe animals frequent the banks of rivers, and take their prey by ſurpriſe, either lurking in thickets, from which they dart on them when they approach within a convenient diſtance, or creeping on the belly till they reach their victim: they climb trees in purſuit of monkies and ſmaller animals with perfect eaſe; it is only when preſſed with hunger that they attack man.

Travellers relate that the fleſh of theſe animals is of excellent flavour, and white as veal. The Indians and Negroes eat it, but prefer that of the dog; they however take it in pitfalls for the ſake of the fleſh, as well as the ſkins, which latter ſell for a high price. Collars, bracelets, and other ornaments compoſed of the teeth of theſe animals, alſo conſtitute an article of finery in the dreſs of the negro-women, and are eſteemed the more valuable as charms to repel the power of witchcraft.

Uncia. Tail long; body whitiſh, with irregular black ſpots. Erxleb. *Once*, Buff.

The once is about three feet and a half long from the noſe to the tail, ſtrong, the back long, and the legs ſhort. The hair is long, and of a light grey colour, tinged with yellow, and paler on the breaſt and belly; the head is marked with ſmall round ſpots, with a larger ſpot of black behind each ear; the back is beautifully varied with a number of oval blotches rather darker, and ſurrounded with a margin of black dots; the ſpots on the ſides are more irregular, and thoſe on the legs and thighs ſmall, ſcattered, and few in number; the tail is long, and full of hair, and is irregularly marked with large black ſpots.

This is ſuppoſed to be the panther of Pliny, and the ſmaller panther of Oppian. It inhabits the northern parts of Africa, Perſia, and China, and is ſaid to abound in the Thyrcanean foreſts. The once, according to moſt writers, is trained to the chaſe like the hunting tiger; but it is conjectured that Tavernier, upon whoſe relation this is ſtated, was deceived, and that the animal he means is no other than the felis jubata.

Onca. Tail moderate; body yellowiſh, with black, rotundate, angulate ſpots, yellow in the middle. Schreber. *Pardus aut lynx Braſilienſis, jaguara dictus, Luſitanis onza*, Ray. *Jaguara*, Marcgraf. *American tiger, or jaguar.*

The colour of this animal is bright tawny; the upper part of the head ſtriped with black; the ſides beautifully variegated with irregular oblong ocellar ſpots; the thighs and legs are variegated with black ſpots without central ſpaces; breaſt and belly whitiſh; tail not ſo long as the body, above marked with large black ſpots in an irregular manner, beneath with ſmaller ſpots.

This ſpecies grows to the ſize of the wolf, or larger, and inhabits the hotter parts of America, from the iſthmus of Darien to Buenos Ayres; at Brazil it bears the name of janouara; at Paraguay, and in other parts of South America, it is called yagouarèté.

The jaguar is neither ſo timid, nor ſo indolent as ſome writers have repreſented; it is fierce and deſtructive to man and beaſt: like the tiger it plunges its head into the body of its prey, and ſucks out the blood before it devours the fleſh. It runs ſwiftly, and by means of its talons aſcends the loftieſt and ſmootheſt trees with a facility that is inconceivable, when in purſuit of quadrupeds, that endeavour, by climbing up the trees, to effect their eſcape. The Indians, who are much afraid of this animal, entertain the ſilly perſuaſion that it prefers them to the white inhabitants, who perhaps are better prepared to repel its attacks, and are not therefore ſo often annoyed by it. In travelling through the deſerts of Guiana they light large fires in the night time, to prevent theſe animals from attacking them. The howl of the jaguar is dreadful; their cry plaintive, grave, and ſtrong, like that of the ox. The female is ſuppoſed to produce only two young at a birth.

Pardalis. Tail long; upper part of the body ſtriped, beneath ſpotted. *Felis pardalis*, Schreber. *Ocelot*, Buff. *Mexican cat*, or *ocelot*.

Greatly reſembles the common cat, but is three or four times its ſize, meaſuring in length about four feet, and its height two feet and a half.

In the variety of its markings, as well as colours, the ocelot is extremely beautiful, the male eſpecially. The general colour is bright tawny above, with the breaſt, belly, and lower part of the ſides, together with the limbs, white. A black ſtripe extends from the top of the head, along the back, to the origin of the tail; the forehead is ſpotted with black, as are alſo the legs; the ſhoulders, back, and rump are finely variegated with ovate blotches and interrupted longitudinal bands of a deeper tinge than the ground colour, the edges of which are black; the ſpots are generally marked in the middle with a ſingle ſpot of black, the ſtripes with a ſeries of black dots diſpoſed at nearly an equal diſtance from each other. The tail is diverſified with blotches of an irregular form and black at the tip. In the female the fur is neither ſo vivid in colour, nor ſo beautiful in variety.

The ocelot inhabits the hotter parts of South America, where it inhabits mountainous ſituations, and reſides chiefly among trees, like the lynx, or caracal; it lies in wait upon the boughs concealed among the leaves, and ſeizes its prey by darting on them from its lurking-place, when they approach within a convenient diſtance. Sometimes it ſurpriſes them by ſtratagem, extending itſelf along the boughs, where it can be ſeen as if it were dead, and ſpringing on them when, from natural curioſity, they approach within its reach; monkeys are often caught by the ocelot in this manner. It is ſaid to prefer the blood of animals to their fleſh. Though voracious and fierce, it is of a timid nature, and ſo afraid of dogs that, when purſued by them, it flies to the woods for ſafety. The inhabitants of South America call it chibigouazou.

The ocelot is not uncommon in Paraguay, though, from its manners of life, and the ſecrecy of its retreats, it is ſeldom ſeen; its viſits to the poultry-yards in the farms contiguous to the woods are often aſcertained by its foot-ſteps and the devaſtation committed. The ocelot never leaves its lurking-places in the day time, nor even in the night, when the moon ſhines; it is under the obſcurity of the darkeſt nights, and when the weather is tempeſtuous, that it ventures ſo far as the neighbouring farms in queſt of prey. Each of the retreats of the ocelot appears to be inhabited by a male and female, with their family of young; and though there may be many ocelots in the ſame woods their haunts are ſeparate. They are ſaid to have about two young ones at a litter.

Some years ago a male and female ocelot that had been taken very young were carried to France. At the age of three months they became ſo ſtrong and fierce, as to kill a bitch that was given them to nurſe. When a live cat was thrown to them they ſucked its blood, but would not taſte the fleſh. The male ſeemed to have a great ſuperiority over the female, inſomuch as never to allow her to partake of the food till his own appetite was ſatisfied. In a ſtate of captivity the ocelot has been known to eat about five pounds of meat daily; three or four pounds are the ordinary allowance.

Tigrina. Tail long; body fulvous, ſtriped and ſpotted with black, beneath whitiſh. Erxl. *Felis ex griſeo flaveſcens, maculis nigris variegata*, Briſſ. *Felis fera tigrina*, Barr. *Margay*, Buff.

The margay is conſidered by ſome late continental writers as the ſame animal with the ocelot, in a leſs advanced ſtate of growth; but it appears to be more generally admitted as a variety of that ſpecies. It is a native of Guiana, Brazil, and various other parts of South America. In point of ſize it reſembles the common wild cat. The ground colour is bright tawny; the face ſtriped downwards with black; the body is marked with ſtripes and ſpots of black; the breaſt and inſide of the legs white, with black ſpots; tail long, and marked with alternate ſpots of black, tawny and grey. Like the ocelot it lives in woody ſituations, chiefly reſiding in trees, and is ſaid to breed in the hollows of them. It is of a fierce diſpoſition, preys on birds, and produces two young at a birth.

Jubata. Tail moderate; body fulvous, with black ſpots; neck maned. Schreber. Erxl. *Tyger-wolf*, Kolbe. *Guepard*, Buff. *Maned*, or *hunting leopard*.

This animal is about the ſize of a greyhound, the uſual length being about three feet and a half; the head is ſmall, the body long, the ears ſhort, and the tail about twenty inches. The body is of a light tawny brown above, marked with ſmall round black ſpots, which are ſcattered over the back, ſides, head, and legs; the belly is white, and the tail marked on the upper ſide with three large black ſpots. In ſeveral of the above particulars this animal agrees with others of the cat or tiger kind, but that by which it may be at once diſtinguiſhed from every other of the ſame tribe is the mane on the collar and between the ſhoulder, a character no other animal of this genus is known to poſſeſs; the hairs which conſtitute the mane are about five inches long, and ſufficiently copious to be diſtinguiſhed.

The ſpecies of tiger, or leopard, which the Indians train for the purpoſe of hunting the antelope and other beaſts of chaſe, has been deſcribed ſo vaguely, and under ſuch diſſimilar names, that we cannot ſpeak preciſely, but it is preſumed the animal intended muſt be of this kind. The hunting tiger, according to the reports of travellers, is carried in a ſmall kind of waggon, chained and hoodwinked, till it approaches the herd, when the animal is unchained and ſuffered to purſue the game. At firſt it creeps along with its belly cloſe to the ground, ſtopping and concealing itſelf till it gets an advantageous ſituation; it then darts towards its prey with amazing agility, and, after five or ſix bounds, ſeizes it, and brings it to the ground. Should it not ſucceed in the firſt effort, it ſhews no inclination to renew the attempt, but gives up the point and returns to its maſter.

Concolor. Tail long; body fulvous, without ſpots; beneath whitiſh. *Felis concolor*, Schreb. *Felis ex flavo rubeſcens, mento et infimo ventre albicantibus*, Briſſ. *Puma ſ. leo Americanus*, Hernand. *Cuguacuerana*, Marcgr. *Cougouar*, Buff.

The puma, or cougouar, is ſometimes called the American lion. It is the largeſt of the beaſts of prey known to inhabit the new continent, meaſuring in length rather more than five feet from the noſe to the tail, and the tail itſelf meaſuring two feet eight inches. The form is ſlender, the body being long, and the animal ſtanding high on his legs. The predominant colour is pale browniſh red, inclining in ſome parts to blackiſh, eſpecially on the back, which is darkeſt. Its chin is white; breaſt and belly tinged with aſh-colour, as are likewiſe the inſides of the legs; the tail inclines to duſky ferruginous, with the tip black.

This is an animal of great ſtrength and fierceneſs, preying on cattle and deer, to attack which it will ſwim rivers, and burſt through the bounds of incloſures. Sometimes it is ſaid to climb trees, and watch the opportunity of ſpringing on ſuch animals as paſs beneath. The ſpecies is common in Guiana, Brazil, and Mexico, and is found in various parts of North America, from Canada to Florida.

Notwithſtanding its ferocity, the couguar, when brought into captivity, is allowed to become almoſt as gentle as the common cat, allowing itſelf to be careſſed, and permitting boys to mount on its back. When ſatisfied with eating, it conceals the reſt of its food; purs like the cat, and ſometimes howls dreadfully. The fleſh of this animal is white, and is eaten by the American Indians, who eſteem it excellent food. The fur is ſoft, and forms an article of winter clothing amongſt theſe people.

Discolor. Tail long; body above black, beneath whitiſh. *Felis diſcolor*, Schreber. *Felis nigra*, Erxl. *Le cougouar noir*, Buff. *Jaguar, or black tiger*, Penn.

This inhabits the ſame parts of America as the former, and reſembles it pretty nearly, except in colour, which is duſky, and in general plain. The throat, belly, and inſide of the legs are pale aſh; the upper lip white, and furniſhed with long whiſkers, and the eye-brows beſet with long hairs; at each corner of the mouth is a black ſpot; the ears are ſharp-pointed, and the paws white. The tail is of the ſame colour with the reſt of the body.

The black tiger is a cruel and ferocious creature, and greatly dreaded by the Indians, but is fortunately not common; it grows to the ſize of an heifer of a year old, and is remarkable for its ſtrength; its form, like that of the puma, is rather ſlender. M. De la Borde relates of the black tigers that they frequent the ſea ſhore, and eat the eggs depoſited there by the turtles. They alſo devour alligators, lizards, and fiſhes, and ſometimes the buds and tender leaves of the Indian fig. They are excellent ſwimmers. In order to catch the alligator, according to this writer, they lie down on their belly at the edge of the river, ſtrike the water to make a noiſe, and immediately that the alligator raiſes its head above the water, the tiger darts his claws into the eyes, and drags it on ſhore.

Catus. Tail long and annulated. Gmel. *F. catus; cauda elongata, auribus æqualibus*, Linn. Fn. Suec. 3.

The wild cat (ferus) is diſtinguiſhed from the varieties of the domeſtic cat by the ſuperiority of its ſize, meaſuring four or even almoſt five feet in length from the muzzle to the end of the tail. It is comparatively more robuſt, and poſſeſſed of far greater ſtrength and ſpirit. The head is larger, and the face flatter; the teeth and claws more formidable; and the colours and ſtripes in general nearly uniform. The fur is grey, mixed with yellowiſh, and ſometimes ſlightly tinged with tawny. A dark liſt extends along the back, from the head to the origin of the tail, and the back, ſides, and flanks traverſed with a number of blackiſh lines, which originating in the longitudinal dorſal line, point downwards, in nearly a perpendicular direction towards the belly, like the ſtreaks in the fur of the tiger. The tail is thick, and marked with alternate bars of black and whitiſh grey, and the middle of the throat and breaſt, and the lower part of the belly, are uſually of the ſame colour.

Cats are found in a ſtate of wildneſs in many of the foreſts of Germany, and, from the nature of its haunts, acquired among the old writers the names of felis ſylveſtris, and catus ſylveſtris. Some writers affirm that the wild cat, which may be truly conſidered as the parent ſtock of our domeſtic cats, is confined to the woods of Europe and Aſia. Others aſſert that wild cats are found with very little variety in almoſt every climate; they exiſted, according to thoſe authors, in America before its diſcovery by the Europeans, and it is advanced in argument, that one was brought to Columbus, which was of the ordinary ſize, and of a browniſh grey colour, with a long tail. It is alſo concluded to be a native of Africa, as Sparrman deſcribes one ſhot at the cape, which, he ſays, was ſimilar in every reſpect to thoſe of Europe; this was of a grey colour; and meaſured from the noſe to the tail almoſt twenty-two inches; the tail was thirteen inches long, and its height about a foot and a half. Its inteſtines were full of moles and rats.

In this country the wild cat is the largeſt and moſt deſtructive beaſt of prey extant, if we except the fox; the bear and the wolf, which in early times infeſted our woods, being wholly extirpated. Formerly the wild cat was abundant in our foreſts; and were conſidered among the beaſts of chaſe, as appears by a charter of Richard II. to the abbot of Peterborough, which grants him permiſſion to hunt the hare, fox, and wild cat. This animal was hunted chiefly for the ſport it afforded, the fleſh being uſeleſs, and the ſkin bearing an inferior price; at leaſt it was not eſteemed of the moſt luxurious kind, for it was ordained that no abbeſs or nun ſhould uſe more coſtly apparel than ſuch as was made of lamb's or cat's ſkins. The wild cat is now become rare in Britain, one was killed ſome years ago in Cumberland, and another in Warwickſhire, which latter is in the collection of Mr. Donovan. In the Hebrides, and the north of Scotland, the wild cat is ſuppoſed to be more frequent than in South Britain. They are taken in traps, or by ſhooting.

It prefers woods in mountainous ſituations, and living on trees, preys on birds and the ſmaller quadrupeds, ſuch as rats, mice, bats, and ſquirrels; it alſo purſues rabbits and hares, makes great havoc among poultry, and will even kill young lambs, kids, and fawns. It is dangerous in the chaſe of thoſe animals to wound them ſlightly, for they defend themſelves with great ſpirit, attack the dogs with fury, and even faſten on the ſportſman, and, from the ſtrength of their talons and teeth, can prove themſelves no deſpicable enemies.

The common domeſtic cat, catus domeſticus of the Linnæan ſyſtem, felis vel catus of Geſner, and felis domeſtica of Briſſon and Jonſton, derives its origin from the former, and is ſo infinitely varied in its appearance from culture and domeſtication, as to baffle all deſcription. Schreber diſtinguiſhes the domeſtic kind from that exiſting in a ſtate of wildneſs, by its ſmaller ſize, and the comparative ſhortneſs as well as thickneſs of the hair. Among the principal varieties of the domeſtic cat, we may mention thoſe entirely black, or black with white ſpots. White without ſpots or variation; white with black ſpots; white with brown ſpots. Dun or grey, plain or with little variation; or greyiſh, with darker ſtripes, which laſt approaches neareſt in appearance to the parent ſtock. There are alſo many varieties ſpotted with white, black, and fulvous, occaſioned by croſſing the breed of the common with the Spaniſh or tortoiſe-ſhell cat, which latter is ſuppoſed by naturaliſts to conſtitute a diſtinct breed, though not ſpecifically different from our domeſtic cat.

We can add nothing to the general hiſtory of an animal ſo fully deſcribed as the preſent ſpecies, and whoſe manners of life are familiar to every reader. It is repreſented as an uſeful but deceitful domeſtic. Although when young it is playful and gay, it poſſeſſes at the ſame time an innate malice and perverſe diſpoſition, which increaſes as it advances to maturity, and which education inſtructs it to conceal, but not to ſubdue. Conſtantly bent upon theft and rapine, though in a domeſtic ſtate, they are full of cunning and diſſimulation; they conceal all their deſigns, ſeize every opportunity of doing miſchief, and then, ſenſible of their miſconduct, fly from puniſhment. Thus they aſſume, it is ſaid, the habits of ſociety, but never its manners; for they have only the appearance of friendſhip and attachment. Nothing can be more illiberal, however, and oftentimes more unfounded, than general obſervations. We are too apt to deduce unlimited inferences from certain traits in particular individuals, or which may be evinced under peculiar circumſtances, and thus eſtabliſh the character of a whole race of animals from the moſt partial views. In ſome degree the reproach attached to the character of the cat from its want of gratitude and attachment to its benefactors may be true, but ſurely not to the extent deſcribed; and we are to conſider, alſo, that the treatment or the inſtruction this animal receives is not always of ſuch a nature as to excite attachment. We beſtow chaſtiſement, and expect fondneſs in return; we betray apathy, and require affection; or we deſire gratitude for favours which are not worthy of that ſentiment; and that without reflecting that the cat is of all others the moſt unreſtrained of our domeſtics; one of thoſe inmates which, even under our own roofs, leads a life of independence, and is careſſed and admired only in proportion as ſhe exhibits thoſe proofs of ferocity towards the minor race of animals, which inſpires her with the worſt paſſions of her race, a love of carnage, cruelty, and unrelenting vengeance; a propenſity to deſtroy all creatures ſhe has the ſtrength and addreſs to overcome. Thus early inured to habits of rapine, ſhe becomes the tyrant of her inferiors, while to larger animals, and to man, ſhe owns obedience, rather becauſe ſhe is ſenſible of her own weakneſs, and looks up to them for protection, than from any tie of friendſhip or regard. The hand that miniſters to her wants and ſupplies her food ſhe may reſpect; few of the moſt ferocious beaſts of prey are deſtitute of this attachment, and none reduced by culture to domeſtication. Thus reared and tutored, we inſtruct her to be rapacious when ſhe can conquer; we teach her to be deceitful towards thoſe ſhe cannot overcome; and then accuſe her of diſſimulation becauſe ſhe profits by our inſtruction. The ingenious Sonnini, overlooking thoſe propenſities of the cat inherent in her nature, or imbibed from culture, is anxious to place this animal in its moſt amiable point of view; his reflections are juſt, but we are to remember that it is ferocity, at leaſt to a certain extent, and not mildneſs, that befits the cat for that ſtation in ſociety which it is deſtined to fulfil; and that thoſe traits of character, which alone conſtitute its value as a domeſtic, at the ſame time that they cannot fail to render it rapacious and deceitful, ought ſurely not to have been forgotten in deſcribing the diſpoſition of this valuable animal. "The cats," ſays Sonnini, in ſpeaking of thoſe found in Egypt, "are gentle and familiar; they have no diſtruſt of man, the ferocious character, which, in ſome parts of France, render them a race of animals rather wild than domeſtic: but theſe differences are as much the work of man as the effect of climate. In the department where I live, and in thoſe adjacent, the cat, eſpecially in the country, is the moſt miſerable of beings, next to the horſes ſet apart for huſbandry. Maſters and ſervants agree in hunting the cat, in beating her, in pelting her with ſtones, in worrying her to death by dogs, after having almoſt ſtarved her to death. If hunger, which her leanneſs clearly witneſſes, incites her to ſpy the moment for ſtealing a little morſel, the pretended thief, becauſe nature would not ſuffer her to let herſelf die of abſolute want, pays with her life the addreſs ſhe has employed to ſupport it. How is it poſſible that cats ſhould not aſſume, under the diſcipline of ſuch maſters, whoſe cruelty to animals borders on barbarity, a wildneſs of phyſiognomy, an impreſs of ferociouſneſs? And if you compare thoſe wretched cats of my country with ſuch as are entertained at Paris, where, more kindly treated and ſheltered from perpetual alarm, they are of an amiable familiarity, you will have a new proof of the influence which the character of man exerciſes over that of the brute creation."

The cat brings forth twice or ſometimes thrice in the courſe of the year. She goes with young about fifty-five or fifty-ſix days, and produces five or ſix young at each litter. The female exhibits every degree of maternal tenderneſs for her young, and often conceals them, leſt the male, as is ſometimes the caſe, ſhould devour them; and, if apprehenſive of being diſturbed, ſhe will remove them, one by one, in her mouth, to ſome other place of greater ſecurity.

Cats are in particular attached to the place where they were brought up, and if carried elſewhere ſeem loſt and bewildered, and frequently take the firſt opportunity of eſcaping to their former haunts. Theſe animals have been known to return to the place from whence they were carried, though at miles diſtant, and though they could not poſſibly have any knowledge of the road or ſituation that would lead to it.

This animal is about eighteen months before it acquires its full growth, and about ten years is the uſual period of its life; ſome remarkable inſtances of longevity are, however, recorded, cats having lived to the age of twenty years, or more. It is generally remarked, that cats can ſee in the dark, which is not abſolutely true, yet it is certain that they can ſee with much leſs light than moſt other animals, owing to the peculiar ſtructure of the eye, the pupil of which is capable of being contracted or dilated in proportion to the degree of light by which they are affected. During the day the pupil of the eye is perpetually contracted; and it is with difficulty that it can ſee by a ſtrong light, but, as in the twilight, the pupil reſumes its natural roundneſs, the animal enjoys perfect viſion, and takes advantage of this ſuperiority to diſcover and ſurpriſe its prey. The cry of the cat is loud, piercing, and clamorous; and, whether expreſſive of anger or of love, is equally violent and hideous. When pleaſed the cat purs and moves its tail: when angry ſpits, hiſſes, growls, and ſtrikes with its feet, it is alſo ſaid to emit a fœtid ſmell at ſuch times, and climb with great agility. In hunting and ſeizing its prey, the cat exhibits all the actions of the tiger, lying in wait, crawling on the belly, wagging the tail when preparing for its leap, and bounding on it when within a convenient diſtance. The cat is averſe to water, cold, and unpleaſant ſmells; it delights in certain perfumes, and is in particular partial to the aromatic emanations of the valerian, marum, and cat-mint, and, if not prevented, would infallibly deſtroy the plants of this kind, growing in gardens, by rubbing itſelf againſt them, and trampling over them. The cat drinks ſparingly; eats fleſh and fiſh, the latter of which it prefers, and ſeldom eats vegetables, unleſs preſſed with hunger. It is proverbial, that the cat waſhes behind its ears before a ſtorm; that when it falls from a height it alights on the feet, and that it is tenacious of life. The eyes have a ſomewhat phoſphoreſcent or ſparkling appearance in the duſk; and the hair being dry emits an electric fire which is viſible in the dark: the fur is indeed ſaid to yield the electric ſparks ſo readily, that if, in froſty weather, a cat be placed on a ſtool with glaſs feet, and rubbed for a certain time, in contact with the wire of a coated phial, the latter will become effectually charged by that means.

In the days of Howel Dda, or Howel the Good, who reigned a ſhort time before the Norman conqueſt, the domeſtic cat was valued at a conſiderable price, both on account of its ſcarcity and utility, and its life protected by law. The price of the kitten, before it could ſee, was to be a penny; till proof could be given of its having caught a mouſe, two-pence, after which it was rated at four-pence, a great ſum in thoſe times: it was, however, required, that it ſhould be a good mouſer, have its claws whole, and, if a female, be a careful nurſe; but if it failed in any one of theſe good qualities the ſeller was to forfeit a third part of its value. If any one ſhould ſteal or kill the cat that guarded the prince's granary, he was either to forfeit a milch ewe, her fleece and lamb, or as much wheat as, when poured on the cat ſuſpended by the tail (its head touching the floor), would form a heap high enough to cover the tip of the former.

The cat was held in high veneration by the ancient Egyptians. When a cat died in a houſe, the owner of the houſe, Herodotus informs us, ſhaved his eye-brows; they carried the cats when dead into conſecrated houſes to be embalmed, and interred them at Bubaſtis, a conſiderable city of Lower Egypt. If any killed a cat, though by accident, he could not eſcape death. Theſe laws were politically uſeful; it was neceſſary to put under the immediate protection of the laws a ſpecies of animals whoſe protection was indiſpenſable againſt the prodigious multitudes of rats and mice with which Egypt was infeſted, and the moſt effectual means of procuring reſpect for them was to render them objects of deification. Cats, no longer regarded ſacred in Egypt, are nevertheleſs to this day treated with the utmoſt care in that country, and are to be found in all the houſes. The cats are trained in ſome of the Grecian iſlands to attack and deſtroy ſerpents, with which thoſe iſlands abound.

The following are conſidered as permanent varieties, or diſtinct breeds, of the common cat ſpecies, felis catus.

Angora cat, the hair of which is ſilvery-white, ſilky, and long, that ſurrounding the neck longeſt. This is the moſt beautiful of all the varieties; its noſe and edges of the lips are fine roſe colour; the eyes in general blue or yellow, and of a ſparkling brilliancy, and its whole aſpect mild and compoſed. The hair is of a dazzling whiteneſs, remarkably thick and long, and the tail, when elevated above the body, forming a beautiful plume. Angora, the place celebrated for this race of cats, is in Aſia Minor, not far from Smyrna; the camlets manufactured with the hair of this animal is celebrated for its beauty and fineneſs throughout Aſia.

Tortoiſe-ſhell cat, *Hiſpanicus*, Gmel. *Chat d'Eſpagne*, Buff. is black, varied with white and orange.

Blue cat, *cæruleus*, Gmel. *Chat des Chartreux*, Buff. *Blaue kaze*, Kolbe. The hair of this is blue-grey. It was originally a native of Ruſſia, from whence it has been diſperſed, and cultivated in various parts of Siberia.

Red cat, *ruber*, Gmel. *Rothe kaze*, Kolben. This is diſtinguiſhed by having a ſtreak of bright red running along the ridge of the back to the tail, and loſing itſelf in the grey and white on the ſides. It is found at the Cape, and the ſkin is much valued from a ſingular idea the coloniſts entertain that it affords eaſe in the gout.

Japan cat, *Chat ſauvage Indien*, Voſmaer. This is deſcribed as being about the ſize of the common cat, and has a tail ten inches and a half long; the ears are upright and pointed; colour of the face and lower part of the neck whitiſh; breaſt and lower belly clear grey, mixed with black, diſpoſed in tranſverſe ſtreaks. Along the back is a broad band of black, which extends over the upper part of the tail; the lower part is ſemi-annulated with black and grey. Its cry is ſaid to reſemble the mewing of a great cat.

Guiana cat, Penn. *Felis Guigna*, Molin. According to Molina this is a native of Chili, and is the ſize of the common cat. Its haunts are inacceſſible foreſts. The colour is tawny, marked with round black ſpots, rather leſs than half an inch in diameter, and extending the whole length of the back cloſe to the tail. The head in this and the following is rather larger in proportion than in the common cat.

Corololo-cat. *Felis Corololo*, Molin. Like the former this inhabits foreſts, and preys on mice and birds. The colour is white, marked with irregular ſpots of black and yellow, and the tail encircled with black to the tip. Tail rather larger in proportion than in the common cat.

We cannot conclude this enumeration of the varieties of the common cat without obſerving, that it is extremely probable, when the three laſt mentioned animals become better underſtood, they may be found ſpecifically diſtinct; whether alſo the variety ſaid to occur in China, which has pendulous ears, and fur variegated with black and yellow; and the Madagaſcar cat with twiſted tail, be of the ſame ſpecies with the common cat, ſeems rather undetermined. The felis manul of Gmelin appears, on the contrary, to be no other than a variety of the common cat.

MANUL. Tail elongated, and annulated with black; head ſpotted with black, and marked with two lateral black bands. Pallas.

Inhabits the waſtes of Tartary and northern Aſia. Its ſize is that of the fox, but its form is more robuſt in proportion. The colour is tawny; the cheeks with two duſky lines running obliquely from the eyes; the feet are obſcurely ſtriped with dark lines; the tail longer than that of the domeſtic cat, thickly beſet with hair, and encircled with ten diſtinct black rings, three of which neareſt the tip are placed ſo contiguous as almoſt to touch each other. This is conſidered as a variety of the common wild cat, felis catus.

CAPENSIS. Tail rather long, and annulated with black; body fulvous, with ſtripes above, and ſpots beneath black; ears naked with a lunated white ſpot.—*Felis capenſis*, Gmel. *Felis tigrina capenſis*, Forſt. Act. Angl. v. 71. *Cape tiger*, Penn.

This animal appears to be of the ſame as that deſcribed by Labat under the name of 'Nnuſſi, and which he ſtates to be the ſize of a dog, with a coat as much ſtriped and varied as that of a tiger. Its appearance he tells us beſpeaks cruelty, and its eyes fierceneſs; but it is cowardly, and gets its prey only by cunning and inſidious arts. When Dr. Forſter touched the ſecond time at the Cape of Good Hope, namely, in 1775, an animal of this ſpecies was offered to him for ſale, but this he declined, becauſe he was apprehenſive, as one of the legs was broken, it would not live till they reached England. It was brought in a baſket to his apartment, where it remained about twenty four hours, and this allowed him ſufficient time to deſcribe it with greater accuracy than had been previouſly done, and in ſome degree of obſerving its manners and economy. Theſe he found to be perfectly analogous to thoſe of our domeſtic cats. It ate freſh meat raw, and was very much attached to its feeders and benefactors: though it had broke the fore-leg by accident it was very eaſy. After it had been ſeveral times fed by Dr. Forſter it followed him like the common cat. It was pleaſed when careſſed, and, in token of its gratification, rubbed its head and back againſt the clothes of the perſon who fed it, and purred at the ſame time like the domeſtic cat. This animal had been taken when quite young, and was not above eight or nine months old when deſcribed, yet it had nearly, if not entirely, attained to its full ſize. Dr. Forſter was told that the ſpecies lives in the mountainous and woody tracts; and that in their wild ſtate they are highly deſtructive to the hares, rabbits, jerboas, young antelopes, lambkins, and the whole of the feathered race. This animal is fully deſcribed in the 71ſt volume of the Philoſophical Tranſactions.

CHAUS. Tail moderate; annulate near the tip, which is black; body browniſh yellow; ears brown on the outſide, and bearded with black at the tip. Guldenſt. *Caſpian lynx*, Penn.

Reſembles the wild cat in manners, voice, and food. Its general length is about two feet ſix inches from the noſe to the tail, though in ſome inſtances it has been known to meaſure three feet. The prevailing colour is yellowiſh brown, with the breaſt and belly much brighter, or more inclining to orange colour; the tail reaches only to the flexure of the legs, and, beſides the black tip, has three obſcure black bands at ſome diſtance from it; and on the inſide of the legs near the bend of the knee are two duſky bars; the tufts at the extremity of the ears are black.

The ſpecies was firſt deſcribed by Guldenſtedt in the Tranſactions of the Royal Society of Peterſburgh; it is found in the woods and marſhy tracts on the borders of the weſtern ſide of the Caſpian ſea, and in the Perſian provinces of Ghilan and Maſenderan, and is frequent about the mouth of the Kur, the ancient Cyrus.

SERVAL. Tail rather ſhort; body marked above with roundiſh duſky ſpots; orbits of the eyes and belly white. Erxl. *Le ſerval*, Buff. *Chat-pard*, Perrault.

An animal much reſembling the lynx in form, but ſmaller, the ears are alſo deſtitute of that tuft of hair ſo conſpicuous at the tip in the lynx, and the tail is, comparatively to the general ſize of the animal, rather ſmaller. The ſpecimen deſcribed by the French academicians meaſured two feet and a half from the noſe to the tail, and the latter was eight inches long. The colour on the head, back, and ſides are fawn colour, the throat, belly, and inſides of the legs white, and the whole ſurface is covered with ſmall, but very diſtinct ſpots of black, which are not diſpoſed in roſes like the ſpots on the panther, but ſeparate. As in the lynx the head is large, the feet alſo are ſtrong and thick, and the eyes brilliant.

The ſerval inhabits the mountainous parts of India and Thibet, where it reſides chiefly among trees, from which it rarely deſcends, but, feeding on birds, purſues them by leaping among the branches, or from one tree to another. In its diſpoſition it is extremely fierce, but avoids mankind unleſs provoked, when it darts furiouſly upon the offender, and tears and bites in the ſame manner as the panther. The provincial name of this animal among the natives of Malabar is maraputa; the Portugueſe eſtabliſhed on that coaſt call it ſerval.

CARACAL. Tail rather ſhort, and with the body reddiſh brown; ears outwards black, tip black and bearded. *Siyah-ghuſh*, Charleton. *Lynx cauda vitulina*, Klein. *Caracal*, Buffon. *Perſian cat*, Penn. *Perſian lynx.*

The caracal, or Perſian lynx, reſembles the common lynx in figure and aſpect, and nearly correſponds in ſize. It differs from that animal in not being ſpotted; its hair is rougher, and its colour diſſimilar; the tail longer, and of an uniform colour with the reſt of the body; its face is of a more lengthened form, and its diſpoſition more ferocious. The ſpecies inhabits only the warmer climates, and is common in Perſia, India, Barbary, and other parts of Aſia and Africa. In the Perſian language it is called ſyah-guſh, and in the Turkiſh karrah-kulak, both which ſignify the cat with black ears. The caracal is ſaid to follow the lion, and to feed on the remains which that animal leaves of its prey, and for this reaſon it is called among the Arabs the *lion's guide*. Its height is about that of the common fox, but is ſtronger and more robuſt; and Dr. Charleton mentions one which killed a hound, and tore it inſtantly in pieces, notwithſtanding the vigorous defence of the latter.

This animal, though tamed with extreme difficulty, when taken young, and reared with great caution, may be trained for the chaſe. It is employed with ſucceſs in the purſuit of the ſmaller tribes of quadrupeds, but it is ſaid, whenever it meets with one that is ſuperior to it in ſtrength, that it loſes its courage and gives up the chaſe. Herons, cranes, pelicans, peacocks, and others of the larger kinds of birds, it takes by ſurpriſe, and overcomes with ſingular addreſs. When it has ſeized its prey, it holds it faſt in its mouth, and lies upon it ſome time motionleſs.

There are ſeveral varieties of the caracal, according to different authors. The caracal of Barbary, deſcribed by Buffon on the authority of Mr. Bruce, has the ears red on the outſide inſtead of black; the tufts on the ears are black, the tail white at the tip, annulated with four black rings, and ſome black marks behind the legs. It is the animal which Mr. Bruce names the booted lynx, and is moſt probably ſpecifically diſtinct. Another ſuppoſed variety inhabits Bengal, and has the tail as long as the legs; and a third the tail white, with four black rings at the extremity, the firſt of the two laſt mentioned is perhaps a diſtinct ſpecies.

RUFA. Tail rather ſhort, beneath and at the tip white, above banded with black; body tawny ſpotted with brown; ears bearded at the tip. Schreber. *Bay cat*, Penn.

Twice the ſize of the common cat; its colours a bright bay, obſcurely marked with ſmall duſky ſpots; the lips, throat, and whole underſide of the body and limbs white. From beneath each eye three curved blackiſh ſtripes paſs down the cheeks, and the upper part of the inſide of the fore legs is marked with two black bars. The hair is ſhorter and ſmoother than that of the common lynx, and the ſpecies inhabits America.

LYNX. Tail obſcurely annulated, and black at the tip; head and body whitiſh-tawny ſpotted with black; ears bearded at the tip. Schreber. *Pinuum daſypus*, Nieremb. *Lynx*, Aldr. *Le lynx*, Buff.

The lynx is about the ſize of the fox, or of a middling dog. The colour varies, but is generally of a pale-grey, with a very ſlight reddiſh tinge; the back and whole of the upper parts obſcurely ſpotted with blackiſh or duſky; tail white, with the tip and rings black. The throat, breaſt, and belly are white; and the fur remarkably thick and ſoft. The eyes are of a pale yellow colour, and its whole aſpect milder than that of the panther or once.

Writers deſcribe ſeveral ſuppoſed varieties of this animal, one of which is white with dark ſpots, another yellowiſh-white above, and beneath white with duſky ſpots, and a third correſponding with the latter, but marked with ſpots ſtill more diſtinct. The ſpecies is ſo generally diffuſed throughout Europe and Aſia, and inhabits ſuch various climates, that we are not to be aſtoniſhed that ſuch varieties ſhould exiſt. The true lynx is found in the great foreſts in the north of Germany, in Lithuania, Muſcovy, Siberia, and the northern parts of the old continent; but it admits of conſiderable doubt whether it inhabits ſouthern Aſia. The lynx of the Levant, Barbary, Arabia, and other hot countries, is certainly the caracal, and the fur of this is known by being deſtitute of ſpots.

In the muſeum of natural hiſtory in Paris, is a preſerved ſpecimen of an animal called "Le lynx du Canada," a ſuppoſed variety of the common lynx; its length is two feet three inches from the noſe to the extremity of the body, and its height twelve or thirteen inches. The hair is long, greyiſh mixed with white hairs, and is ſpotted like the European lynx, but differs in the length of the tail, and the tuft of hair on the ears being ſmaller. There is another lynx in Miſſiſſipi, which has the tuft at the extremity of the ears ſmaller than that laſt mentioned, the tail more flocky, and the hair clearer in colour. In thoſe northern climates however, where the viciſſitudes of the ſeaſons are ſo ſeverely experienced, it is to be conſidered that the fur of animals vary in colour according to the ſeaſon. Thus the winter furs are exceedingly different from thoſe of ſummer in all the animals that inhabit the north of America, or Europe. The fur of the American lynxes is moſt beautiful in winter, and bears a higher price than thoſe of ſummer, and it is not only on account of their beauty theſe are preferred, they are more valuable for their ſoftneſs and warmth. The ſame may be obſerved of northern Europe and Aſia. The farther they are taken to the northward the whiter is the fur, and the ſpots more diſtinct. The moſt elegant of theſe are called *irbys*, and is taken near the lake Balkaſh, in Uſbec Tartary. It is larger than the European lynx, meaſuring five feet from the noſe to the tip of the tail, of which the tail meaſures about ſix inches. The ſkin ſells in that country for about twenty ſhillings ſterling. Vaſt numbers of theſe ſkins are exported annually to China and Europe.

The lynx is a very deſtructive animal. It feeds on weaſels, ermines, ſquirrels, and other ſmall quadrupeds, which it purſues to the tops of the higheſt trees. The lynx alſo watches the approach of larger animals, as the hare and even the deer, and darts upon them from the branches of trees where it lies concealed, ſeizes them by the throat, and ſucks their blood; after which it abandons them and goes in queſt of other game. It often eats no more of the ſheep or the goat than the brain, the liver, and the inteſtines. The ſight of this animal is remarkably quick, which enables it to diſcern its prey at a great diſtance, and it is ſo artful, that it will ſometimes dig under the doors to gain admiſſion into the ſheep-fold. When attacked it throws itſelf on its back, and ſtrikes deſperately with its claws. The howl of the lynx is not unlike that of the wolf, and it frequently expreſſes its malignity by a kind of ſnarling ſcream. From the ferocity of its nature the lynx cannot be tamed.

The poetical fictions of the ancients reſpecting this animal are not unknown; they feigned that the chariot of Bacchus was drawn by lynxes; that its ſight was ſo penetrating that it could ſee through the moſt opaque bodies, and that its urine was converted into precious ſtone. Pliny confounds the lynx with the once, and ſpeaks of it as a native of Ethiopia: the ſame writer, however, in another part, ſeems to have known the true lynx of the moderns, and informs us, the firſt lynx that was ſeen at Rome was brought from Gaul, which country might at that time produce this animal, as the Alps and Pyrenées were known to have done at a later period.

FELIX I. in *Biography*, pope, and a ſaint in the Roman calendar, was born at Rome, and ſucceeded in the pontificate in the year 269. Little more is known of this pontiff than that he reigned, and in his time a perſecution was commenced by Aurelian againſt the Chriſtians, to which, it has been ſuppoſed, that Felix fell a ſacrifice, after he had filled the papal chair between five and ſix years. In the third volume of the "Collectio Conciliorum" is a fragment of a letter which this pope wrote to Maximus, biſhop of Alexandria, againſt the tenets of Sabellius and Paul of Samoſata, and which was read in the councils of Chalcedon and Epheſus. Moreri.

Felix II. pope, though by ſome writers denominated anti-pope, was a native of Rome, and archdeacon of that church when pope Liberius was baniſhed by the emperor Conſtantius in the year 355. At this time the emperor and the Arian party were determined to place in the Roman ſee a perſon more favourable to the meaſures which they had adopted againſt Athanaſius than Liberius, who had refuſed to ſign his condemnation; they fixed upon Felix for that ſtation. This excited much diſcontent, which kindled into inſurrection; and the emperor recalled Liberius on the condition that he ſhould jointly, with Felix, preſide over the ſee. The people were ſtill indignant, and joined in general acclamation, "There is but one God, one Chriſt, one biſhop;" and as ſoon as Liberius returned, they drove Felix out of the city with every mark of deteſtation. Upon being expelled from the city, to which the emperor in the ſequel conſented, he withdrew to a ſmall eſtate, which he had on the road to Porto, and there ſpent the remainder of his life in retirement. He died in 365. Many centuries after his death it was a ſubject of warm and even fierce contention, whether he was to be conſidered as a pope or not; and, in 1582, it was determined by pope Gregory XIII. that the cauſe of this pope ſhould be ſolemnly tried, when, with the aid of a well concerted miracle, it was agreed that his title was valid. Moreri.

Felix III. pope, was ſon of a preſbyter at Rome, and is thought to be the great grandfather of pope Gregory, ſurnamed the Great. He was elevated to the papal throne in the year 483, when he was choſen ſucceſſor to Simplicius, by the unanimous vote of the people, clergy, and ſenate. He had not been long called to this high office before he found an opportunity, of which he was very deſirous, of attempting to extend the influence of the Roman ſee over the eaſtern churches. Legates were accordingly diſpatched for this purpoſe, who carried letters to Zeno the emperor, and Acacius the patriarch of Conſtantinople, conjuring them, as they valued the ſalvation of their ſouls, not to ſuffer a heretic to ſit in the ſee of St. Mark. They had orders alſo to cite the patriarch to appear in perſon, or by proxy to juſtify his conduct in an aſſembly of biſhops before St. Peter. With theſe inſtructions they ſet ſail for Conſtantinople; but when they had arrived at Abydus on the Helleſpont, they were arreſted by order of the emperor, and thrown into priſon, where they were harſhly treated and threatened with death, as diſturbers of the public peace. They were at length ſuffered to depart, bringing back letters from the emperor and Acacius to the pope in juſtification of their own proceedings. Felix immediately aſſembled a council of Italian biſhops, by whom the legates were declared to have behaved in a manner highly prejudicial to the Catholic cauſe in the Eaſt, and to be unworthy of the epiſcopal dignity. Felix next engaged the council to undertake the trial and condemnation of Acacius. The pope, on this occaſion, aſſumed an authority, when promulgating the ſentence pronounced againſt him, for which, it is ſaid, there is no precedent in church hiſtory. That ſentence the pope tranſmitted to the emperor and clergy, enjoining them to ſubmit to the ſacred laws of the church, and adding, that they muſt renounce Peter Mongus, the heretic before referred to, who had been countenanced by Acacius in oppoſition to Talaia, the depoſed patriarch of Alexandria, or that of the apoſtle Peter. The ſame ſentence was conveyed to Acacius, who treated the pope and his anathemas with the utmoſt contempt, and in turn anathematized him, cutting him off from his communion, and ordering his name to be ſtruck out of the ſacred diptychs. This conduct of Acacius was approved by the emperor, the church of Conſtantinople, and by almoſt all the eaſtern biſhops, who united in a ſeparation from the communion of the pope. Such was the origin of the firſt ſchiſm between the Greek and Latin churches. In the year 487 Felix convened a ſynod at Rome, to diſcuſs the queſtion reſpecting the reconciliation of thoſe to the Catholic church, who had been baptized or re-baptized by the Arians during the Vandal perſecution in Africa. About the year 488 Fravita ſucceeded Acacius as patriarch of Conſtantinople, when meaſures were immediately taken to bring about a reconciliation between the eaſtern and weſtern churches, which Felix rejected, unleſs the name of Acacius was firſt ſtruck out of the ſacred diptychs. The ſame inexorable temper proved an obſtacle to the deſired union during the patriarchate of Euphemius, the ſucceſſor of Fravita. On the death of Zeno in 491, Felix wrote to Anaſtaſius his ſucceſſor, congratulating him on his acceſſion to the throne, intimating an expectation, that under his authority the intereſts of the true faith would be reſpected and promoted. The emperor paid no attention to this letter, and Felix died before he could have any opportunity of witneſſing his reſentment at the neglect of the exhortation. He was, as our account will ſhew, an enterpriſing, ambitious, and arrogant man, more devoted to the extenſion of the papal power, than the true welfare of the church. In the 4th volume of the "Collectio Conciliorum" are fifteen letters aſcribed to him, and Dupin has taken pains to diſtinguiſh between the genuine and ſpurious. Moreri. Moſheim.

Felix IV. pope, a native of Beneventum, was raiſed to the papal ſee on the death of John, in the year 526. He was appointed to this high dignity by king Theodoric, who, when the ſenate and people were divided in their ſupport of rival candidates, thought proper to interpoſe his authority, and fix upon a perſon of a moſt exemplary life, and every way worthy of the pontifical dignity, but whom the contending parties had overlooked. The people at firſt oppoſed his authority, but ſubmitted when the king agreed that in future they ſhould be allowed to chooſe whom they pleaſed, ſubject to his confirmation. After this Felix was ordained to his office, and preſided over the Roman ſee about four years. He died in 530. Three letters in the 4th volume of the "Collectio Conciliorum" have been attributed to him, but the firſt two are not regarded as genuine. Moreri.

Felix V. See Amadeus VIII. and Eugenius IV.

Felix, biſhop of Urgella, in Catalonia, in the eighth century. See Elipand.

Felix, *St.* in *Geography*, a ſmall iſland in the Pacific ocean, N.N.W. of Juan Fernandez, not far from the coaſt of Chili. S. lat. 26° 10'. W. long. 80° 46'.—Alſo, a town of France, in the department of the Upper Garonne, and chief place of a canton in the diſtrict of Villefranche; 22 miles E.S.E. of Toulouſe. The place contains 3 38, and the canton 11,458 inhabitants, on a territory of 185 kiliometres, and in 13 communes.—Alſo, a town of France, in the department of the Aveiron; ſix miles S.E. of St. Afrique.—Alſo, a town of Brazil, in the government of Goyes, on the river Tocantin. S. lat. 15° 36'. W. long. 49° 36'.

Felix, *Cape*, a cape on the weſt coaſt of the iſland of Sumatra. N. lat. 4°. E. long 96°.

FELIZAN, a town of France, in the department of Marengo; 12 miles E. of Aſti.

FELIZES de Gallego, *St.* a town of Spain, in the province of Leon; eight miles N.N.W. of Ciudad Rodrigo.

FELL, John, in *Biography*, ſon of Dr. Samuel Fell, dean of Chriſt-Church, Oxford, was born in the year 1625. He received his grammar learning at Thame, in Oxfordſhire, and from thence was admitted a ſtudent at Chriſt-Church college in 1636, when he was but eleven years of age. In 1640 and 1643 he took his degrees of B.A. and M.A., and about the lattter period he bore arms for king Charles I. within the garriſon of Oxford, and obtained the rank of enſign. In 1648 he was ejected from his ſtudent's place by the parliamentarian viſitors, from which time, till the reſtoration of Charles II., he lived in retirement at Oxford, joining many royaliſts in privately uſing the liturgy and rites of the church of England at Merton college. After the reſtoration he was appointed prebendary of Chicheſter; canon, and then dean of Chriſt-Church in 1660, when he was created doctor in divinity, and appointed one of his majeſty's chaplains in ordinary. He was, in every reſpect, a great benefactor to Chriſt-Church college, of which he was the head. He applied himſelf to the reſtoration of its diſcipline, and to the promotion of learning and religion among its members; and by his own benefactions, together with what he procured from others, he made many important additions to the buildings of the college. From the year 1666 to 1669 he filled the office of vice-chancellor of the univerſity with the higheſt reputation. In 1675 he was promoted to the biſhopric of Oxford, with leave to hold his deanery, in order that his college and the univerſity might ſtill enjoy the benefit of his ſervices. To the former he continued through life a liberal benefactor, and at his death left an eſtate for the ſupport of ten exhibitioners. As one powerful means of promoting literature, he paid great attention to the improvement of the univerſity preſs, and became himſelf editor of numerous ancient and modern writers. From the time of his becoming dean of Chriſt-Church to his death, he annually publiſhed a book, generally a claſſical author, with a preface, notes, and corrections, which he preſented as a new-year's gift to the ſtudents of his houſe. He was a liberal benefactor likewiſe to the poor and diſtreſſed. When he had filled the ſee of Oxford ten years his health began to ſink under his exertions, and the anxiety which he felt on account of the changes attempted to be brought about in religion by king James II. He died in 1686, leaving behind him the general character of a learned and pious divine, of an excellent claſſical ſcholar, of a great aſſerter of the church of England, of another founder of his own college, and of a patron of the whole univerſity. When the Royal Society was inſtituted, Dr. Fell was among the alarmiſts at the innovation upon the Ariſtotelian ſyſtem, and encouraged Stubbe to write ſeveral pieces againſt the members, charging them with intentions to bring contempt upon ancient and ſolid learning, to undermine the univerſity, and even to deſtroy the eſtabliſhed religion and introduce popery. Dr. Fell was author of the life of Dr. Henry Hammond; he publiſhed ſome other original pieces. He tranſlated, with the aſſiſtance of perſons employed by himſelf, "Hiſtoria et Antiquitates Univerſitatis Oxonienſis," &c. in two volumes, folio. In his tranſlation he omitted ſome things which Anthony Wood, the author, requeſted the public not to impute to him. He publiſhed an edition of the Greek Teſtament, and was author and editor of a great many other works, for an account of which, ſee Biog. Brit.

Fell, John, a Proteſtant diſſenting miniſter, was born at Cockermouth, in Cumberland, in the year 1732, and roſe, by his talents and application, from a humble ſtation and mechanical employment, to conſiderable reputation as a ſcholar and a divine. He finiſhed his education for the miniſtry at the academy at Mile-end, in the vicinity of London; and was much aided and encouraged by Dr. Walker, one of his tutors, who took pleaſure in promoting the literary attainments of thoſe who were committed to his care. Mr. Fell was one of his favourite pupils, and in the progreſs of his years appeared to have availed himſelf in a very high degree of the advantages which he had enjoyed under the inſtruction of his tutor. His firſt ſettlement, as a paſtor, was at Thaxted in Eſſex, where he formed a connection with a congregation of the independent denomination in the year 1770, and where he continued for ſeveral years; uniting with his paſtoral duties the ſuperintendance of a reſpectable boarding-ſchool. As a ſchool-a ſchool-maſter and a preacher he was highly eſteemed and reſpected. When a vacancy of reſident and claſſical tutor occurred in the academy where he had received his education, then removed from Mile-end to Homerton, he was earneſtly urged to accept this office; which, on account of ſeveral unpleaſant circumſtances that attended it, ariſing partly from domeſtic diſcord, and partly from the unkindneſs and illiberality of ſome of the friends of the inſtitution, proved in the event the occaſion of great uneaſineſs, and ſerved, indeed, to embitter and to accelerate the termination of his life. Although he was diſcharged from his office by a vote of the majority of his conſtituents, he was patronized after his diſmiſſion by a very reſpectable minority, who deviſed plans for his future ſubſiſtence and comfort. With this view they engaged him to deliver twelve lectures on the evidences of Chriſtianity, for which the ſum of 200*l.* was contributed; and an active friend opened for him a ſubſcription which was ſufficient for purchaſing an annuity of 100*l.* His conſtitution, however, was broken down by the treatment he had ſuffered; and the irritation of his mind was increaſed by his anxiety for duly diſcharging the ſervice he had undertaken, and thus requiting the generoſity of his friends; ſo that he did not long live to enjoy the proviſion which had been made for him. Four of the propoſed lectures were delivered in the four firſt months of the year 1797 to crouded auditories; but a complicated diſorder, under which he languiſhed for four months, prevented his proſecution of them, and terminated his life on the 6th of September in this year, in the 65th year of his age. The courſe of lectures was completed by Dr. Hunter, and the whole ſeries formed a volume, which was publiſhed after the death of Mr. Fell. The theological ſentiments of Mr. Fell were ſuch as are uſually denominated Calviniſtic; but he combined with his ſteady attachment to them a great degree of charity and candour towards thoſe who differed from him. We knew him well; and though his temper was ſomewhat irritable, he was a pleaſing and inſtructive companion. His memory was retentive; his reading various; and his knowledge extenſive. To the intereſts of civil and religious liberty he was ardently devoted; and of theſe intereſts he was an able advocate. Under the article Farmer we have mentioned ſome of his moſt elaborate publications. Beſides theſe, he was alſo the author of the following works: *viz.* "An Eſſay on the love of one's Country," 8vo. "Genuine Proteſtantiſm, or the unalienable rights of conſcience defended," 1773, and 1774, 8vo. "The Juſtice and Utility of Penal Laws for the direction of Conſcience examined," 1774, 8vo. "Remarks on the Appendix of the Editor of Rowley's Poems, &c." 1783, 8vo. "An Eſſay towards an Engliſh Grammar, with a Diſſertation on the natural and peculiar Uſe of certain hypothetical Verbs in the Engliſh Language," 1784, 12mo. &c. Gen. Biog.

Fell, in *Rural Economy*, a term ſometimes employed to denote the ſkin or hide of an animal.

Fell, a term applied to the knocking down of animals which are to be killed. The axe is moſtly employed in this buſineſs, but ſhould be diſcontinued, and that of *pithing* be made uſe of in its place.

Fell, in *Mining*, ſignifies ſmall pieces of lead ore, and ſpar, which have paſſed through a riddle with openings about an inch ſquare. Fell-fleet ſignifies large pieces of ſaſtage, or ſeagh, that is, refuſe ſpar.

FELLA, in *Geography*, a river of Carinthia, which runs into the Drave, near Machling.

Fella, *Cape*, a cape on the weſt coaſt of Calabria. N. lat. 39° 38′. E. long. 16° 2′.

FELLENBERG, a town of the Tyroleſe; four miles W.S.W. of Inſpruck.

FELLETIN, a town of France, in the department of the Creuſe, and chief place of a canton in the diſtrict of Aubuſſon; 21 miles S.S.E. of Gueret. N. lat. 45° 53′. E. long. 2° 15′. The place contains 2666, and the canton 10,713 inhabitants, on a territory of $207\frac{1}{2}$ kiliometres, and in 10 communes. The chief article of trade is cattle, and near it is a medicinal ſpring.

FELLIN, a town of Naples, in the Lavora; 13 miles E.N.E. of Naples.

FELLING, a town of Auſtria; 10 miles W.N.W. of Crems.—Alſo, a town of Auſtria; 11 miles S. of Vienna.

Felling *of Timber*, in *Rural Economy*, the operation of cutting down trees for the purpoſe of timber. In the performing of this ſort of buſineſs attention ſhould in the firſt place be paid to the ſeaſon of the year, eſpecially where the timber is of the oak kind. or ſuch as is to be peeled for the bark, as it will only peel, or, what the workmen term *run*, at a particular period, which is generally in the ſpring months, juſt before the leaves expand. With many other ſorts of timber trees this is not, however, neceſſary to be regarded; but they ſhould, in general, be cut down previouſly to the leaves appearing.

It is the practice of ſome, where any ſort of tree is to be cut down in the above intention, firſt to take off any branches that may be likely to injure it in its fall, much harm being frequently done to trees for want of care in this reſpect. Where the branches or limbs are of conſiderable ſize, they ſhould be cut on both ſides, cloſe to the bole, in order to prevent their ſplitting. In caſes where the trees are not grubbed up, they ſhould be cut as cloſe to the roots as poſſible, by which there will be a ſaving of the moſt valuable part of the timber.

In the work of felling there is conſiderable art to make them fall in the beſt way, which is only known by thoſe woodmen who have had much experience. Where a large fall is therefore to be made, it is of much advantage to have men of this kind to undertake the buſineſs. The price of felling is regulated by a variety of different circumſtances, as the kind of wood, the ſize of the trees, the nature of the ſituation, &c.; but the work is often done by the tree, or at a fixed price for a certain number of trees. See Woods and Timber.

FELLINGSBRO, in *Geography*, a town of Sweden, in Weſtmanland; 24 miles W. of Stroemſholm.

FELLIS, a mountain of Africa, in Adel; 50 miles W. of cape Guardefui.

FELLOWS, or Fellies, in *Artillery*, are ſix pieces of wood, each of which forms an arch of a circle, and theſe, joined all together by duledges, make an entire circle, which, with a nave, and twelve ſpokes, form the wheel of a gun-carriage.

Their thickneſs is uſually the diameter of the ball of the gun they ſerve for, and their breadth ſomething more. Their dimenſions are as follow: for a 24 pounder, five inches thick, and $6\frac{1}{2}$ inches broad; for a 12 pounder, $4\frac{1}{2}$ inches thick, and ſix inches broad; for a ſix pounder, four inches thick, and $5\frac{1}{2}$ broad, &c. made of dry elm.

FELLOWSHIP, Company, or *Partnerſhip*, in *Arithmetic*, is a rule of great uſe in balancing accounts amongſt merchants and owners of ſhips; where a number of perſons putting together a general ſtock, it is required to give every one his proportional ſhare of loſs or gain.

The golden rule, ſeveral times repeated, is the baſis of fellowſhip, and fully anſwers all queſtions of that kind; for, as the whole ſtock is to the total thereby gained or loſt, ſo each man's particular ſtock is to his proper ſhare of loſs or gain. Wherefore, the ſeveral ſums of money of every partner are to be gathered into one ſum for the firſt term; the common gain or loſs for the ſecond; and every man's particular ſhare for the third; and the golden rule is then to be wrought ſo many times as there are partners.

There are two caſes of this rule, the one *without*, the other *with time.*

Fellowship *without time*, is where the quantity of ſtock contributed by each perſon is alone conſidered, without any particular regard to the length of time that any of their monies were employed. An example will make this proceſs eaſy.

A. B. and C. freight a ſhip with 212 tons of wine; A. laying out 1342*l.* B. 1178*l.* and C. 630*l.* towards the ſame; the whole cargo is ſold at 32*l.* per ton. Query, what ſhall each perſon receive?

Find the whole produce of the wine by multiplying 212 by 32, which yields 6784. Then, adding together the ſeveral ſtocks, 1342, 1178, and 630, which make 3150, the work will ſtand thus:

$$3150 : 6784 \left\{ \begin{array}{l} 1342\text{—Anſw.—}2890,1993, \&c. \\ 1178 \text{ ——— } 2537,0006, \&c. \\ 630 \text{ ——— } 1356,8. \end{array} \right.$$

Proof 3150 6784

Fellowship *with time*, uſually called the *Double rule of Fellowſhip*, is where the time during which the money, &c. were employed, enters into the account. An example will make it clear.

A. B. C. commence a partnerſhip the firſt of January, for a whole year. A. the ſame day diſburſed 100*l.* of which he received back again, on the firſt of April, 20*l.* B. pays, on the firſt of March, 60*l.* and more, the firſt of Auguſt, 100*l.* C. pays, the firſt of July, 140*l.* and the firſt of October, withdraws 40*l.* At the year's end their clear gain is 142*l.* Query, what is each perſon's due?

A.'s 100*l.* multiplied by three months, the time it was in, makes 300*l.* and the remaining 80, by nine months = 720, in all 1020*l.* of A.'s contribution. For B. 60 into 10, gives 600; and 100 into 5, 500; in all 1100*l.* for B. For C. 140 into 3, gives 420; and 100 into 3, is 300; in all 720*l.* for C. Now, 1020 + 1100 + 720 = 2840 for the common antecedent, and the gain 142, is for the general conſequent; the rule will ſtand thus:

$$2840 : 142 \left\{ \begin{array}{l} 1020\text{—Anſw. }51 \\ 1100\text{————}55 \\ 720\text{————}36 \end{array} \right.$$

Proof 2840 142

N. B. All the particular times (if not ſo given) muſt be reduced into one denomination, *viz.* into years, months, weeks, or days.

FELLY, in *Agriculture*, is a term which is ſometimes provincially applied to the breaking up of a fallow. It is likewiſe the name of a part of a wheel.

FELNA, in *Geography*, a diſtrict of Ruſſia, in the government of Smolenſko, ſituated on the Deſna.

FELO, Cape, the S. W. point of Sicily. N. lat. 37° 46'. E. long. 12° 27'.

Felo *de ſe*, in *Law*, is he that commits felony, by willingly and deliberately killing himſelf; or doing any unlawful malicious act, the conſequence of which is his own death; as if, attempting to kill another, he runs upon his antagoniſt's ſword; or, ſhooting at another, the gun burſts and kills himſelf. (1 Hawk. P. C. 68. 1 Hal. P. C. 413.) The Saxons call him *ſelf-bane.* He muſt be of the age of diſcretion, and *compos mentis.* But if a real lunatic kills himſelf in a lucid interval, he is a felo de ſe as much as another man. (1 Hal. P. C. 412.)

A felo de ſe is to be interred without Chriſtian burial, with a ſtake driven through his corpſe; and is to forfeit his goods and chattels, real and perſonal; but he may make a deviſe of his lands, becauſe they are not ſubjected to any forfeiture. (Plowd. 261.) However, theſe forfeitures are generally ſaved by the verdict of the coroner's jury, who find lunacy. See Suicide.

If a perſon felo de ſe is ſecretly made away with, ſo that the coroner cannot view his body, preſentment is to be made of it by juſtices of peace, &c. in order to entitle the king to the forfeiture of goods.

FELON, in *Surgery*. See Whitlow.

Felon *wort.* See Solanum.

FELONIOUS Homicide. See Homicide.

FELONY, Felonia, was anciently uſed for a violent and injurious action of a vaſſal, or tenant, againſt his lord.

Menage derives the word from *felonia*, formed of *felo*, or *fello*, which occurs in the capitulars of Charles the Bald, and is ſuppoſed to come from the German *fehlen*, or Saxon *faelen*, *to fail*, or *be delinquent.* Others derive it from the barbarous Latin *vilania.* Lord Coke, Nicod, &c. derive it *a fello*, *gall*, as being ſuppoſed to be done maliciouſly. Others derive it from the Greek φηλειν, *to deceive.* But the learned Spelman, with greater probability, deduces it from two northern words, *viz.* *fee*, which ſignifies *fief*, *feud*, or *beneficiary eſtate*, and *lon*, which ſignifies *price* or *value*; ſo that felony is the ſame as *pretium feudi*, the conſideration for which a man gives up his fief; agreeable to the common expreſſion, ſuch an act is as much as your life, or eſtate, is worth.

In this ſenſe felony was equivalent to petty-treaſon, or it was a crime next below high treaſon. The crime of felony imported confiſcation of the fee, to the profit of the lord.

All thoſe acts, whether of a criminal nature or not, which at this day are generally forfeitures of copy-hold eſtates, are ſtyled *feloniæ* in the feudal law.

Felony was alſo applied to an injury of the lord to his vaſſal, which imported a forfeiture of the homage and ſervice thereof, and made it revert to the ſovereign.

Fidelity and felony are reciprocal between the lord and the vaſſal.

Felony, in the general acceptation of law, compriſes every ſpecies of crime, which occaſioned, at common law, the forfeiture of lands or goods. This moſt frequently happens in thoſe crimes for which a capital puniſhment either was or is liable to be inflicted; for thoſe felonies which are called clergyable, or to which the benefit of clergy extends, were anciently puniſhed with death in lay or unlearned offenders, though now by the ſtatute-law that puniſhment is, for the firſt offence, univerſally remitted. (See Benefit *of Clergy.*) Treaſon itſelf (ſays Coke, 3 Inſt. 15.) was anciently compriſed under the name of felony. And not only all offences now capital are in ſome degree or other felony; but this is likewiſe the caſe with ſome other offences, which are not puniſhed with death; as ſuicide, where the party is already dead; homicide by chance medley, or in ſelf-defence; and petty larceny or pilfering; all which are, ſtrictly ſpeaking, felonies, as they ſubject thoſe who commit them to forfeitures. So that upon the whole, the only adequate definition of *felony* ſeems to be this, *viz.* "an offence which occaſions a total forfeiture of either lands or goods, or both, at the common law ; and to which capital or other puniſhments may be ſuperadded, according to the degree of guilt." (Blackſt. Com. vol. iv.) The idea of felony is ſo generally connected with that of capital puniſhment, that it ſeems hard to ſeparate them ; and to this uſage the interpretations of law now conform. For if a ſtatute makes any new offence felony, the law implies that it ſhall be puniſhed with death (*viz.* by hanging), as well as by forfeiture, unleſs the offender prays the benefit of clergy. (Hawk. P. C. i. c. 41. ii. c. 48.) So where a ſtatute decrees an offender to undergo judgment of life and member, the offence becomes a felony, though that preciſe word be omitted ; but the words of the ſtatute muſt not in ſuch caſe be the leaſt doubtful or ambiguous. (1 Hawk. P. C. c. 41.)

Felony is alſo uſed, in *Common Law*, for any capital offence, perpetrated with any evil intention.

Though capital puniſhment does by no means enter into the true idea and definition of felony, the true criterion of which is forfeiture ; for in all felonies which are puniſhable with death the offender loſes all his lands in fee-ſimple, and alſo all his goods and chattels ; but in ſuch as are not ſo puniſhable, his goods and chattels only. 1 Inſt. 391.

In a ſtricter ſenſe, felony denotes all capital crimes below treaſon.

Felony includes ſeveral ſpecies of crimes, ſuch as petit-treaſon, murder, theft, homicide, ſodomy, rape, wilful burning of houſes, receiving of ſtolen goods, &c.; breach of priſon, reſcue and eſcape, after one is arreſted or impriſoned for felony, and divers others found in the ſtatutes, which are daily making crimes felony, that were not ſo before.

Felony by the common law is againſt the life of a man, as murder, manſlaughter, felo de ſe, ſe defendendo, &c. againſt a man's goods, ſuch as larceny and robbery ; againſt his habitation, as arſon and burglary ; and againſt public juſtice, as breach of priſon. 3 Inſt. 31.

Piracy, robbery, and murder upon the ſeas, are felonies puniſhable by the civil law, and alſo by ſtatute. 1 Inſt. 391.

Felony is eaſily diſtinguiſhed from treaſon.

From leſſer crimes it is diſtinguiſhed by this, that its puniſhment is death, though not univerſally ; for petty larceny, *i. e.* ſtealing of a thing under the value of twelvepence, is felony, according to Brook, though the crime be not capital, but only a loſs of goods. The reaſon Brook gives for its being felony is, that the indictment runs, *felonice cepit.*

Till the reign of Henry I. felonies were puniſhed by pecuniary fines ; that prince firſt ordered felons to be hanged about the year 1108.

Felony is of two kinds ; the one *lighter*, which for the firſt time is entitled to the benefit of clergy ; as man-ſlaughter. The other, more heinous, is not allowed the privilege.

Felony is alſo puniſhable by loſs of all lands, not intailed ; and all goods and chattels, both real and perſonal ; though the ſtatutes make a difference in ſome caſes concerning lands, as appears by ſtat. 37 Hen. VIII.

Felony ordinarily works corruption of blood, unleſs the ſtatute, ordaining the offence to be felony, provide otherwiſe ; as the ſtat. 39 Eliz. cap. 17.

The puniſhment of a perſon for felony by our ancient books is to loſe his life ; to loſe his blood, as to his anceſtry, ſo as to have neither heir nor poſterity ; to loſe his goods ; and to loſe his lands. (4 Rep. 124.) A felony by ſtatute incidentally implies, that the offender ſhall be ſubject to the like attainder and forfeiture, &c. as is incident to a felon at common law. (3 Inſt. 47. 59. 90.)

Private perſons may arreſt felons by their own authority, or by warrant from a juſtice of peace ; and every private perſon is bound to aſſiſt an officer in taking felons. But one ought not to be arreſted upon ſuſpicion of felony, except there be probable cauſe ſhewn for the ground of the ſuſpicion. (1 Lil. Abr. 603.) A private man cannot juſtify breaking doors to take the perſon ſuſpected ; but he doth this at his peril. Whereas officers may break open a houſe to take a felon, or any perſon juſtly ſuſpected of felony ; and if an officer hath a warrant to take a felon, who is killed in reſiſting, it is not felony in the officer ; but if the officer is killed, it is otherwiſe. Dalt. 289.

Perſons indicted of felony, &c. where there are ſtrong preſumptions and circumſtances of guilt, are not repleviable ; but for larceny, &c. when perſons are committed, who are of good reputation, they may be bailed.

If a perſon be committed to priſon for one felony, the juſtices of gaol delivery may try him for another felony, for which he was not committed, by virtue of their commiſſion. (1 Lil. 602.)

It is not very eaſy to re-capitulate the vaſt variety of offences that are made felony by innumerable ſtatutes, which the ſecurity of ſociety has required. We muſt refer for particulars to the appropriate articles as they occur.

Felony, *Appeal of.* See Appeal.

Felony, *Compounding of.* See Theft-bote.

Felony, *Diſcovery of.* See Discovery.

Felony, *Miſpriſion of.* See Misprision.

FELOOPS, in *Geography*, a people of Africa, who inhabit a conſiderable tract of country between the Gambia and the Rio Grande.

FELORE, a river of Africa, which runs into the Senegal, 60 miles above Galem.

FELSBERG, a town of Heſſe Caſſel, with an ancient caſtle on a rock ; 12 miles S. of Caſſel.

FELSTIN, a town of Auſtrian Poland, in Galicia ; 40 miles S.W. of Lemberg.

FELSITE. See Felspar.

FELSPAR, *Feldſpath*, Germ. Of this mineral there are the following ſub-ſpecies : adularia, common felſpar, compact felſpar, continuous felſpar, Labrador felſpar.

1. Adularia. *Moonſtone*, Kirw. The colour of adularia is yellowiſh, greeniſh, or milk-white, and in certain directions it exhibits a diſplay of ſilvery and pearly colours, owing to the different reflections of light from the laminæ of which it is compoſed. It occurs either in maſs or cryſtallized. Its primitive figure is an irregular oblique-angled parallelopiped, of which the faces are ſmooth and well defined, and form an angle with each other of 90° ; while the faces in the third direction are uneven, and form with the others angles of 120° and 111° 28′. It alſo preſents the following modifications : 1. An oblique four-ſided priſm, bevilled on two of its oppoſite ſides. 2. An oblique four-ſided priſm with dihedral ſummits. 3. A ſix-ſided priſm with dihedral ſummits. 4. A double cryſtal in the form of a rectangular four-ſided priſm, compoſed of two half cryſtals united together in oppoſite directions. 5. A quadruple cryſtal, compoſed of four cryſtals of var. 2. united together by their ſummits, and mutually penetrating each other, forming a croſs conſiſting of four triangles united round a common centre.

The ſurface of the cryſtals is ſmooth, and often ſtriated longitudinally. They are for the moſt part middle-ſized or large. The external luſtre is ſhining and ſomewhat pearly ;

the luſtre of the principal fracture is bright-ſhining, that of the croſs fracture is ſhining, between vitreous and pearly. Its longitudinal fracture is perfectly foliated; its croſs fracture is ſmall conchoidal. It breaks into rhomboidal fragments. It is ſometimes compoſed of ſtraight lamellar diſtinct concretions. It is tranſlucent, paſſing to tranſparent. Its hardneſs is inferior to that of quartz, but greater than that of common felſpar. It is eaſily frangible; ſp. gr. = 2.5 to 2.6. It has been analyſed by Vauquelin, with the following reſult.

Silex . .	64
Alumine . .	20
Lime . .	2
Potaſh . .	14
	100

Adularia was firſt found by H. Pini in the mountains ſurrounding St. Gothard, in Switzerland, eſpecially in the ſummit called Mont Adula, (whence its name.) It here occurs in cryſtals, lining the cavities of micaceous ſchiſtus.

2. *Common Felſpar.*—The colour of this mineral is milk-white, yellowiſh, greyiſh, and reddiſh-white, alſo wax-yellow, and ochre-yellow, fleſh-red, blood and brick-red, leek-green, mountain-green, and, rarely, verdegris-green. It occurs in maſs, diſſeminated, in rounded fragments, and cryſtallized. Its primitive form, and the other varieties of cryſtallization, are the ſame as thoſe of adularia: it has alſo been found in ten-ſided priſms, with dihedral, or other variouſly modified ſummits. The cryſtals are for the moſt part ſmall and middle-ſized. Externally, this mineral is more or leſs ſhining; internally, it is the ſame, with a luſtre between vitreous and pearly. The longitudinal fracture is perfectly lamellar, the croſs-fracture is fine-grained uneven, paſſing into ſplintery. Its fragments are rhomboidal, with four ſhining, and two dull faces. It varies from tranſlucent to opaque. It occurs often in large or ſmall granular concretions. It is not ſo hard as quartz, yet will ſcratch glaſs. It is brittle and eaſily frangible; ſp. gr. 2.27 to 2.7.

It melts without addition, before the blow-pipe, into a white, ſomewhat tranſlucent glaſs.

Felſpar has often been analyſed, and with very different reſults: that perhaps the moſt to be depended on is of the green Siberian felſpar by Vauquelin, of which the following is the reſult:

Silex . .	62.83
Alumine . .	17.02
Lime . .	3.
Oxyd of iron . .	1.
Potaſh . .	13.
	96.85

Felſpar, when expoſed to the weather, acquires gradually an earthy appearance, and at length paſſes into porcelain clay. It alſo occurs in a ſtate of ſemi-decompoſition in ſeveral varieties of granite and porphyry, where it cannot have been affected by the atmoſphere. When in this ſtate it is uſually of a yellowiſh or reddiſh-white colour, a faintly glimmering luſtre, and a fracture imperfectly foliated, paſſing into earthy: it breaks into indeterminately angular fragments, is opaque, and conſiderably ſofter than common felſpar. A very light-coloured variety was analyſed by Vauquelin, and found to conſiſt of

Silex . .	74.
Alumine . .	14.5
Lime . .	5.5
	94.
	6. Loſs
	100.

Some of the coloured tranſlucent varieties of felſpar contain particles of mica diſperſed through their ſubſtance, and theſe, when the ſtone is expoſed to the light, form ſo many luminous points which relieve the colour of the felſpar, and give the whole a ſpangled appearance, that has a pleaſing effect. When felſpar exhibits this appearance it is called *aventurine* (a term alſo applied to a ſimilarly glittering variety of quartz). The green Siberian felſpar ſometimes contains ſpangles of a remarkably brilliant ſilvery mica, forming a very elegant aventurine. Another fine variety has been procured from Fedlovatoi, an iſland in the White ſea, not far from Archangel, conſiſting of a tranſparent hyacinth-brown baſe, with gold-coloured ſpangles.

Common felſpar is the moſt generally diffuſed, both as to its local and geological ſituation, of any other mineral, except perhaps quartz. It is an eſſential conſtituent of granite and gneiſs, of ſienite and greenſtone: it abounds in all porphyries, and in many rocks of trap-formation, and in the greater part of the real lavas.

3. *Compact Felſpar.*—*Felſite*, Kirw. Its colour is blueiſh-white, paſſing into ſky-blue; or greeniſh-white, paſſing into browniſh-green. The blue variety occurs in maſs, the green is either diſſeminated or cryſtallized. Its luſtre is gliſtening; its fracture is very imperfectly lamellar, approaching to ſplintery; its fragments are indeterminately angular; it is feebly tranſlucent, and, though hard, conſiderably inferior to quartz.

It is fuſible without addition, though difficultly, before the blow-pipe, into a frit or imperfect glaſs. It has not been analyſed.

The blue compact variety was diſcovered by Widenmann at Krieglach, in Stiria, forming a granitic maſs with white quartz and ſilvery mica: the green varieties occur in green porphyry and greenſtone.

4. *Continuous Felſpar.*—Its colour is reddiſh-grey, or fleſh-coloured; or pale reddiſh-yellow, or olive-green. It occurs in maſs, and generally contains common cryſtallized felſpar diſperſed through it in various proportions. It is ſometimes dull, but generally poſſeſſes a feeble glimmering luſtre; it is tranſlucent on the edges; its fracture is fine ſplintery, paſſing into uneven earthy; its fragments are indeterminately angular; its hardneſs is fully equal to that of common felſpar, and it is leſs brittle. At a high heat it melts into a porous porcelain maſs.

5. *Labrador Felſpar.*—The proper colour of this mineral is ſmoke-grey, or dark-aſh colour, but, on account of the ſmall crevices between the lamellæ of which it is compoſed, it preſents a moſt beautiful play of vivid tints, varying according to the poſition in which it is viewed. Of blue, it exhibits all the varieties from violet to ſmalt blue; of green, it diſplays the pure emerald green, and various other tinges paſſing on one hand into blue, and on the other into yellow; of yellow, the uſual tints are gold and lemon-yellow, verging into deep orange, and thence into rich copper-red, and tombac-brown. The parts exhibiting theſe beautiful colours are diſpoſed in irregular ſpots and patches, and the ſame ſpot, if held in different poſitions, diſplays various tints. It has hitherto been found only in detached rolled

pieces Internally it is ſhining with a luſtre between pearly and vitreous: its principal fracture is perfectly lamellar in two directions, the lamellæ croſſing each other at right angles; its croſs fracture is ſomewhat conchoidal; it breaks into rhomboidal fragments, with four ſpecular faces; it is ſtrongly tranſlucent, paſſing into ſemi-tranſparent. Sp. gr. 2.6 to 2.7.

It is fuſible, without addition, before the blow-pipe, into a white enamel. According to Bindheim, who alone has analyſed this mineral, it conſiſts of

Silex	69.5
Alumine	13.6
Sulphat of lime	12.
Oxyd of copper	0.7
Ditto of iron	0.3
	96.1
Loſs.	3.9
	100.

It was firſt diſcovered by the Moravian miſſionaries on the iſland of St. Paul, on the Labrador coaſt, and has ſince been found in Ingermannland, in Norway, and in the vicinity of lake Baikal, in Siberia.

It is in conſiderable eſtimation among lapidaries for ornamental works.

FELT, a kind of ſtuff, either of wool alone, or of wool and hair; neither ſpun, croſſed, nor woven, but deriving all its conſiſtence from its being wrought, and fulled with lees and ſize, and afterwards faſhioned on a block or mould, by help of fire and water.

Caſtors, camels, and coneys hair, lambs, and ſheeps wool, &c. are the moſt uſual ingredients of felts; and hats of all kinds are the works they are chiefly employed in.

The felt intended for a hat, being ſufficiently fulled, and prepared, is reduced into one piece, ſomewhat in the figure of a large funnel; in which ſtate it remains ready to be put into form, and becomes a hat. See HAT.

FELTING, in the *Manufactures*, denotes the operation by which the fur, hair, and wool of animals are wrought into a ſpecies of cloth, without either ſpinning or weaving. A hatter ſeparates the hairs from each other by ſtriking the wool with the ſtring of his bow, thus cauſing them to ſpring up in the air, and they then fall in every direction on the table, ſpread and diſtributed in ſmall flocks, which the workman covers with a cloth, ſlightly moiſtened; preſſing it with his hands, and moving the hairs backwards and forwards in different directions. In this manner the different fibres are brought againſt each other, and their points of contact conſiderably multiplied; and the agitation gives each hair a progreſſive motion towards the root, in conſequence of which the hairs become twiſted together. As the maſs becomes compact, the preſſure ſhould be increaſed, in order to keep up the progreſſive motion and twiſting of the hairs, which is thus performed with greater difficulty. The various fibres of the materials being thus by a gradual preſſure in different directions made to interweave and croſs each other, form a piece of ſtuff of a ſoft and ſpongy texture; upon this firſt piece is placed another, formed in the ſame manner, and ſometimes a third or fourth, according to the nature of the materials, and the intended thickneſs and conſiſtence of the work. Theſe different pieces are ſucceſſively brought together, and diſpoſed in a form ſuitable to the article which is to be fabricated; and in order to effect the coheſion, the operator uſes a number of preſſures and alternate motions in different directions, during which he preſerves the ſuppleneſs and flexibility of the material by ſlight aſperſions of water. The next operation is *fulling*, which ſee. The hair intended for the manufacturing of hats is always cut off with a ſharp inſtrument, and not pulled up by the roots; becauſe the bulb of the hair, which would come out with it in the latter caſe, would render the end which was fixed in the ſkin very obtuſe, and nearly deſtroy its diſpoſition to unite with the adjacent hairs. The hairs ſhould not be ſtraight like needles, for then there would be no compactneſs in the ſtuff. The fibres of wool having naturally a crooked form, that ſubſtance is well adapted to the operation of felting. The hair of beavers, rabbits, hares, &c. being ſtraight, cannot be uſed in felting, till it has been prepared for the purpoſe. See HAT.

FELTON, *the Rev.* WILLIAM, in *Biography*, prebendary of Hereford, and a dilettanti muſician, above the common claſs of gentlemen performers. He was a good organ-player, and had a neat finger and powerful hand for common diviſions, and the rapid multiplication of notes. As a compoſer he imitated Handel's organ concertos, and produced three ſets, in which there were two concertos that were thought worth playing in London by Stanley at the Caſtle Concert, and Butler at Ranelagh. Two of his airs, with variations, were long the pride of every incipient player on the harpſichord in town and country.

FELTRI, in *Geography*, a town of Italy, and capital of the Feltrin, the ſee of a biſhop, ſuffragan of the patriarch of Aquilea; ſituated at the foot of mountains generally covered with ſnow, which renders the air cold. The principal trade of the place is iron. The town has broad and well paved ſtreets, a ſplendid town-houſe, a large and fine market place with fountains, a cathedral church, which yields a good income to the biſhop, three monaſteries and three nunneries, a pawn-bank, and ſpacious ſuburbs, ſeated in a plain. The number of inhabitants is eſtimated at 5,200; 53 miles N.W. of Verona. N. lat. 46° 2'. E. long. 11° 48'.

FELTRIN, a ſmall diſtrict of Italy, bounded on the north by the Belluneſe, on the eaſt and ſouth by the Treviſan, and on the weſt by the Trentin and Vicentin. It is 28 miles in length, and ten in breadth, and produces a ſufficiency of grain, and an abundance of fruit, eſpecially fine nuts, wine, ſilk, black cattle, ſheep, fire wood, and game. The air is ſalubrious. This territory contains, beſides the capital, 120 villages, 20 pariſhes, and 42,000 inhabitants. The only place of note is Feltri.

FELTRINO, a river of Naples, which runs into the Adriatic, 4 miles S.E. of Ortona.

FELTRO, MORTO DA, in *Biography*, a painter of groteſque or ornamental works. He was born at Florence in 1468, and there he firſt ſtudied the art of painting. His peculiar genius directing him to paint in the groteſque ſtyle, he went young to Rome, the grand emporium of works of the ancients in that kind, which he eagerly ſought for among its antiquities and ruins. The veſtiges of temples, baths, grottos, tombs, &c. ſupplied him with a great variety of ſtudies, whoſe elegance of ſtyle he effectually imitated, and became eminent in that manner. It is no ſmall praiſe of him that Giorgione employed him to introduce the ornamental parts of ſome of his grandeſt compoſitions.

FELUCCA, or FELUCCO, a little veſſel with from ten to ſixteen banks of oars, not covered over, much uſed in the Mediterranean as a paſſage boat. The natives of Barbary employ boats of this ſort as cruiſers.

The word is formed from the Arabic *felkon, a ſhip.*

It has this peculiarity, that the rudder may be applied either in the head or ſtern; there being diſpoſitions in both to receive it. For ſize, it may be compared to a ſloop or ſhallop. It is rigged and navigated like *galleys;* which ſee.

FELUDSJE, Feleja, or *Felicha*, in *Geography*, a ſmall iſland in the N.W. part of the gulf of Perſia, near the coaſt of Arabia. N. lat. 29° 45′. E. long. 48°.

FEMALE, the ſex that conceives and bears fruit.

An animal that generates within itſelf, is called female; and that which generates in another, male.

The female, in quadrupeds, and even in birds, is uſually ſmaller and weaker than the male; though in birds of prey, as the falcon, hawk, &c. it is otherwiſe; the female being bigger, ſtronger, bolder, hardier, and more courageous.

The like is obſerved in moſt inſects, particularly ſpiders; to that degree, that M. Homberg aſſures us, he has weighed five or ſix male garden-ſpiders againſt one female of the ſame ſpecies, which has been equal to them all.

For the numeral proportion of males to females, ſee Marriage.

Naturaliſts alſo diſtinguiſh male and female plants; male and female flowers, &c.

Female *Flowers*, in *Botany*. See Fertile *Flowers*.

Female *Flute-Player*. See Flute, Lamia, and Ambubajæ.

Female *Screw*. See Screw.

FEMBLE-Hemp, in *Rural Economy*, a name given in ſome diſtricts to the female hemp.

FEME Covert, in *Law*, denotes a married woman; who is alſo ſaid to be under covert-baron.

By the law of England, a feme-covert committing a bare theft in company with, or by coercion of, her huſband, is not deemed guilty of felony; neither does ſhe become acceſſary to a felony, by receiving her huſband who has been guilty of it, as he does by receiving her. But if ſhe commit a theft by the bare command of her huſband; or treaſon, murder, or robbery, in his company, or by his coercion, or keep a bawdy-houſe with him, ſhe is puniſhable in the ſame manner, as if ſhe was ſole; and generally if ſhe be guilty of any offence not capital, ſhe may be indicted, &c. without making the huſband a party. But if ſhe incur the forfeiture of a penal ſtatute, the huſband muſt be made defendant in the action or information. (Hawk. P. C. b. i. c. 1.)

Among the Romans, a married woman was as capable of making a will as a feme-ſole, but with us ſhe is not only utterly incapable of deviſing lands, but of making a teſtament of chattels, without the licence of her huſband. For all her perſonal chattels are abſolutely his. Yet by her huſband's licence ſhe may make a teſtament, and the huſband, upon marriage, frequently covenants with her friends to allow her that licence. The queen conſort is an exception to this general rule, for ſhe may diſpoſe of her chattels by will, without the conſent of her lord (Co. Litt. 133.); and any feme-covert may make her will of goods, which are in her poſſeſſion *in autre droit*, as executrix or adminiſtratrix, for theſe can never be the property of the huſband; and if ſhe has any pin-money, or ſeparate maintenance, it is ſaid ſhe may diſpoſe of her ſavings thereout by teſtament, without the controul of her huſband. (Prec. Chan. 44.) A feme covert may *purchaſe* an eſtate without the conſent of her huſband, and the conveyance is good during the coverture, till he avoids it by ſome act declaring his diſſent. (Co. Litt. 3.) See more on this ſubject under the article Coverture.

Feme *ſole*, an unmarried woman, whoſe debts contracted before marriage become thoſe of her huſband after it. If a feme ſole makes her will, and afterwards marries, ſuch ſubſequent marriage is eſteemed a revocation in law, and entirely vacates the will. See Custom *of London*.

FEMERN, in *Geography*, an iſland of Denmark, in the Baltic, ſeparated from Holſtein by a narrow ſtrait, called "Femern Sound," about 27 miles in circumference. It contains the town of Burg, and a few villages. This iſland, though ſmall, has always been conſidered as one of the keys of Denmark towards Germany. There is a fort at the landing-place from Holſtein. N. lat. 54° 33′. E. long. 11°.

FEMININE, or Foeminine, in *Grammar*, one of the genders of nouns.

The feminine gender is that which denotes the noun or name to belong to a female. In the Latin, the feminine gender is formed of the maſculine, by altering its termination; particularly by changing *us* into *a*. Thus, of the maſculine *bonus equus, a good horſe*, is formed the feminine, *bona equa, a good mare;* ſo, of *parvus homo, a little man*, is formed *parva fœmina, a little woman*, &c. In French, the feminine gender is expreſſed, not by a different termination, but a different article: thus, *le* is joined to a male, and *la* to a female.

In Engliſh, we are generally more ſtrict, and expreſs the difference of ſex, not by different terminations, nor by different particles, but different words; as *boar* and *ſow, boy* and *girl, brother* and *ſiſter*, &c. though ſometimes the feminine is formed by varying the termination of the male into *eſs*, as in *abbot, abbeſs*, &c.

Feminine *Rhymes*. See Rhyme.

FEM-OWL, in *Ornithology*, an Engliſh name uſed in Shropſhire, and ſome other counties, for the *caprimulgus*, or goat-ſucker, called alſo the churn-owl. It is a very beautiful bird, and more reſembles the cuckow than the owl-kind. See Caprimulgus.

FEMSIO, in *Geography*, a town of Sweden, in the province of Smaland; 50 miles W. of Wexio.

FEMUR, or Os Femoris, in *Anatomy*, the bone of the thigh. See Extremities.

FEN, in *Agriculture*, a term commonly made uſe of to ſignify lands which are of the ſoft, boggy, or marſhy kind; and which, from the great ſtagnation and retention of moiſture, are diſpoſed to the growth and production of different coarſe vegetables, as well as to become unhealthy for thoſe who inhabit them. In different diſtricts of the kingdom, as in the counties of Lincoln, Cambridge, and thoſe which adjoin them, immenſe tracts of this deſcription of lands are ſtill to be met with; which, by proper means, ſuch as thoſe of incloſing, effectual draining, paring and burning, and the growth of ſuitable kinds of crops, might be rendered of vaſt importance to individuals as well as the nation, but which in their preſent ſtate afford ſcarcely any thing, except ruſhes, ſeeds, ſedge, and coarſe graſſes.

The lands of this kind differ in their qualities according to the progreſs they have made to the ſtate of firmneſs from the gradual depoſitions of earthy matters; in ſome caſes being quite ſolid, while, in others, they are covered with water, except ſome ſmall portions which riſe above the ſurface in particular places. The former are moſtly without any rivers paſſing into or through them, but the latter have commonly ſprings riſing in them, and become the ſources of rivers.

The firſt ſort of fen lands is moſtly injured by the ſtagnation of ſuch waters as come upon them from the higher grounds during the time of floods or heavy falls of rain, from their being generally of conſiderable extent, and for the moſt part lying perfectly flat, without the leaſt fall to diſcharge or take them off. They of courſe continue upon them until they are taken up by the proceſs of evaporation.

The other is conſtantly in a great meaſure covered with water, only having ſomewhat more dry ground during thoſe ſeaſons which are long free from rain.

In the drainage of theſe ſorts of lands, which conſtitutes their chief firſt improvement, the operator muſt be principally directed by the circumſtances of the particular caſes, their ſituations, and the nature of the cauſes from which the wetneſs proceeds. See DRAINING *of Land.*

In ſome inſtances they will not only require the proper cutting of deep and ſurface drains, and ditches; but often extenſive embanking, when on the borders of large rivers or the ſea, as well as flood-gates to prevent the influx of water during the time of floods or high tides. And occaſionally likewiſe other machinery in the nature of fen or lifting mills, in order to throw or diſcharge the water over the banks. See MILL.

In caſes which ariſe from ſprings, as well as thoſe which are produced by the ſtagnation of ſurface water, it will frequently be neceſſary, in order to effect their drainage, to have one or more deep open cuts, brought up in a proper direction from the loweſt point at which the water can be diſcharged. Into this various other, either ſurface or other drains, muſt be formed, in ſuitable directions, according to the nature of the caſes, that the water may be effectually carried off. In the execution of the buſineſs it will conſequently be firſt neceſſary to aſcertain the moſt depending part of the land by proper levelling with a ſpirit or other level, ſuitable to the purpoſe. Where this is not carefully done, the drainage can ſeldom be accompliſhed in a proper manner.

The main drain or drains, in caſes of this kind, ſhould conſtantly have ſufficient depth and width to readily diſcharge the water from the whole extent of the level; and the flood and tide waters be kept as much as poſſible from flowing upon the lands by proper embanking and the uſe of flood-gates, as ſuggeſted above. See EMBANKMENT and FLOOD-GATE.

In moſt other points the drainage of theſe ſorts of lands may be conducted in the ſame way as for common draining. See DRAINING.

When fen lands have been rendered ſufficiently dry by proper draining, and are become in a ſtate of proper ſolidity for carrying on the operation of tillage, where they contain much coarſe vegetable matter upon their ſurfaces, the moſt advantageous method is to begin by paring and burning, which will afford an excellent preparation for a crop of rape, or even turnips where the lands are free from too much ſtagnant moiſture; and either of theſe kinds of crops will leave the grounds in excellent condition for potatoes, beans, or cabbages, with which they ſhould be conſtantly cropped until they are brought into a ſuitable ſtate for the growth of grain, when a few crops of this ſort may be taken in alternation with thoſe of the green kind, keeping it always in mind that the great object is to lay them down as ſoon as poſſible to graſs, for which they are in general the beſt calculated.

In the introduction of grain crops, it is for the moſt part the beſt to begin with oats, as ſuch ſorts of land are commonly well adapted to them. The other kinds may afterwards be had recourſe to according to circumſtances.

It has been ſtated by the writer of the "Survey of the County of Lincoln," that the probable improvement that might be made by the incloſing, draining, paring and burning, and judicious cropping of the eaſt and weſt fens in that diſtrict, would not be leſs than is ſtated below.

Preſent Value, Dr.				Improved Value, Cr.										
								Val. *per* Acre.				Rent.		
	£.	s.	d.		A.	R.	P.					£.	s.	d.
To preſent value of all the common rights in the eaſt and weſt fens	4,173	5	0	By the weſt fen - -	16,924	2	6	20				16,924	10	9
				By the eaſt fen - -	12,424	3	39	15				9,318	14	11
				Total improved value, Cr.	29,349	2	5					26,243	5	8
				Deduct the former value - - - - -								4,173	5	0
				Net improvement - - - - - -								22,070	0	8
					A.	R.	P.	Val. *per* Acre.	£.	s.	d.			
				By the Wildmore fen	10,661	2	25	20	10,661	13	1½			
				Deduct Dr. as oppoſite				—	1,515	13	1			
To preſent value of the common rights in the Wildmore fen	1,515	13	1	Net improvement - - - - - -								9,146	0	0
				The whole improvement of the eaſt and weſt Wildmore fens - - - - - - -								31,216	0	8

It is remarked, that the calculation is drawn from the average of the common rights of two different pariſhes, thoſe of Luſhby and Reveſby, the one being detached a conſiderable diſtance from the common, and the other greatly nearer, which furniſhes a tolerable data for the whole of the towns; and if thoſe two pariſhes common rights produce a given ſum, and their two ſhares of land-tax amount for Luſhby, 40*l.*, Reveſby, 237*l.*; all the pariſhes which have rights upon the fens, amounting to 3975*l.* 15*s.* produce the ſum of 4173*l.* 5*s.* *per* year, which gives the preſent value of the common rights upon theſe fens, from 29,349 acres, at about 2*s.* 10*d.* the acre; when, by the improvement from an incloſure, the ſame 29,349 acres would produce 26,243*l.* *per* year, which averages about 17*s.* 11*d.* the acre, and which is the moderate average value; although there are certain lands taken in to defray the expence of draining the weſt fen, let by auction for 34*s.* the acre; in the average about 4,000 acres in farms.

It is ſuggeſted, that the chief reaſon why theſe fens are ſo unprofitable in their preſent ſtate, is from the diſorder in ſtocking; becauſe human nature being in its various capacities anxious of property, ſome perſons, from avarice, or a wiſh to get rich at once, ſtock ſo largely as to injure themſelves, and oppreſs the common; others, in the line of jobbing, put in great quantities of ſtock to ſell again, which are altogether injurious to the fair commoner, who only ſtocks with what his farm produces. Becauſe, ſuppoſe one man ſtocked a paſture of 29,349 acres, he would conſider the different ſorts of cattle to be depaſtured thereon, for each to thrive and yield their proportionable ſhare of profit; but if 3,000 men ſtock, they have different views of ſuppoſed intereſt; ſome increaſe their breed of ſheep, beaſts, horſes, geeſe, &c. There are inſtances of a cottager renting five pounds *per* year having fifteen hundred or two thouſand breeding geeſe, which muſt injure his neighbour of five pounds *per* year, who has got only a few ſheep, or a cow. The chief proprietors of theſe fens have long had their improvement in contemplation, eſpecially ſince ſo many inferior neighbouring commons have been embanked and incloſed to ſuch advantage, and particularly as it is evident that if this was the caſe, they would produce a yearly rent of 26,243*l.* 5*s.* 8*d.* There are plough farms being eſtimated to produce three years rent, 78,729*l.* 17*s.* which increaſe of property would, it is ſuppoſed. employ more poor, maintain more farmers, increaſe trade, and produce great quantities of grain, which now coſts Engliſh money to import from foreign nations. The reaſons why the proceeding has been ſo long delayed has been the extent of the undertaking, and the intermixture of large mortmain eſtates, with ſome differences in the rights between the ſoke of Bolingbrooke and Holland town. This great work has however ſince, we believe, been accompliſhed, and a vaſt extent of valuable land reclaimed and brought into the ſtate of cultivation.

It was formerly ſuppoſed that fens were of great advantage to thoſe who reſided in the vicinity of them, in the large quantities of fowl and fiſh which they afforded; but this does not appear to be really the caſe, when the value of the land in other views is fully conſidered. The kinds of wild-fowl with which they principally abound are thoſe of the wild-duck and teal ſorts, which are often extremely numerous, being taken in decoys, and conveyed to the London markets.

The fiſh are chiefly pike and eels, which are in great numbers of large ſize, and taken without any very great difficulty; but they are ſaid not to be ſo delicate for eating as thoſe of ſome other ſituations.

But the principal benefit was probably derived from the vaſt number of geeſe that were kept upon them, as, beſides their uſe as food, they afforded very conſiderable profits in the feathers and quills. It is ſhewn by the books in the cuſtom-houſe at Boſton, in the county of Lincoln, that formerly there were not unfrequently ſent away from that place, in one year, the quantity of three hundred bags of feathers, each bag containing one hundred and a half weight. They pluck the geeſe ſeveral times in the year for the feathers, and once for the quills. See FEATHERS and GOOSE.

FEN, in *Rural Economy*, the name of a pernicious diſtemper to which the hop is particularly expoſed. It conſiſts of a mould or moſs, which grows with great rapidity, ſpreading itſelf greatly, and occaſioning much injury in the hop plantation. The fine ſmell and condition of the hop are in this way very much impaired

FENCE, in *Agriculture*, a term ſignifying any ſort of conſtruction raiſed for the purpoſe of incloſing land, ſuch as a bank of earth, a ditch, hedge, wall, railing, paling, or any ſimilar kind of erection.

It ſeems evident that fences only became known, and were recurred to, as the paſtoral ſtate of ſociety diſappeared; and that during that of the feudal ſyſtem they were but little neceſſary, except in the caſe of villages, for the purpoſe of incloſing the little portions of graſs lands, which were ſcattered about them; or in particular inſtances for protecting the more expoſed parts of pariſh fields, while they were kept in the ſtate of corn.

In this country, however, fences are now generally prevalent, except where the remains of the feudal practice is ſtill permitted to continue; or where the appropriated mountains and high lands are managed under the ſheep ſyſtem; and where the extenſive ranges of chalk hills in the ſtate of appropriation, which are more favourably ſituated and conducted under a mixed kind of cultivation, are ſtill wholly open. Theſe hills are, however, particularly ſuited to the ſheep huſbandry, the more elevated, bleak, and leaſt fertile parts of them having conſtantly been kept in the ſtate of ſheep walks by their occupiers. Conſequently large flocks of ſheep are preſerved on them under the care of ſhepherds, who attend them during the day, and fold them in the night, by which practice the crops are effectually protected from injury.

But whether this ſyſtem of management be proper or the contrary, it is clear that wherever horſes, neat cattle, or ſmall numbers of ſheep, which have not the attendance of ſhepherds, are the paſturing ſtock, fences become eſſential to the due cultivation of the land.

The materials which are the moſt commonly employed in the raiſing of fences are, earthy ſubſtances, living plants of various kinds, ſtones, bricks, and wood of different ſorts. Iron, and even rope, or cord, are likewiſe occaſionally made uſe of for forming fences.

The firſt of theſe, though frequently made uſe of in the forming of fences, are far from being good materials for the purpoſe, as they ſoon begin to decompoſe by the action of the air, and moulder away, leaving any ſort of plants that may have been ſet upon them in a naked and expoſed condition. In moſt ſituations they likewiſe become ſo dry and parched by the heat of the ſun in the ſummer months, that the plants never thrive properly upon them. They are alſo very apt to be thrown down by neat cattle and ſheep, rubbing againſt them in hot ſeaſons. Theſe mound fences are much met with in different counties, as Devonſhire, Lancaſhire, and in ſome parts of Wales.

The ſecond ſort of ſubſtances for the purpoſe of fences affords great variety, there being many kinds of plants that anſwer perfectly well, but the beſt are unqueſtionably the white thorn and the holly. The black thorn, hazel, and crab-tree, may likewiſe be uſed in the ſame way. Fences made with ſome of theſe ſorts of plants are by much the beſt and moſt durable.

Several other kinds of plants may likewiſe be employed in forming live fences, as the willow, the elder, the birch, and the alder for moiſt ſituations; the beech on thoſe that are high and expoſed; and the elm and horn-beam where they are low and the ſoil inclined to be heavy. Theſe two laſt are, however, but little had recourſe to in this intention. Of the willow there are many ſorts, all of which may be cut into truncheons of ſuitable lengths, and planted out in that way.

Stones and bricks make excellent fences, both in reſpect to convenience and durability; but they are moſtly much too expenſive, except where they are abundant, and labour cheap. The latter can only be employed on particular occaſions, and under particular circumſtances, chiefly where ornament is required. On hilly, low, mountainous, and other ſtony-expoſed ſituations, where live fences cannot be raiſed without great difficulty, and ſhelter is not required, walls are capable of being had recourſe to with advantage, and are commonly the moſt proper ſort of fence for the purpoſe. In leſs elevated diſtricts, where theſe ſorts of materials are readily procured, fences of the wall kind are likewiſe not unfrequently met with, as conſtituting the diviſion of lands merely in the ſtate of tillage, as well as for the confining of the inferior ſorts of live ſtock. Their appearance is, however, extremely naked and diſguſting.

Wood is a ſort of material which is certainly the worſt and moſt expenſive that can be had recourſe to in the conſtruction of fences; as whether it be the ſmaller ſorts of wood for the forming of dead hedges, the defending of the banks of ditches, &c.; or the larger kind of timber-wood employed in making paling, railing, and other ſimilar fences, it may be ſaid to be in a conſtant progreſſive ſtate of decay from the very period of its being put up. It can of courſe be very rarely made uſe of as a fence, except in the caſe of dead hedges, where living ones cannot be raiſed; and for incloſing about the farm-ſteads and parks, or other pleaſure-grounds, where ornament is required, or in the form of paling, for protecting new-planted quickſet hedges, &c.

The two laſt materials can evidently never be had recourſe to as farm-fences from their expenſive nature; it is only in ornamented grounds, where a peculiar degree of neatneſs is required, that they can be employed. The latter is a very periſhable kind of material, and the former ſtands in need of frequent expenſive painting, to preſerve it from decay.

Fences may be capable of being divided, from the nature of their conſtruction, into two claſſes or kinds, as

1. *Simple Fences.*
2. *Compound Fences.*

The firſt claſs, or diviſion, comprehends all thoſe which are ſufficient of themſelves for the purpoſes of incloſure, without requiring the aſſiſtance of any other ſort; as thoſe of ſimple ditches, dikes, hedges, walls, palings, railings, &c.

The ſecond ſort compriſes all ſuch kinds as ſtand in need of the aſſiſtance of ſome other kinds, in order to guard and protect them in their young growth, or which may render them more ſafe and ſecure when farther advanced; as hedge and ditch, or bank, hedge ditch and paling, hedge ditch and railing, double hedges, hedge and wall, hedge ditch and wall, hedge ditch and trees, hedge, or hedge, wall, and belt of planting, and others of the ſame kinds.

After this arrangement and diviſion of fences, it will be proper to conſider the different kinds in a ſeparate manner, in order to explain more fully their particular nature and advantages, as well as the moſt proper methods of conſtructing and preſerving them ſo as to render them the moſt durable.

Simple fences.—Theſe are moſtly formed with much leſs trouble, and kept in order with far leſs difficulty, than thoſe of the compound kind.

Open ditch, or *water fence.*—This ſort of fence conſiſts ſimply in a ditch of conſiderable width and depth, which is kept as full of water as poſſible. It has been remarked by a late writer on this ſubject, that though ditches now form a part of that claſs of fences which are termed compound, they in their ſimple and original ſtate were conſidered rather in the light of open drains; and in place of being looked upon as a fence, their greateſt benefit was ſuppoſed to ariſe from their receiving or carrying off the ſuperfluous moiſture from the incloſed field. In a variety of inſtances, ditches are made for this purpoſe only, where there is no intention whatever to incloſe the field. They are, however, ſometimes meant as fences; but, in ſuch caſes, they are made very deep and wide, and the earth taken out of them is ſometimes formed into a bank, the height of which, when added to the depth of the ditch, forms a tolerable barrier. In general, however, the greateſt value of the ditch is met with, when it is uſed in conjunction with other fences, as will be ſeen under the ſecond claſs, or compound fences.

The forms of ditches are various; ſome of them being of an uniform width both at top and bottom; others are wide above, and have a gradual ſlope downwards; thoſe of a third kind have one ſide ſloping, and the other perpendicular. For whatever purpoſe the ditch is meant, however, the ſloping form is by much the beſt, as it not only coſts leſs money in the digging, but is at the ſame time much more durable, and has a neater appearance. Where open ditches are indiſpenſably neceſſary for the drainage of the field, the ſloping ditch is preferable to every other, as the ſides are not liable to tumble in or be undermined, or excavated by the current of the water, when properly executed. The ſlope ſhould be conſiderable, perhaps not leſs than three times the width at top that it is at bottom. The advantages of this conſtruction will, however, be more fully explained in ſpeaking of *hedge* and *ditch fences*.

It has been remarked that the open ditch, with a wall or perpendicular ſides, is liable to much objection both in its ſimple and compound ſtate: that in its ſimple ſtate the ſides are perpetually tumbling in, eſpecially after froſts or heavy rains; and if the field round which theſe ditches are made has any conſiderable declivity, the bottom is undermined, and large maſſes tumble down, bringing the hedge along with them. Theſe circumſtances are of themſelves ſufficient to bring this kind of ditch into diſcredit; but while they are thus improper as open drains, owing to the circumſtances we have mentioned, their ſhape is, it is conceived, the beſt poſſible for a covered drain, as the broader theſe covered drains are at bottom the more water will they carry off; with this additional benefit, that, by being broad below, they are leſs liable to choking, or obſtruction, than if they were narrow; in which caſe a ſingle ſtone or two clapping cloſe together, will ſo far interrupt the courſe of the water, and ſo much ſand and mud will accumulate behind them, as to render the drain uſeleſs: whereas, when there is a ſufficient breadth at bottom, if the water is obſtructed by one ſtone, it readily finds a paſſage in ſome other place.

The *open ditch*, or *water fence*, is moſt commonly employed in low, marſhy, and fen-land ſituations ; and where it is made of the width of not leſs than half a ſtatute pole, and is capable of being preſerved conſtantly full of water, it may be an eligible fence, even in the ſummer ſeaſon. But in open extenſive tracts, where the land is much expoſed, from its affording little ſhelter, it is obviouſly an improper fence. In ſevere froſts it alſo loſes its qualities as a fence againſt ſheep ; and when they are more ſlight, and the ice covered with ſnow, but not ſufficiently ſolid to ſupport the weight of ſheep, often betrays them to their deſtruction. In particular ſituations it is, however, the only ſort of fence that can be had recourſe to. A repreſentation of this ſort of fence is quite unneceſſary, as the following will, in ſome meaſure, ſhew it.

Simple ditch, and bank of earth.—This is a kind of fence which conſiſts ſimply of a gradually ſloping ditch, in which the earth that is removed in forming it is laid up into a back on one of the ſides, leaving a ſcarcement, or projecting ſpace of ſix or eight inches on the ſide where the bank is formed, to prevent the earth from tumbling in and filling up the ditch. The earth or clay, in ſome places, is likewiſe gathered into heaps, after being taken out of the ditches, and uſed as manure. This ſort of fence is repreſented in the former ſtate in *Plate* XVIII. (*Fence*) *Agriculture*, at *fig.* 1, in which *a* is the opening, and *b* the bank of earth on the ſide.

Double ditch with intermediate bank of earth.—This is a kind of fence not often uſed, unleſs in caſes where it is meant either to plant hedges or trees on the bank between the ditches. In ſome caſes, however, double ditches are made, where there is no intention whatever of planting either hedges or trees, and in ſeveral inſtances are highly valuable. Conſidered as a fence, it has an evident advantage over the ſingle ditch, as the earth taken out of the two ditches, when properly laid up in the middle, forms a pretty ſteep bank of a formidable appearance, which, without any other addition, makes a very tolerable temporary fence. For the purpoſes of open drainage the double ditch is excellently adapted, eſpecially by the ſides of highways, where the lands have a conſiderable declivity towards the road ; the ditch next the field, by receiving the water on that ſide, prevents it from overflowing and waſhing the road, a circumſtance which very frequently happens in ſuch ſituations : while the ditch on the ſide next the road, by receiving and carrying off the moiſture that falls upon, and which would otherwiſe lodge there and deſtroy it, keeps it conſtantly dry and in good repair. The double ditch is alſo uſeful in dividing high from low flat lands, particularly where the high grounds ſlope very ſuddenly down upon the low fields ; that next the high ground, by receiving the water from it during heavy falls of rain, ſaves the inferior grounds from inundation, while the ditch on the other ſide ſerves as an open drain for the lower fields. It is truſted that it will not be thought foreign to the preſent ſubject to mention, that where double ditches are made in the immediate vicinity of high grounds, or on the ſides of highways, care ſhould be taken to prevent the water from the furrows, or ſide-drains, from running into the main ditch at right angles. Where this is neglected, much trouble and inconvenience ariſe ; as when the water comes from a height, during heavy rains, in a ſtraight line into the ditch, it preſſes with accumulated force againſt the ſides of it ; and if the ſoil is of a looſe incoherent nature, the bank will be undermined and waſhed away in many places. To prevent this, nothing more is conceived requiſite than to alter the direction of the furrows, or ſmall ſide-ditches, a few yards from their opening into the main ditch ; and, in place of permitting the water to fall upon the bank in a ſtraight line, to give the furrows or ſide-ditches a gentle curve ; by that means, inſtead of falling into the ditch in a ſtraight line, and acting againſt the bank in the manner deſcribed, the furrows will empty themſelves into it in an oblique direction, and, by joining immediately with the ſtream in the ditch, will be prevented from having any bad effect upon the bank. It is obvious that the water, by thus having its direction changed, can do no harm to the ſides of the main ditch : and what is of advantage, the earth and ſediment brought along with it from the high ground, inſtead of being depoſited in that place where the cuts enter the main ditch, which ſeldom fails to be the caſe where the water falls into it in a ſtraight direction, are carried off along with it ; and though this ſediment ultimately falls to the bottom of the ditch, yet, as it falls down gradually in its courſe, it is equally divided over the whole, and occaſions no obſtruction in any particular part of the ditch. This form of fence is ſhewn at *fig.* 2. in the ſame plate, in which *a*, *a*, are the two ditches, and *b b* the intermediate bank of earth.

Where ſoils are moiſt and retentive, this is often a beneficial method for raiſing live fences, both with the thorn, and other ſorts of hedge-plants.

There are other methods of conſtructing fences of this nature. They are in ſome caſes formed by raiſing up long piles of earth between two ſod facings, in a battering manner, or leaning ſomewhat inwards towards each other, to the neceſſary heights and widths, as will be ſeen below.

Various other modes of planting on banks of this nature raiſed to different heights, have alſo been practiſed in different diſtricts of the kingdom.

Bank of earth with perpendicular ſod-facing and ſlope behind.—This, it may be obſerved, is a very common ſort of fence, and in ſome ſituations extremely uſeful, as in making folds, for inſtance, for the confinement of ſheep or cattle. It is alſo valuable on the ſides of highways, for defending the adjoining grounds, and for laying off clumps or belts of planting in the middle or corners of arable fields, for incloſing ſtack-yards, cottages, gardens, and other ſimilar purpoſes. The front of the bank is made with the ſod pared off from the ſurface of the ſloping ditch, and the mound at the back with the earth taken out of it. In all caſes, it is remarked, where this fence is uſed in the field, the perpendicular front ſhould be made on the outſide, and the bank on the inſide of the field. But when it is employed for folds, the front ſhould be on the inſide of the fold, as in that way it will not only preſent a much more formidable appearance to the ſheep or cattle, but the depth of the ditch will be an addition to the height of the bank ; and the earth taken out of it being laid behind will ſerve as a kind of buttreſs to ſupport the facing of ſod, and give it a degree of firmneſs and durability, far ſuperior to that of the common turf walls, or fold-dikes, as they are generally termed in North Britain. When this fence is properly conſtructed, a work at which the labourers in that part of the kingdom are now pretty expert, it laſts a conſiderable time ; but in its moſt perfect ſtate it is only to be conſidered as a temporary expedient ; for however neat it may appear, or however well it may anſwer the purpoſe at firſt, it ultimately loſes its value. Where wood for paling is ſcarce, or cannot be had, and where other materials for the ſhelter or protection of young hedges are equally ſcanty, this may be uſed with advantage for a time, and will both ſhelter the young hedge and incloſe the field ; but where permanent plans of incloſing are intended it ſhould never be had recourſe to, as however cheap it may be in the firſt inſtance, it is by no means durable. It is repreſented at *fig.* 3. in which *a* ſhews the half-ſection of a high road; *b* the ſloping bank of earth on the ſide; and *c* the perpendicular facing of turf or ſod in the front.

Perpendicular earth-wall.—This is a ſpecies of fence that may be occaſionally had recourſe to with advantage, as in incloſing rabbit-warrens, and other ſimilar caſes, where better ſorts of materials cannot be provided, except at too great expence. But it is only a temporary kind of incloſure, as the ſods ſoon decay, and begin to moulder down. And by neat cattle, ſheep, and ſwine ſuch fences are ſoon thrown down and deſtroyed. When it is employed, it ſhould have the ditch on the inſide or piece of ground that is incloſed, and be firmly built with turfs or ſods cut out from the ſurface of it, being well backed with the earth taken from below. It is ſhewn at *fig.* 4. in the ſame plate. Under the head *wall-fences* below, this ſort of wall is more fully explained, in ſpeaking of *turf-walls*.

Ha-ha, or ſunk fence.—It has been obſerved by Mr. Somerville, that this deſcription of fence is calculated chiefly for fields that require no ſhelter, and where an uniform unbroken proſpect is an object to be preſerved, as is the caſe in pleaſure-grounds, gardens, and extenſive lawns; but in all ſituations where ſhelter is wanted, the ſunk fence ought to be avoided, unleſs a hedge is planted upon the top of it. The form of the ſunk fence very nearly reſembles the mound of earth with the perpendicular facing of turf juſt deſcribed, with this difference, that the facing of the former is turf or ſod, and the height of the fence depends entirely, or in a great meaſure, upon the depth of the ditch. While theſe ſunk fences are either faced with brick, dry-ſtone, or ſtone and lime, and are of various heights, according to the ideas of the proprietor, or the circumſtances of the caſe. In the Agricultural Report drawn up for the northern diſtricts, in the account of Cromarty the following deſcription of the ſunk fence is given: "Upon the line where this fence is intended, begin to ſink your ditch, taking the earth from as far as eight feet outward, and throwing it up on the inſide of the line. This ditch and bank is not made quite perpendicular, but inclining inward towards the field as it riſes; to this is built a facing of dry-ſtone, four feet and a half in height, one and three-quarters broad at bottom, and one foot at top, over which a coping of turf is laid: the ditch or ſunk part forms an excellent drain. The whole of this is there performed when the ſtone can be procured at about a quarter of a mile diſtance, for 6*d. per* yard." But in other caſes it will ſtand greatly higher, according to the diſtance of the materials, the price of labour, and various other circumſtances. It is a ſort of fence which is ſeen at *fig.* 5. in the annexed plate.

With regard to the advantages of ditches as fences, it has already been obſerved, that none of the different kinds of ditches taken by themſelves are to be conſidered as good fences, with the ſingle exception of the ſunk fence, which is under the neceſſity of being claſſed along with them. This laſt ſort anſwers the double purpoſe of an open drain and a fence. But though ditches in their ſimple ſtate are thus defective as fences, their uſe is attended with many advantages; not only in draining the field, but in affording a ſupply of earth, which, under proper management, may be converted into excellent manure. Where the ſoil in which ditches are made is deep, and of a good quality, the earth taken out of them, if it is either made into a compoſt with lime or dung, or even ſpread by itſelf upon the adjoining fields, will greatly increaſe their fertility, and prove a laſting and valuable improvement. Even where the ſoil is moſs or clay, it may be converted to the ſame valuable purpoſe by burning: moſs being burnt, and the aſhes uſed as a manure in many parts of the kingdom; and the ſame is the caſe with clay. It has been found in the marſhes of Somerſetſhire that the clay taken out of the ditches and burnt is, upon ſtrong tenacious ſoils, highly valuable; as it breaks their coheſion, and by that means renders them not only leſs retentive of moiſture, and of courſe eaſier cultivated, but alſo much more favourable to the growth of plants, by affording room for the roots to extend and ſtretch themſelves out in ſearch of food. Their value, as making a part of any of the compound fences, will be further ſeen below, and under the article *ditch* and *hedge*.

Compound ditch fence.—This is that ſort of fence in which the ditch is only a conſtituent part, being combined with ſome other, in order to form a perfect fence.

Double ditch and hedge.—This is a kind of fence ſometimes employed in the incloſing of land. In conſidering the double ditch as a ſimple fence, its uſe, and the various ſituations in which it is applicable, whether as a fence or an open drain, have been noticed. To what has been mentioned, we may add that the cuſtom of incloſing with double ditches, and a hedge in front of each, is now practiſed in many parts of the kingdom, eſpecially upon what are termed cold lands; from an idea, that a ſingle row of plants would not grow ſufficiently ſtrong or thick to form a proper fence. The advocates for this ſort of fence farther allege, that in addition to the two rows of plants forming a more ſufficient fence, an opportunity is afforded of planting a row or rows of trees in the middle of the bank, as repreſented at *fig.* 6. in the plate.

It has been obſerved that the double ditch and hedge is liable to many objections; the expence of forming the ditches, the hedge-plants made uſe of, and the ground occupied thereby, being double of what is requiſite in a ſingle ditch and hedge. From twelve to eighteen or twenty feet is the leaſt that is required for a double ditch and hedge; this ſpace, in the circumference of a large field, is ſo conſiderable, that upon a farm of 500 acres, divided into fifteen incloſures, the fences alone would occupy above forty acres. By throwing up a bank in the middle, the whole of the nouriſhment, not only of both hedges, but alſo of the row of trees, is confined ſolely to that ſpace, which, from its being inſulated by the ditches, and elevated ſo much above the common ſurface, not only curtails the nouriſhment of the hedges and row of trees, but expoſes them to all the injuries ariſing from drought, froſt, &c. The idea of two rows of plants making a better fence than one, is certainly no good reaſon for ſuch an unneceſſary waſte of land and money, as in almoſt every inſtance, where the plants are properly adapted to the ſoil and climate, one row will be found quite ſufficient; but, if it ſhould be preferred to have two rows, the purpoſe will be anſwered equally well with a ſingle ditch, or even without any ditch at all; for in every ſituation where the ſoil is tolerably dry, and the fields much elevated above the level of the ſea, the ditch, except for the purpoſe of drainage, may be diſpenſed with.

In addition to the double ditch, and while the hedges are ſtill young, the fence is ſometimes ſtrengthened by a paling, either of young firs or other wood placed upon the top of the bank; in other caſes, a dead hedge is put in the middle, between the two quick hedges; and not unfrequently an open wall, reſembling a Galloway-dike, made with round ſtones, is placed in the ſame ſituation; any of which, when properly executed, not only incloſe the field completely for the time, but alſo very effectually ſhelter the young plants that conſtitute the fence. Under every circumſtance this is a very expenſive ſort of fence.

Simple hedge fences.—Theſe are of two kinds; either ſuch as are made up of dead materials, or ſuch as are formed of living plants, of ſome ſort or other. They are likewiſe made in different ways according to cuſtom and circumſtances.

Dead hedges.—It may be obſerved that theſe are made either with the prunings of trees, or the tops of old thorn, beech, or other hedges that have been cut down; and are principally intended for temporary purpoſes, ſuch as the protection of young hedges till they have acquired a ſufficient degree of ſtrength to render them fencible without any other aſſiſtance. For this purpoſe the dead hedge is well adapted, and laſts ſo long as to enable the live fence to grow up and complete the incloſure.

In many caſes, however, dead hedges are had recourſe to as the ſole fence, and where there is no intention of planting quicks, or any other hedge. From their very periſhable nature, however, they are found to be exceedingly expenſive; ſo much ſo, indeed, that, after the firſt or ſecond year, they cannot be kept in repair at a leſs expence than from a fifth to a tenth part of the value of the land, and ſometimes more. When dead hedges are meant for the protection of young live fences, if the quick fence is planted upon the common ſurface, the dead hedge is made in a trench or furrow immediately behind it, in ſuch a way as to prevent the ſheep or cattle grazing in the incloſed field from injuring it. Where the quick fence, however, is planted upon the ſide of a ditch, the dead hedge is, for the moſt part, made on the top of the mound formed by the earth taken out of the ditch; theſe are called plain dead hedges, being made by cutting the thorns or bruſh-wood, of which they conſiſt, into certain lengths, and ſticking or putting them into the earth. They are called plain, in oppoſition to other deſcriptions of dead hedges, where more art is uſed; ſuch as the dead hedge with upright ſtakes wattled, and the common plaited hedge, bound together at the top with willows; but of which the reader will be able to form a much better idea than can well be conveyed by words, by conſulting the annexed plates; in which *fig.* 7. repreſents a dead hedge inclining a little, placed upon the plain ſurface in the ordinary manner; *fig.* 8. the common dead hedge; which, it is obſerved, is almoſt the only fence met with in ſeveral of the counties of England, with the thorns or dead wood let into the earth about twelve or fourteen inches, and faſtened at the top with willows or hazels; *fig.* 9. ſhews the wattled dead hedge, with ſtrong upright poſts, or what is generally termed ſtack and riſe, or in Scotland ſtake and rice, and in ſome places ſtaff and band. This laſt, and the one immediately preceding it, form, it is remarked, very handſome fences; it is only to be regretted that they are not permanent ones, ſeldom laſting above a year or two. This defect is complained of in many of the reports publiſhed under the authority of the Board of Agriculture. The words of the ſurveyor of one of which are; "dead fencing ſupplies the place of live, which occaſions an eternal expence to the occupier; 1ſt, in purchaſing the fencing ſtuff, and bringing it from a conſiderable diſtance; and, 2dly, in the delay of his intereſt, by reaſon that the land occupied by a dead fence might ſuſtain a live one, which would not only anſwer the preſent purpoſe, but, in place of decaying, would be annually improving." The truth of this obſervation cannot be diſputed; as the ſoil and climate, in almoſt every ſituation where theſe dead hedges are complained of, are ſuch, that hedges of live plants would not only grow, but could be made at equal, perhaps leſs expence, than theſe temporary erections; and with this advantage, that, in place of decaying, and occaſioning an endleſs loſs and expence for repairs, they would be every year growing ſtronger, would require little expence to ſupport them, and, in place of the forlorn decayed appearance which dead hedges never fail to give a country, they would at once ſhelter and ornament it. It cannot, therefore, in the opinion of Mr. Sommerville, be too ſtrongly recommended to proprietors and farmers, in thoſe parts where dead hedges are at preſent ſo much uſed, and ſo juſtly complained of, to ſubſtitute live hedges in their place; the expence of doing which will be trifling, and the benefit ariſing therefrom immenſe.

In carrying a plan of this kind into execution, there is no occaſion to throw ſuch fields as are at preſent incloſed with theſe temporary fences open; quite the contrary: the dead fences ought to be preſerved till the young plants have attained ſuch a ſtrength and ſize as to enable them to form a good fence without any auxiliary aid. In that way the incloſure will not only be preſerved, but the dead fence, from the ſhelter it will afford to the young plants, will accelerate their growth, and render them much ſooner uſeful than they would otherwiſe be. This change of ſyſtem would be at once pleaſant and profitable to all concerned; the expence of incloſing, which is at preſent ſeverely felt, would be done away; the appearance of the country conſiderably improved, and the public benefited in a great degree; and, as no doubts can be ſtated as to the practicability of this ſcheme, it is truſted that the bare mention of it will be ſufficient to dictate a better ſyſtem of incloſing to thoſe concerned. The idea entertained by ſome landlords, that, provided a farm is once let, with the uſual burden upon the tenant of ſupporting the fences, the nature of the fence is of no importance to them, deſerves the ſtrongeſt and moſt pointed reprobation: indeed, it could ſcarcely be ſuppoſed that men, who have a permanent intereſt in the property, would reaſon in ſuch a manner. There can be no doubt, if lands are let to a good tenant for a term of years, that the landlord is certain of drawing his rent during the currency of the leaſe, whatever the expence of ſupporting the fences may be; but if this tenant is a man of ſenſe, the offer he makes will proceed upon the value he has in his own mind formed of the nature of the ſoil, and the expence which muſt unavoidably ariſe from cultivating and ſheltering it, and bringing the produce to market: the farmer who has not made, or is not capable of making ſuch a calculation, can never be a deſirable tenant to any proprietor; but if the tenant poſſeſſes this neceſſary knowledge, the yearly rent he will offer for the farm will be leſs in proportion to the ſum which he expects annually to expend in conſtructing or ſupporting theſe fences. It is truſted, that but very ſlender obſervation is neceſſary to convince intelligent proprietors or farmers, that the ſubſtitution of live for dead fences will not only make the incloſures more perfect, but will make an addition to the annual value of the property, equal to, if not greater, than the expence at preſent incurred in keeping theſe dead fences in repair. It need hardly be added, that as the greateſt value of theſe fences conſiſts in their completing incloſures, and ſheltering the young hedges till they arrive at a certain age, they ſhould never be thought of by either proprietors or farmers, except for theſe or other temporary purpoſes.

In the making of all ſorts of dead hedge fences, conſiderable art is required to perform it in a proper manner, and ſo as to become the moſt durable and laſting poſſible. Whatever the nature of the materials may be which are to be employed in this way, they ſhould be neatly depoſited and wrought into the fence, according to the manner in which it is to be made.

Live hedges.—Theſe may in general be conſidered as the ordinary farm fences of this country. And, except in particular ſituations and circumſtances, and for particular purpoſes, they are unqueſtionably the moſt proper and uſeful.

It is found, that in diſtricts which have been for a conſiderable length of time incloſed from the paſtoral or foreſt ſtate, without having previouſly undergone cultivation, the hedges are ſeemingly of great age, having moſtly crooked irregular directions, as if originally formed out of the bruſhwood of ſuch foreſts, or waſtes. While, in other caſes, coppice-woods of different ſorts are found growing on low wide banks, which ſeem as if they had been formerly gathered in the woods, and afterwards planted in ſuch banks. The practice of planting out full grown plants in this way has, however, been long, in general, diſcarded in this kingdom, and young hedges chiefly raiſed with plants of a few years' growth, planted in different ways according to ſituations and circumſtances, being firſt reared for the purpoſe in ſome proper place.

In reſpect to live hedges, it may likewiſe be further obſerved, that they are in general made either entirely with one kind of plants, or a mixture of different kinds; and for this purpoſe almoſt every tree or ſhrub known in Britain are either wholly or in part employed.

Under the head INCLOSING *of Land* ſome account will be given of each; but there are certain circumſtances common to all of them, and upon which the ſucceſs of every attempt made to rear good fences will be found ultimately to depend. Theſe circumſtances are, 1ſt, the plants being ſuited to the ſoil and climate; 2dly, the preparation of the earth or ſoil; 3dly, the time and mode of planting; 4thly, the age of the plants; 5thly, the ſize of them; 6thly, the dreſſing or pruning of the tops and roots before planting; 7thly, weeding and hoeing them while growing; 8thly, trimming and after-management; 9thly, filling up the gaps in hedges; 10thly, diſeaſes to which hedge-plants are liable, and their remedies.

With regard to the firſt, it has been obſerved, that upon the proper choice of plants ſuited to the ſoil and climate where the hedge is to be made, the ſucceſs of every attempt to incloſe with live fences will be found to depend. A mind given to obſervation, and capable of applying it in practice, may receive conſiderable aſſiſtance upon this point by attending carefully to the indigenous trees or ſhrubs which thrive beſt, and attain the greateſt ſize and perfection, upon particular ſoils and in certain climates: by an attention of this ſort many plants, which are ſeemingly of ſmall value at preſent, might, it is remarked, be rendered highly uſeful by planting hedges with them. But though an obſervation of this kind will in ſome inſtances ſerve as a guide, and lead the perſon who makes it to certain uſeful practices, it is not always to be depended upon, as there are many ſituations where neither trees nor ſhrubs, fit for making hedges, are to be met with in an indigenous ſtate; and even when they are met with, their nature will not admit of their being tranſplanted. Fortunately in theſe caſes, though nature affords no guide to aſſiſt us in the choice of the plants, we ſhall find ſufficient direction from the experience of the country, by carefully noting the circumſtances of ſoil and climate under which certain plants that have been introduced into them have proſpered, and either riſen into trees, or made good fences. In ſpeaking of the nature of incloſing land, notice will be taken of the great loſs which attends the fence, and the plants of which it conſiſts, in not being properly adapted to the natural circumſtances of the ſoil they are meant to incloſe. Many miſtakes of this kind might be enumerated; eſpecially in the more elevated ſituations, where great labour and expence have been employed to raiſe hedges of hawthorn, which, after many years' care and attention, were found totally unfit for ſuch inclement regions. In ſuch ſituations, experience has now ſufficiently proved that good fences can be reared in a ſhort time with beech, birch, larch, and the Huntingdon willow: hedges of theſe kinds ought, therefore, to be the only ones uſed in hilly countries, or upon cold wet ſoils. The three firſt upon the dry ſoils, and the laſt, with the addition of poplars, upon ſuch as are wet, or marſhy. In the low country, however, and in the leſs elevated part of the uplands, the white thorn will be found the beſt upon all the dry, or moderately dry parts of the ſoil; eſpecially the different kinds of loamy, ſandy, or gravelly lands: upon clays, or cold wet ſoils, however, beech, crab, birch, poplar, willow, and alder, may be uſed with advantage. The birch, poplar, alder, and Huntingdon willow, are peculiarly calculated for the coldeſt, wetteſt, and moſt marſhy parts; while beech, crab, &c. will be found to anſwer beſt upon the ſtiff clays. Hazel, ſweet-briar, mountain-aſh, or rowan-tree, and indeed all the different kinds of foreſt trees that are at preſent known to delight in dry ſoils, may alſo be employed for making hedges in the low lands with ſucceſs; but which-ever of theſe is uſed, they ſhould, if poſſible, be without mixture, or have as little of it as poſſible. See INCLOSING *of Land.*

It may be remarked, that it is ſeldom indeed that any ſoil, however good, will be found equally favourable to the growth of plants ſo very oppoſite in their nature; this circumſtance alone will render their growth unequal, and of courſe make the fence faulty and defective. Theſe defects in the fence, and inequalities in the growth of the plants, will increaſe with time, become every day more apparent, and be every day more ſenſibly felt; as the plants which have thus acquired the aſcendency will continue to keep it, and not only ſhade the weaker ones, and prevent them from enjoying the influence of the ſun and air, but alſo deprive them of nouriſhment. Independent of theſe conſiderations, there is another, it is obſerved, of equal, perhaps greater moment, that requires to be mentioned: allowing the ſoil to be equally favourable to the growth of the whole plants, of which the mixture conſiſts, there are certain plants which are highly inimical to the growth of others, when planted in their immediate vicinity; ivy and honey-ſuckle for inſtance, when mixed with thorns, or other plants in a hedge, never fail to deſtroy ſuch of the hedge-plants as they faſten upon; indeed moſs, which is known to be one of the worſt enemies to all hedges, is not more dangerous, or more certainly ruinous; even the different kinds of ſweet-briar, brambles, &c. have the ſame effect; and in the end never fail to produce a gap in that part of the hedge where they grow, by rubbing, corroding, and ſmothering the thorns or other plants of which the fence conſiſts.

There is one plant that may, however, be employed in mixture with the white thorn, without any inconvenience of this nature, and with the advantage of rendering the hedge more formidable, as well as much more ornamental. This is the common holly. It thrives remarkably well in ſuch combination where the ſoil is ſufficiently dry, and not too heavy.

In what regards the ſecond point, or the preparation of the ſoil for hedges, and even plantations, it is remarked that, though at preſent ſhamefully neglected, it is nevertheleſs one of thoſe points intimately connected with, indeed eſſential to, their ſucceſs. Except in a very few inſtances, however poor the ſoil may be, or however ſtrong the coheſion of its parts, no attempt is made either to break that coheſion by proper tillage, or improve its quality by enriching or alterative manures; the young plants being for the moſt part laid upon the old ſurface, which has perhaps never been opened by the labour of man, and their roots covered with the earth taken out of the ditch, conſiſting very often of the pooreſt and coldeſt *till*, or of earths loaded with iron, or other metallic impregnations. To thoſe who have conſidered the matter with the ſmalleſt attention, the fate of ſuch a hedge will not appear doubtful; the ſurface upon which the plants are laid will be ſo hard and impervious to the roots, as to preclude the poſſibility of their penetrating it; of courſe their only chance of either extending themſelves, or procuring nouriſhment, is by ſpreading out between the ſurface and the mound made by the earth taken out of the ditch, or by ſtriking up into the mound, where, though the ſoil will be ſufficiently open to admit of this, the roots, in place of finding an eſtabliſhment in a ſituation friendly to their growth, will very often be either ſtarved or poiſoned. In the culture of the grain, and the whole of our moſt uſeful and valuable vegetables, proper preparation of the ſoil by tillage and manure is, it is remarked, deemed indiſpenſably neceſſary; and experience has ſufficiently evinced, that upon the perfection of the tillage, and the quality and judicious application of the manures, the ſucceſs of the farmer or gardener, and the value of their crops, entirely depend. Is it not ſtrange then, that the ſame farmer who is convinced of the utility and neceſſity of tillage and manures for his other crops, and who would think himſelf for ever diſgraced, were he to ſow or plant grain, or any other uſeful vegetable upon an unploughed, dirty, unmanured field, ſhould, without ſhame or compunction, commit a hedge, which is to form the incloſure of the field, and upon which a conſiderable part of its future improvement is to depend, to the earth without any one of theſe aids? Incredible as it may appear, this is however certainly the fact; unleſs, as has formerly been obſerved, in a few inſtances where better ſenſe and ſtronger obſervation have dictated a different management; it being the uniform cuſtom in moſt plans of improvement, be the quality of the ſoil what it may, to mark off the line of the fence, dig the ditch, and commit the hedge-plants to the earth, without any previous preparation, either by tillage or manures.

In every inſtance where a hedge is to be made, the ground ſhould, it is contended, be previouſly prepared by a complete ſummer fallow, in order to deſtroy the weeds; when this is accompliſhed a certain proportion of dung, lime, or compoſt ſhould be laid on the tract upon which the hedge is meant to be planted; after this is done, and the manure properly incorporated with the ſoil, a furrow ſhould be drawn with a common plough about the end of November; in this furrow the plants ſhould be placed, and the earth, thus impregnated with the dung or compoſt, drawn up to and trod firmly about their roots. When the ſoil has been previouſly cleared of weeds in this manner, and a ſufficient quantity of manure beſtowed, the hedge, if the plants are healthy, and ſuited to the ſoil and climate, may be committed to the earth, with every proſpect and chance of ſucceſsful growth.

With regard to the third circumſtance, or the time and mode of planting, it is contended, that of whatever plants the hedge is to be made, they ought always to be put into the ground, either before winter, or very early in the ſpring, before any vegetation takes place. In this way, if the plants have been carefully taken out of the nurſery ground, and no material injury done to their roots by laceration, pruning, or otherwiſe, their growth receives ſcarcely any check, and they make more progreſs in one year, than they would do in three or four years under different management. The beginning of November, or any time during the month of January, ſeems the moſt proper time for planting thorns.

The holly, where it is made uſe of, muſt however have a different treatment, and be planted out at a very different ſeaſon of the year, as upon theſe its ſucceſs and progreſs ſeem wholly to depend. The proper time for tranſplanting or removing this ſort of plants is about the middle of the ſummer ſeaſon, as at this period they are found to ſcarcely ſuffer any check from the operation. From the want of knowledge of this fact numerous hedges of this ſort have failed; as, when removed during the winter months, plants of this kind are almoſt certain to be deſtroyed; while, under the contrary circumſtances, they grow with certainty, and in the moſt rapid manner. In putting them into the ſoil, their root fibres ſhould likewiſe be as little trimmed off as poſſible, and the ground ſhould not be in too moiſt a ſtate.

The mode of planting thorn, and other ſorts of hedges of that kind, differs in different places, and even in the ſame place according to the nature of the hedge: when hedges are made in the face of a ditch, bank, mound, or wall, the univerſal practice is to lay the plants horizontally, either upon the ſurface, or upon a paring of ſod or earth taken from it; and afterwards cover them in ſuch a manner as that about ſeven or nine inches of their length ſhall be covered with the ſoil, and about three inches left projecting without it. In this way, ſufficient room is left for the roots ſtretching out and forming an eſtabliſhment for the plant, while the part left projecting is ſo ſhort as not to be able to produce above two, or at moſt three good ſhoots, which, from the ſmallneſs of their number, will be vigorous and uſeful; whereas, if a greater length had been left without being covered, the ſhoots would have been more numerous and of courſe weaker; the future value of the hedge depending entirely on the number and ſtrength of the firſt ſhoots the plants make. We have already hinted at the neceſſity of preparing the ſoil properly by tillage and manures; and in this mode of planting, namely, upon the plain ſurface in the face of a ditch, bank, mound, or wall, it is equally neceſſary as in any other; dung, lime, or compoſt, ought to be laid upon the tract, and pointed in with a ſpade, and in place of laying the earth taken out of the ditch indiſcriminately upon the roots of the thorns, care ought to be taken to cover them with the beſt of the ſurface mould; by ſuch treatment, having a well prepared, well manured, bed below, and a covering of good earth above, the roots of the plants have not only abundant room to ſpread, but have alſo plenty of nouriſhment; this gives them a decided advantage at their firſt ſtarting, and enables them to make more progreſs in two or three years than they would otherwiſe do in twice that length of time. In the bank method of planting hedges, there is much variety in the heights to which the banks are raiſed, but the proper height muſt probably be directed by the nature of the ſoil and the ſituation. And beſides the horizontal mode of laying in the plants into the banks, there are other methods practiſed in particular caſes.

In reſpect to the manner of planting a hedge upon the common ſurface it is very ſimple; a furrow, about eight or nine inches deep, is made with a common plough upon the tract that has been previouſly limed and dunged: to render the furrow as clean as poſſible the plough ſhould be drawn twice along it; one labourer then goes along the furrow with a bundle of plants under his arm, which he drops in handfuls of ſix or eight together at certain diſtances: when he has gone over perhaps a hundred yards in this manner, he returns to the farther end, where he began to drop the plants; and, taking up the firſt handful, begins to ſet them in the bottom of the furrow, not in a direction perpendicular to the horizon, but inclining a few degrees in the ſame direction that the fence runs. Theſe the labourer places, leaning againſt the perpendicular ſide of the furrow, at the requiſite diſtance from each other, as from four to ſix or eight inches: having placed the whole of them in this manner, he covers them with the earth from the other ſide, or that which has been turned up by the plough: when this operation is finiſhed, he ſets a foot on each ſide of the hedge, and, beginning at one end of it, goes ſlowly along, treading the earth cloſe to the roots of the plants the whole way; the ſoil is then pointed with a ſpade on each ſide, which finiſhes the operation. Where the neceſſary pains have previouſly been taken to pulverize the ſoil, a ſingle labourer will, with great eaſe and exactneſs, plant ſeveral hundred yards of thorns or other hedge-plants in the courſe of one day.

Another method conſiſts in one labouring man receiving the plants, by two or three at a time, from another, who carries a bundle of them, ſetting them in the middle of the furrow, with the top reclining a little, and drawing a quantity of earth from each ſide with his foot to cover the roots: when about fifty or a hundred yards are completed in this way, each labourer takes a common garden rake; and draws up a ſufficient quantity of earth to each ſide of the plants; treading the ſurface with their feet, as they go along, in ſuch a manner as to bind the ſoil moderately, and at the ſame time ſet the plants in a ſtraight line.

And a third mode of practice conſiſts in harrowing the tract or line of the hedge, or raking it with a garden rake, then ſtretching a line along it, laying out a furrow with the ſpade, and afterwards planting the thorns or other plants, and laying the earth to them in the manner deſcribed in the above methods. The laying out a furrow with the ſpade in this way admits of the work being done with great neatneſs and accuracy; but it is attended with conſiderably more labour and expence, and, after all, appears to poſſeſs no great ſuperiority over planting with the plough. In ſome caſes the hedge is planted with the dibble, but it will be ſeen below that this practice muſt be an improper one; for if the plants have the whole of their roots preſerved, and are planted with a dibble, inſtead of the fibres being properly ſpread out, as they always ought to be, they will be crammed together into a very narrow ſpace, with their points ſtaring upwards; or, in other words, looking out of the ſoil, in place of dipping into it: or, if by much pruning they are cut ſo cloſe as to be made fit for going into the dibble hole in an eaſy manner, their growth will ſuſtain a very ſevere check by ſuch injudicious pruning. In conſidering hedges as forming the conſtituent parts of compound fences, the circumſtances connected with the planting of each will be more fully deſcribed and pointed out.

In regard to the ſtate of growth or age at which hedge-plants may be uſed with the greateſt advantage and propriety, it may be obſerved that it is extremely common, particularly where young hedges are made with quickſets, to plant them out at one, two, or three years old, but ſeldom exceeding this laſt age. Plants of this ſort, when put into the earth at a proper ſeaſon of the year, upon a line of fence which has been prepared in a proper manner, and which are afterwards kept clean by a careful attention, and the earth ſoft and looſe, by regular weeding and digging, ſeldom fail to form good fences: ſuch young plants are, however, it is ſuggeſted by ſome, long in a ſtate of infancy, and require great nurſing, and the moſt complete protection to bring them to perfection, and are liable to be either much hurt, or totally deſtroyed by many accidents that would produce little or no effect upon older and ſtronger plants. It is the opinion of many ſenſible and well-informed people, that much time might be ſaved in the rearing of hedges, and the fences be much more perfect and uſeful, if older plants were employed for that purpoſe. Three years old is certainly the youngeſt that ſhould be planted, and if they are even ſix or ſeven years old, ſo much the better: the prevailing idea that plants of this age will not thrive if tranſplanted, is, it is ſaid, totally unfounded; as, with proper care, they not only grow readily, but make excellent fences in one half of the time that younger plants uſually do, with this additional advantage, that they are much leſs liable to be killed or injured by froſt, drought, weeds, or the other cauſes that affect younger plants. Thorns of ſix or ſeven years old, in place of being no thicker than a common ſtraw, will be at a medium more than an inch in circumference; we leave thoſe who are judges to determine how far a plant of this laſt deſcription will be ſuperior to one of two years old, and how much ſooner it will anſwer the purpoſe of a fence. It is, however, very material to obſerve that, where plants of this age and ſize are uſed, the moſt complete care ſhould be taken to preſerve the roots as entire as poſſible. The degree of pruning which may be neceſſary before planting will be mentioned afterwards. In reſpect to the ſize of thorns, or other hedge-plants, it may be neceſſary to obſerve, that, when the plants are once obtained, they ſhould be ſeparated into ſorts, according to their ſizes and apparent ſtrength, picking out the largeſt firſt, and ſo on downwards. This will be attended with ſeveral very material advantages, which thoſe who have made obſervations on the ſubject will very readily underſtand: plants of the ſame ſize and ſtrength, when planted together, keep pace with each other; no one of them takes from the earth more than its own ſhare of nouriſhment, of courſe, the growth of the whole is regular and uniform, and the hedge, when arrived at a certain age, becomes a ſubſtantial efficient fence of an equal height throughout, and free of any gaps: whereas, when no pains have been taken in aſſorting the plants, and they are planted promiſcuouſly, great and ſmall, ſtrong and weak, the conſequence is, that the ſtrongeſt plants very ſoon outgrow ſuch as are weaker, and not only overtop them, but alſo deprive them of that nouriſhment which they ſo much require: as the hedge advances in age the evil becomes greater, ſmall ſtunted plants, and innumerable gaps appearing throughout the whole line of the fence; theſe are interſperſed with others remarkable for their ſtrength and luxuriance, the whole conveying to the mind not the moſt diſtant idea of utility. And the worſt part of it is, that, when hedges have been thus neglected in the beginning, no pains or induſtry on the part of the farmer will be ſufficient to render them uſeful afterwards: there being nothing more difficult than that of repairing the defects of a hedge, after the third or fourth year of its growth. This aſſorting of hedge-plants has, it is contended, a farther advantage; namely, that of putting it in the power of the perſon who plants the hedge to put down the large, ſtrong, healthy plants upon the pooreſt part of the line of the fence, and to ſet ſuch as are ſmaller and weaker upon the richer and more fertile parts. He has it alſo in his power, by a more careful preparation of the ſoil, and beſtowing a greater portion of manure upon the ſpaces where the ſmall plants are ſet, to give them that nouriſhment and aſſiſtance which they require, and which would very ſoon enable them to form a fence equal to that part occupied by the ſtrongeſt plants that have been employed.

With regard to the dreſſing and pruning of hedge-plants before they are put into the earth, there is perhaps no part of the ſyſtem of managing them, or foreſt-trees, more hurtful and defective than that now purſued in the common nurſeries. It is a very common practice with nurſerymen in the ſpring, when they wiſh to clear their ground for other purpoſes, to take up great quantities of thorns and other hedge-plants, and after pruning the tops, and cutting off nearly the whole of the roots, to tie them up in bundles, and lay theſe bundles in heaps till they are called for. In that mutilated ſtate they often remain for many weeks, with the mangled roots naked and unprotected, expoſed to every inclemency of the weather before they are ſold. The conſequence is obvious; the ſevere pruning, by curtailing the number of the roots, and depriving the plants of the means of drawing their nouriſhment from the earth, would of itſelf prove an effectual check to their future growth, even if they were planted immediately after this ſevere trimming; but by being allowed to remain ſo long expoſed to the weather afterwards, the tender fibrous extremities of the remaining roots are moſt of them deſtroyed, and when the plants are then put to uſe, they are not only half dead, by being ſo long expoſed above ground, but are, as it were, inſulated, and their connection with the earth cut off by the ſevere pruning and deſtruction of their roots. Under theſe unfavourable circumſtances they muſt remain in the ground till new roots are produced, during which period they ſuffer a total want of nouriſhment, and if the ſoil be dry, and much warm dry weather follows the planting of the hedge, many of the plants will periſh before they are capable of puſhing out and producing a number of new roots ſufficient for their ſupport. Accordingly, many of them fail from theſe cauſes, and numbers of hedges which, under different management and with ſmall trouble, would ſoon have been complete fences, are full of gaps, and remain for ever after in an imperfect ſtate. When thorns or other hedge-plants are thus ſeverely handled, and their roots and tops ſo unmercifully cut off, they reſemble cuttings more than plants, and muſt remain a very long time in the earth before they are capable of ſending out new roots, or drawing from it a quantity of nouriſhment adequate to their ſupport. Were nurſerymen and others, who raiſe theſe plants, to beſtow the ſmalleſt attention upon the ſubject, common ſenſe would dictate a very oppoſite treatment. Men of obſervation know, that in every inſtance where either trees or herbaceous plants are to be tranſplanted, the more carefully they are taken out of the ground the more numerous and entire their roots, and the ſooner they are again put into the earth, the leſs check will they receive, and the quicker and ſtronger will they afterwards grow. If theſe obſervations are juſt, how faulty and defective muſt the ſyſtem we have juſt now deſcribed appear! Indeed nothing can be more repugnant to nature and common ſenſe than to ſuppoſe, that when plants of any deſcription are removed from the ſituation in which they are growing, and ſent to ſuch a new eſtabliſhment in a different ſoil, and perhaps a worſe climate, they will thrive better by having their roots cut off, and being almoſt entirely bereft of the means of obtaining nouriſhment. With equal probability might ſucceſs be expected from planting a colony with people, after having completely mutilated them by cutting off their hands, putting out their eyes, &c. In place of this treatment, the defects of which are ſo obvious, and the conſequences reſulting from it ſo hurtful, no hedge-plants ſhould be lifted out of the nurſery-ground till the day on which they are to be re-planted; and inſtead of digging them with a ſpade, by which they are often much injured, they ſhould be taken up with dung-forks with ſtrong round prongs, taking care to diſengage the roots carefully from the ſoil; and, in place of the ſevere pruning and dreſſing already mentioned, every root, even to the ſmalleſt fibre, ſhould be carefully preſerved, and the uſe of the knife confined entirely to the neceſſary curtailing of the tops. Where this care is taken, and the plants are put into the ground at a proper ſeaſon, they will ſuffer no kind of check, and when the ſpring arrives grow luxuriantly and with a vigour much greater than is commonly the caſe.

It may be farther obſerved, that much of the benefit ariſing from an attention to the foregoing circumſtances will depend upon the after-management of the hedge. Complete weeding, looſening, and laying new earth to the roots for the firſt three or four years, are indiſpenſably requiſite; for whatever pains may have been previouſly taken in dunging and ſummer-fallowing the ſoil, unleſs it is properly attended to, and kept clean afterwards, this dunging and ſummer-fallowing, in place of being uſeful, will prove hurtful to the fence; as the manure and tillage, by enriching and opening the ſoil, will encourage and promote the growth of weeds, which, under circumſtances ſo peculiarly fortunate, will become ſo luxuriant as either to deſtroy or materially injure the growth of the hedge, unleſs they are kept down by frequent and complete cleanings. Theſe weedings are of two kinds, and ought to be conducted in two different ways. If the weeds are principally annuals, a ſlight ſcuffle with a hoe will be perfectly ſufficient, and this to be repeated as often as a new crop of weeds appears; but when the weeds in place of annuals are compoſed of root-weeds, or, in other words, of perennial or biennial plants, the extirpation of theſe laſt will be attended with more trouble. With weeds of this deſcription ſcuffling will not anſwer, as though the tops may be cut off by that operation, the roots remain, and not only furniſh repeated crops of the ſame weeds, but alſo rob the hedge of its proper nouriſhment. In place, therefore, of ſcuffling and cutting off the tops of ſuch weeds with a hoe, the ground ought to be carefully dug with a dung-fork, of the kind already deſcribed for lifting thorns. An inſtrument of this ſort is preferable to a ſpade, as it cuts none of the roots of the hedge, looſens the ground ſufficiently, and at the ſame time admits of the weeds being readily and eaſily picked out. The firſt weeding of this kind that is given to a young hedge ſhould be early in the ſpring, when, if it is completely done, there will be little occaſion for any farther trouble during the ſeaſon. Cleaning at that period has a farther advantage, namely, that of looſening the ſoil at the exact time when the roots are beginning to ſpread and extend themſelves; whereas, when it is delayed till the ſummer, the weeds have attained a conſiderable ſize, have deprived the hedge of much nouriſhment, and the opening of the ſoil then expoſes the roots of the hedge to the parching heat of the ſummer ſun. In the cleaning of young hedges, eſpecially ſuch as are ſituated in the face of a ditch or bank, it is the univerſal cuſtom for the labourer to ſkim off the ſurface with a ſpade, and let it fall into the bottom of the ditch. This operation, though it gives the hedge an appearance of cleanneſs, is attended with ſome very conſiderable diſadvantages; repeated parings of this kind, in the face of a ditch or bank, in a few years waſte the front ſo much as in ſome degree to undermine the hedge, which after froſt or wet weather is apt to ſlide and tumble down; the paring off and throwing into the bottom of the ditch ſo much earth, together with the roots and weeds it contains, very ſoon choaks and fills it up.

Notice will afterwards be taken of the neceſſity of conſtructing hedge-fences in ſuch a way as that the hedge ſhall not project immediately from the front, but ſhall be placed upon a ſhelf, or what is termed a *ſcarcement*, of not leſs than twelve or fourteen inches broad. By ſuch management the hedge will run no riſk whatever of being undermined by the earth falling into the ditch, and may be kept clean with as much eaſe as a common garden-border. The proper method of cleaning a hedge, planted in this manner, ſeems to be that of digging the border with a ſhort-pronged fork in the ſpring, picking out ſuch of the weeds as can be readily taken up by the hand, and afterwards raking it with a garden-rake; this laſt operation, along with its making the ſurface ſmooth, and giving the work a finiſhed look, will alſo bring out a great number of the ſmalleſt roots that had eſcaped the labourer's notice in digging it with the fork. Some imagine that by a ſlight weeding once or twice a year for the firſt two or three years after the hedge is planted, they do all that is requiſite; this, however, is a miſtake; for though a hedge may, by care and attention for the firſt five years of its growth, attain ſuch a height as will prevent it from being ſmothered by the weeds, ſtill it will ſuffer much injury from them, not ſimply by the nouriſhment they take from the hedge, though that muſt be conſiderable, but by the effect they have upon the lateral branches near the root, many of which they kill, and by that means render the fence open and naked at the bottom. Skilful hedgers are well acquainted with this circumſtance, and very properly conſider annual cleanings and looſening the ſoil about the roots as equally neceſſary to the welfare of the hedge as the other operations of ſwitching, pruning, &c. &c. The apparent trouble and expence of cleaning every deſcription of hedge yearly will no doubt preſent a formidable obſtacle to the practice; but, when properly conſidered, this labour and expence will be found more apparent than real; for if a proper weeding has been given when the hedge was firſt planted, and the earth well opened, the only trouble required afterwards will conſiſt in giving the ground on each ſide of the hedge a ſlight ſcuffle with a hoe, a work at which a labourer will be able to do a very great deal in the courſe of a day.

To this practice of keeping hedges clean with a view to promote their growth, is to be added another motive, of equal, indeed of ſuperior, moment: round moſt of the incloſed fields in Britain, the ſpace occupied by the fence is conſiderable; and as no part of this ſpace is under the plough, it is left to produce ſuch plants as nature or accident may have brought into the ſoil; theſe, by being ſuffered to grow, and their ſeeds to ripen yearly, are wafted by the wind into the adjoining fields, where they multiply beyond conception, and create an endleſs trouble to the occupier, rendering abortive a great part of the labour and expence incurred in fallowing. A perſon who is ſenſible of the advantage ariſing from the extirpation of weeds of every deſcription, either in the fields or their immediate vicinity, muſt feel a conſiderable degree of pain to obſerve, about the end of ſummer clouds of the winged or bearded kind riſing from the ſide of every hedge or highway with the ſlighteſt breeze of wind, and ſcattering themſelves over the adjoining fields, which have been perhaps fallowed the year before at a heavy expence; the evil is undoubtedly great, and affects the innocent as well as the guilty, it being no uncommon thing for the beſt farmers to have their fields rendered foul by the wind blowing the weeds of their ſlothful dirty neighbours upon them. The remedy is eaſy: let every farmer be obliged to cut down the weeds round the whole line of his fences, ſo early in the ſeaſon as to prevent them from running to ſeed; and let the truſtees of every county, in making contracts for the repair of the public roads, bind the contractors to cut down the weeds annually. The labour of theſe operations will be very trifling, and their benefit to the public ſcarcely to be calculated.

It may be remarked, that in looſening the earth about the roots of hedges, whether old or young, it will be of advantage, if there is ſoil enough to admit of it, to lay up a few inches of it to the roots; doing this frequently encourages them to puſh out branches near the bottom, which prevent them from growing thin and open, a fault to which almoſt all hedges are liable, if due pains are not taken to prevent it. When a hedge has been planted in the face of a ditch, bank, or mound, with a projecting ſpace or ſcarcement before it of ſufficient breadth, a ſupply of new earth may be laid up to the roots every two or three years, from the ſediment let fall by the water in the bottom of the ditch; this ſediment is in general the richeſt of all ſoils; and as it is neceſſary to remove it from the bottom of the ditch, for the purpoſe of cleaning the water courſe, employing it in this way not only ſaves the trouble of carrying it elſewhere, but promotes the growth of the hedge, and gives the fence a much more finiſhed look. Upon the ſides of highways the ſame thing may be done with advantage, not only to the hedge, but the road alſo; for though there may be no ditch to require cleaning, yet as moſt of the highways in Britain have a greater or leſs declivity towards the ſides, the decayed materials of which the road is made, together with the horſe dung and other matters dropped upon it, are waſhed down from the top to the ſides, where they accumulate in conſiderable quantities; ſhovelling this carefully up, and laying it to the roots of the hedge, afford the plants at once protection and nouriſhment. Where hedges are planted upon the plane ſurface, the earth can be laid up to the roots with great eaſe; and at each cleaning it certainly ſhould be done. The trouble of doing ſo is trifling, the advantage very conſiderable in many points of view.

In ſpeaking of the pruning and after-management of hedges, it is obſerved, that though a ſtrict attention to the foregoing circumſtances, during the infancy of the hedge, is highly neceſſary to produce healthy vigorous plants, a very conſiderable part of its beauty and future value will depend upon theſe being properly performed.

It may be remarked, that there is, perhaps, no part of the ſubject upon which a greater contrariety of opinion at preſent prevails, than the age at which the pruning of hedges ought to commence, the manner of that pruning, or the ſeaſon of the year at which it may be given with the greateſt poſſible advantage, and the leaſt riſk; the practice with ſome is to prune from the firſt year, not only the lateral branches, but the tops alſo; and they give as a reaſon, that cutting off the extremities of the ſhoots contributes to the thickening of the hedge, by making them puſh out a great number of new ones. The fallacy of this argument, and the miſchief with which the practice is attended, we ſhall have occaſion to notice afterwards. As to the manner of pruning, or the form of the hedge, theſe ſeem with many to be matters of indifference, no attention being paid to dreſſing them in ſuch a way as to have them broad at bottom, and tapering gradually towards the top; many of them being not only of one width from top to bottom; and not a few much heavier and broader above than below, it is obvious that ſuch hedges can neither look well nor be uſeful.

The ſeaſon at which they are trimmed is, in many inſtances, it may be obſerved, an improper one; for in place of chooſing that time when the plants are leaſt in danger of ſuffering from an effuſion of their juices, which is either at a late period in the autumn, or very early in the ſpring, the pruning is given in the ſummer ſeaſon, when vegetation is in its prime, and the plants are full of juices: the check and injury they muſt receive from having the whole of their extremities cut off at that period may eaſily be conceived.

When ſpeaking of the treatment of hedge-plants before they are put into the ground, notice has been taken of the neceſſity of preſerving the roots as much as poſſible, and at the ſame time ſhortening the tops: this laſt operation has two good effects; for by curtailing the top and branches the roots have leſs to nouriſh; and by leaving only two or three inches of the top above ground, in place of growing up with a ſingle ſtem, it ſends out two or three; and as theſe ſtrike out from the plant ſo near the earth, each of them has the ſame effect, and ſtrengthens the hedge as much as the original ſtem would have done by itſelf; with this addition, that in place of one prop or ſupport, the hedge will have three or four. After this firſt pruning, however, no hedge ſhould be touched, or at leaſt very gently, for ſome years: from an inattention to this circumſtance, and the injudicious application of the knife or ſhears at an early period, many young hedges are rendered uſeleſs, which, under different treatment, would have made excellent fences, with one-half the trouble that was required to deſtroy them. The practice of cutting over the tops yearly, which is done with a view to render the hedge thicker and more perfect, is one of thoſe miſtakes which one would naturally have ſuppoſed common ſenſe and obſervation would have ſooner corrected; the effect produced being, in almoſt every inſtance, the very reverſe of what was intended: ſhortening the main ſtem of a thorn or any other plant makes it bruſh out a number of ſmall ſtems immediately at the place where it has been cut; and if this operation is repeated once or twice a-year, every one of theſe is again ſub-divided, as it were, by ſending out more branches; thus, in a courſe of years, during which the hedge makes very ſmall progreſs upward, if it be examined, inſtead of being found to conſiſt of ſtrong vigorous plants, with a good main trunk, each reaching from top to bottom of the hedge, and a ſufficient number of lateral branches throughout the whole length of it, it will be found by ſuch repeated cuttings, in the ſame ſtunted ſituation, as certain young trees and ſhrubs that are frequently cropped by ſheep or cattle. From the repeated crops of young ſhoots which the tops ſend out after every clipping, and the great quantity of nouriſhment neceſſary to ſupport ſuch additional numbers, the lateral ſhoots at the bottom, upon the ſtrength and numbers of which the value of the hedge in a great meaſure depends, are ſtinted in their growth, and ſoon die; the hedge, of courſe, becomes open and naked at the bottom, and conſequently uſeleſs as a fence. Where a hedge has been thus ruined, there is no remedy but cutting it over, cloſe by the ground; this will immediately produce a number of healthy, vigorous, upright ſtems, which, under proper management, will ſoon form a good fence.

From the firſt year of planting, till the hedge has riſen to the height of five or ſix feet, the main ſtems ought to be left untouched, and the pruning confined ſolely to the ſide branches, leaving thoſe next the root pretty long, and gradually tapering towards the top; this pruning of the ſide branches will make them ſend out many new ſhoots from their extremities, which, by repeated trimmings, will become ſo thick as to fill up every interſtice from top to bottom of the hedge; while the main ſtems, by being left untouched, continue their growth upward, till they arrive at the neceſſary height, when they may have their extremities cut off with perfect ſafety. When a hedge has attained the wiſhed-for height, all that is requiſite afterwards is regular ſwitching with a hedge-bill, preſerving it pretty broad at bottom, and drawing it gradually to a point at top: this form of a hedge is pleaſant to the eye, is well calculated to ſtand the weather, and, by being thus above the nouriſhment that would have been waſted in ſupporting a thick, buſhy, over-grown top, is retained by the branches at the bottom, which are thereby ſtrengthened, and their numbers conſiderably increaſed; while the trunk, by having no more exertion to make in an upward direction, becomes every year ſtronger and thicker. A hedge of this ſort, in full leaf, has the appearance of a ſolid wall, and, when viewed after the leaves are ſhed, preſents to the eye a ſet of maſſy growing piles, ſo ſtrong and formidable as to bid defiance to any attempts that may be made to break through them. A hedge-fence trimmed in this way is repreſented at *fig.* 10. in the plate to which we have referred.

Cutting over old live hedges.—With reſpect to the cutting down of old hedges, the above directions and obſervations apply, it may be obſerved, with ſtrict propriety, only to ſuch as have been regularly attended to from the time of their being planted: as there are, however, innumerable hedges in the kingdom, which, by being neglected, have grown up to a great height, have become open and naked below, and buſhy and unmanageable at top; it is of conſequence to point out the means of reducing ſuch hedges to a moderate ſcale, and rendering them uſeful. This purpoſe, it may be ſtated, can only be effected by cutting them down, and procuring from their ſtumps a growth of new ſhoots, which, with proper management, will ſoon make a perfect fence. If the fields incloſed by ſuch hedges are alternately in paſture and tillage, the period moſt proper for cutting them down is when the field is to be ploughed. Under a corn crop the confinement of the ſtock is no longer an object; and by the time the field is again brought under the plough, the hedge, if properly treated, will have acquired ſtrength enough to become a good fence.

This operation is performed in ſeveral different ways; in the firſt the hedge is cut over, about a yard above the ſurface, and is left in that ſtate without any other pains being taken with it; if it has originally been good, and the plants thick enough at bottom, this kind of cutting will anſwer the purpoſe perfectly well, and in a few years the hedge will, with proper dreſſing, become both a neat and an uſeful fence. A hedge cut over in this way, with one year's growth of new ſhoots upon it, is repreſented at *fig.* 11. in the plate.

However, in this mode, when there has been a deficiency of plants, and the hedge is cut over in the manner abovementioned, innumerable gaps will appear, which, without ſome art, it will be impoſſible to fill up. It has alſo this farther diſadvantage, that if either horſes or cattle attempt to leap into, or out of, the incloſure, the ſharp points of the ſtakes are apt to run into their bellies; this, accordingly, often happens, and many valuable horſes and cattle are killed, or greatly injured by ſuch means.

Another, and indeed a preferable mode of cutting down old hedges, is, to cut a fourth part of the plants over, to the height which the fence is intended to be made, and to bend down and warp the remaining three-fourths with theſe upright ſtems. This method very effectually cures the gaps and openneſs below, and, with ſlight attention, ſoon makes a good fence. At *fig.* 12. is a repreſentation of a hedge done in this method of cutting.

And a third way of cutting over old hedges, is that of taking them off cloſe by the ſurface; this practice, where the plants are numerous, and there are no gaps in the hedges, anſwers very well; but when there is a deficiency of plants in any part of the hedge, the want will be very apparent. This laſt mode, though much inferior to the one immediately preceding, is nevertheleſs greatly preferable to that firſt deſcribed, as the young ſhoots ſent out from the ſtumps, by being ſo near the ground, will in ſome meaſure remedy the defects occaſioned by the want of original plants, whereas, when the old plants are cut at the diſtance of about a yard, or four feet above the ſurface, the young ſhoots produced by the cutting will be ſo high, as to leave the hedge open at the bottom, and very thin.

There is another method of cutting down old hedges; but which is yet but very little practiſed, which is firſt to cut them down even with the ſurface of the bank, &c. and afterwards to cover the ſtumps completely over with the earth taken out of the ditch, or from the road ſide. When this is carefully done, it is aſſerted that every ſingle root ſends out a great number of young vigorous ſhoots, each of which, by branching out from the ſtump below the ſurface, ſends out roots, and acquires an eſtabliſhment for itſelf: by this means, the bottom of the hedge becomes ſo thick, that neither ſheep, cattle, nor indeed any animal, can break through it.

In which-ever of theſe ways the hedge is cut down, the directions formerly given for the management of *young* hedges ſhould be ſtrictly attended to, as ſoon as the young ſhoots have made ſome progreſs; the ſide branches ſhould be trimmed, and the hedge put into a proper ſhape, preſerving it broad and full at bottom, and tapering gradually towards the top, as ſhewn above. The ſame caution is alſo to be obſerved with regard to the upright ſhoots, none of which ſhould be ſhortened till the hedge has attained the wiſhed-for height. It is ſurpriſing what cloſe beautiful fences are raiſed in this way, in a few years, from the ſtumps of ſome over-grown uſeleſs hedges; which, at the ſame time with their being naked below, and of courſe faulty as fences, occupied four times the ſpace they ought to have done, to the great loſs both of the proprietor and farmer.

The obſervations formerly made with regard to the proper ſeaſon for pruning and ſwitching young hedges apply with equal, indeed greater propriety to the cutting down of old ones; as, if this operation is done at an improper ſeaſon, from the largeneſs of the ſtumps, the extent of wounded ſurface expoſed to the weather, and other circumſtances, the plants are in imminent danger of being deſtroyed; indeed this very often happens when, through ignorance or inattention, the proprietors of hedges have them plaſhed or cut over during ſummer. It is unneceſſary in this place to enter into any digreſſion as to the uſe of leaves and branches to plants of every deſcription; it is ſufficient for the preſent purpoſe to ſtate what experience and common ſenſe have abundantly proved, *viz.* that the loſs of either, eſpecially when the plants are in a growing ſtate, and the juice circulating through them, is in moſt caſes attended with the deſtruction of the plant; indeed the thing ſpeaks for itſelf; the juice of the plant, inſtead of being employed in nouriſhing the top and branches, flows in great abundance through the ſection of the trunk, and by finding ſo ready an exit, draws from the root a quantity of nouriſhment, far exceeding the proportion required for its former ſupport; by ſuch an unuſual drain, the plants are exhauſted, or, as is commonly ſaid, they bleed to death. It is to be obſerved, however, that every deſcription of plants is not equally affected by a ſummer cutting; thoſe that are moſt juicy and ſucculent, and have the largeſt circulating veſſels, always ſuffering more than ſuch as are of a harder texture, have ſmaller pores, and leſs ſap circulating through them. The birch, larch, poplar, willow, and, in general, all plants that contain a large proportion, either of reſinous or ſaccharine matter, are to be ranked in the firſt claſs; the different kinds of thorn, crabs, &c. &c. belonging to the ſecond; the former are almoſt infallibly killed by a ſpring or ſummer pruning; while the ſame operation is often practiſed upon the latter with little apparent injury. But though we thus readily admit that one deſcription of plants will ſurvive an operation by which others would be killed, it by no means follows that they are not injured thereby; there are, indeed, too many proofs to the contrary, as in almoſt every county there are thorn-hedges met with, that have been plaſhed or cut over in ſummer; and which, though they have not died in conſequence of the operation, yet, by the loſs of juices, and the expoſure of their naked trunks and wounded extremities to the parching rays of a ſummer ſun, have been ſo much weakened, as to prevent them from putting out new ſhoots, and have ever afterwards remained in a naked ſtate, exhibiting an appearance no way better than that of a dead-hedge. This picture is the very reverſe of what, under different treatment, would have been the caſe; as when the old plants are cut over at a proper ſeaſon, a healthy luxuriant crop of young ſhoots never fails to be produced.

The proper ſeaſon for cutting over hedges is either at a late period in the autumn, or very early in the ſpring; at both of theſe periods the plants are equally ſafe from injury; at the former, the juices are retiring towards the root, and early in the ſpring they have not begun to riſe. In either caſe, no danger whatever can ariſe from the bleeding of the plants, as, long before the circulation takes place, the wounds occaſioned by the cutting will be completely healed; all cuttings or trimmings ought therefore to be done at one or other of theſe periods. The ſame remarks alſo apply to the modes of cutting over and repairing fences mentioned below.

Plaſhing hedges.—There is a practice in many of the Engliſh counties, which is common in reſpect to fences; that of, after the plants have attained the wiſhed-for height, cutting their ſtems about half through, within a few inches of the bottom; then bending them a little down, all in one direction, and binding them together at top with willows, as repreſented at *fig.* 3. in the ſecond plate on fences. This, when properly executed, forms a very pretty neat looking fence, but is liable to ſeveral objections. By the cutting of the plants ſo near the root, unleſs great pains are taken, there is a chance of cutting them too much; indeed, in ſome inſtances, they are cut through altogether; the value of the hedge is by this means leſſened, and gaps appear in many parts of it. The binding at top being of dead wood ſoon decays; and the plants either riſe up, if they have not been very much cut, or if the cutting has been deep, they are apt to be blown to one ſide, and even broken over by the wind. Owing to theſe cauſes many hedges, where the plants are ſufficiently numerous and healthy, and which, with little trouble, would have formed beautiful and uſeful fences in a ſhort time, have their value impaired, and are rendered faulty and defective. Cutting the ſtem too much ſubjects them to another evil, namely, the miſchief ariſing from heavy falls of ſnow, by which, when the quantity is conſiderable, eſpecially if there is a high wind to accumulate it about the hedge, it is thereby preſſed down, and many of the plants break entirely over.

The practice noticed above, of cutting one-third of the ſtems over, at the height of about four feet from the ſurface, leaving thoſe as ſtandards, and warping them with the others that have been left of the full length, makes a much ſtronger fence, and one that is leſs liable to injury, either from the attempts of cattle, or from the wind, or heavy falls of ſnow. What adds to its value is, that the warping and binding of the buſhes, being done with live wood in place of decaying, as is the caſe when willows or hazels are made uſe of, grow ſtronger with time, and the plants are in the end as completely interwoven, as to form a fence, which nothing can exceed either for cloſeneſs or durability. The way in which this operation is commonly done is liable to one objection, however, it being cuſtomary to trim away the whole of the branches before the ſtems are bent down: this renders it, no doubt, a much eaſier buſineſs for the workman; but it materially injures the hedge, leaves it thin and open in many places, and gives it not only an unpleaſant appearance to the eye, but makes it leſs uſeful as a fence. This defect is not in general repaired for a year or two; whereas, by leaving as many of the ſide-ſhoots as poſſible upon that part of the plants that is to be laid horizontal; and, after the whole hedge is warped, trimming it neatly with a hedge-bill, it will form at once a ſolid and uſeful ſort of fence. Hedges done in this way are repreſented at *figs.* 11. and 12. in the firſt plate on fences.

Where, however, the buſineſs of plaſhing hedges is executed in a proper manner, the above objections will in a great meaſure loſe their force. This is the caſe in the county of Hertford, and the method of performing the work is this; the hedgers firſt begin to clear the old hedge of all the dead wood, brambles, and other irregular growing rubbiſh, leaving all along the top of the bank the ſtraighteſt and beſt growing ſtems of the thorn, hazel, elm, aſh, oak, ſallow, and beech, as well as other kinds, to the number of about five or ſix in the yard. But where there are any gaps, or places that are thin of live wood, more are left on each ſide of them. This being done, they have recourſe to the repairing of the ditches, which ſhould not be leſs than three feet by two and a half, having the width of ſix inches at the bottoms in dry ſoils; but in ſuch as are wet, not leſs than four feet by three, and one at the bottom. The whole of the earthy materials which are raiſed from the ditches is laid up on the banks with great care, the overlooker being attentive to the matter. When the ditches have been thus finiſhed, the men begin with the hedges. Such of the ſtems of the plants as are left in cutting the old hedges over, that are found growing in the line where the new hedge is to run, are cut off at the height of three feet from the top of the bank, being reſerved for hedge-ſtakes to the hedge which is to be raiſed. This is an excellent practice, as ſuch ſtakes, from their being immoveable and incapable of rotting, keep up the new hedge in ſuch a manner that it never falls, or leans in any direction. The dead hedge-ſtakes are in the next place driven firmly into the bank, where they are wanted, ſallows or willows being moſtly choſen in order that they may take root and grow. The remainder of the live wood which had been left ſtanding is then plaſhed down by the hedgers. In executing this part of the work they make two cuts in each of the ſticks, one ſtroke being given near the ground, and the other at the diſtance of eight, ten, or twelve inches above it, but only juſt deep enough to ſlit out a part of the wood between the two cuts, leaving the ſtem ſupported by a little more than the bark, or about a fourth part of its firſt ſize. It is then laid down along the top of the bank, and interwoven with the hedge-ſtakes. All the plants are ſerved in the ſame way, and where they are not ſufficient to fill up and complete the hedge, dead wood is had recourſe to; but this ſhould be avoided as much as poſſible, from its injuring the living plants in its decay. The work is completed by running an eddering along the top of the fence in the manner which is practiſed in making dead hedges.

The making of this ſort of hedge fence is a matter which requires great exactneſs and judgment in order to perform it in a proper manner. It is, however, moſtly done by thoſe who are in a great meaſure ignorant of its nature, often cutting the plants in a downward direction inſtead of an upward one, by which they are expoſed to ſpeedy decay and deſtruction. Where the work of plaſhing is well executed, the cuts formed for the laying down of the plants ſhould not be made in the manner ſhewn at *fig.* 13. in the firſt plate on fences; but as is repreſented in *fig.* 14.

In the execution of this buſineſs, it is very material that the operator be furniſhed with a hedge-bill which is perfectly ſharp, as the neatneſs of the work depends greatly on this circumſtance. The old ſtubby parts of the hedge ſhould be cut ſo low as that it may be covered with the mould from the ditches in the after cleanings of them, and the layers, or parts laid down, ſhould not have more connection with the old ſtumps than is barely ſufficient to convey the ſap juice in due proportion to the plaſhes, or layers. In this way the ſtumps ſoon throw out plenty of young ſhoots for a new hedge, the layers being merely deſigned to ſerve that purpoſe until the young wood gets up again. The moſt healthy and beſt plants ſhould always be ſelected for the plaſhes, and thoſe deſigned for ſtakes ſhould not be too large; the ſize of a ſtrong walking ſtick is quite ſufficient, as they increaſe faſt. It is the practice of ſome diſtricts to lay the plaſhes high, while in others they are laid down very low. Both theſe extremes are attended with diſadvantages, as by the firſt too much ſap juice riſes into the plaſhes for the due ſupport of the bottom ſhoots, by which they become weak and trifling, the hedge being of courſe left thin where the contrary ſhould have been the caſe; and by the latter the hedge is left too low, and conſequently more liable to injuries from cropping with cattle, &c.: the middle courſe ſhould of courſe be purſued. After the layers, or plaſhes, are interwoven with the ſtakes, and the ſuperfluous twigs of the hedge dreſſed off by the bill, ſome nick the layers in different places at the diſtances of about a foot, by which it is ſuppoſed more branches, or ſhoots, are thrown out from between the nicks, or cuts, as the ſap juice riſes more ſlowly.

It is of great advantage to the riſing of the hedges in theſe caſes to have the incloſures under the plough for two or three years after they have been plaſhed.

This ſyſtem of making fences ſhould be more generally practiſed in thoſe diſtricts where it is yet but little known, by having labourers from thoſe where it has been long in uſe, as by it the farmer muſt derive conſiderable advantage in having hedges which are chiefly formed of living materials inſtead of ſuch as are dead, and conſequently on the conſtant decay.

In moſt places the wood which is thinned out in forming ſuch fences, will amply repay the expences which are incurred in making them.

A hedge plaſhed in the proper manner is ſhewn at *fig.* 15. in the plate.

It ſhould be conſtantly recollected that in every operation of the above kind, in which old hedges are either cut over or plaſhed, and bent down ſo as to conſtitute a fence, the ground on each ſide ſhould, as ſoon as circumſtances will admit of it, be completely dug over, cleaned of weeds, and the earth laid up to the roots of the plants. It is truly ſurpriſing what numerous and luxuriant ſhoots the ſtumps ſend out when managed in this way: while, on the contrary, when theſe neceſſary operations are neglected, fewer ſhoots proceed from the old trunks; and of theſe few a a conſiderable proportion is choaked and deſtroyed by the weeds and other rubbiſh in the bottom of the hedge-bank.

Filling up gaps in hedges.—In reſpect to filling up gaps in young hedges, it may be remarked, that when young hedges are planted, if the plants made uſe of are of a nature ſuited to the ſoil, the hedge may be kept free of gaps with very little trouble: for this purpoſe it is, however, neceſſary, about the end of the firſt autumn, after the hedge has been planted, to examine it carefully throughout its whole extent, and take out ſuch plants as are either in a decaying ſickly ſtate, or thoſe that are actually dead, and fill up the ſpaces they occupied with the ſtrongeſt and moſt vigorous ones that can be found: where this care is taken for the firſt two or three years, there will be no defects in the hedge, which will be uniformly thick and ſtrong throughout.

But when old hedges are meant to be cut down, that have many gaps or open ſpaces in them, ſo wide as to prevent the poſſibility of the young ſhoots filling them up, ſome expedient muſt be had recourſe to, in order to render the fence complete. This purpoſe may, it is ſuppoſed, be anſwered in different ways: the eaſieſt, and indeed the moſt common method is, for the hedger, when he comes to a place where any of the plants are wanting, to take one of the ſtrongeſt plants next to it, and after giving it a gentle ſtroke with the hedge-bill, to bend it acroſs the opening, and entwine its branches with the thorns on the oppoſite ſide: indeed, as has been already ſtated, ſome have a cuſtom of cutting down only a fourth part of the ſtems, and warping the remainder with theſe, which appear like ſtakes driven into the earth. Where the hedge is ſhortened to within three or four feet of the ground, both of theſe plaſhing methods anſwer pretty well, and the openings which would otherwiſe have been left, are in ſome degree filled up; but when the old hedge is cut cloſe to the earth, other methods of ſupplying the defects become neceſſary. One very ſimple, and at the ſame time very effectual mode, conſiſts in firſt digging the ground pretty deep with a ſpade, and taking one of the ſtrongeſt plants on each ſide of the opening, that have been purpoſely left uncut, removing the earth from their roots ſo much as to looſen them, and admit of their being bent down, and laid cloſe to the earth in the opening, as repreſented at *fig.* 16. in the plate. They ſhould then be faſtened down with wooden hooks, or pins, and entirely covered throughout the whole of their length with earth. Where this plan is properly executed, the plants ſo laid down ſend up a great number of young ſhoots, which very ſoon fill up the vacancy: when it is practiſed upon a hedge that is cut over cloſe by the ſurface, no other care is requiſite; but where it is done with hedges that are cut at three or four feet above it, there will be a neceſſity for placing a temporary paling in the gap, to protect the young ſhoots from injury, till they acquire a ſufficient degree of ſtrength, as repreſented at *fig.* 1. *Plate* XIX.

It may be remarked that there is ſcarcely any thing attempted by farmers in which they are ſo unſucceſsful as in the mending of hedges: in ſome caſes the defect is attempted to be ſupplied with young plants, which, from want of attention, very ſeldom ſucceed, as they are not only ſhaded by the ſtrong old plants on each ſide, but are alſo deprived of their nouriſhment, by their roots ſpreading into the vacant ſpace. To render an attempt to mend the defects of an old hedge with young plants ſucceſsful, two things are abſolutely neceſſary: the firſt is, that the whole of the roots of the old plants, which extend themſelves into the opening, be entirely cut off; the next, that the hedge ſhall be cut down cloſe to the earth, for at leaſt a yard or more on each ſide of it. By cutting away the roots which extend themſelves into the opening, the young plants are prevented from being robbed of their nouriſhment, and cutting down the old ones, for a little diſtance on each ſide, keeps them from being ſhaded, and allows them to enjoy the full benefit of the light and air: cutting down ſo much of the old hedge, no doubt, renders the opening larger, and of courſe requires more railing or paling to ſupply the defect; but this extra expence will be more than compenſated by the ſucceſs with which it will be attended. In many inſtances theſe vacancies are filled up with dead wood; indeed it is a common practice, after a hedge is dreſſed, to cram the greateſt part of the prunings into theſe ſpaces, and under the bottom of the hedge, where it is any way open or naked. The moſt perverſe imagination, it is ſaid, could hardly ſuppoſe any thing more abſurd; for if it be the wiſh of the owner that the plants on each ſide ſhould ſend out new branches to fill up the openings, the purpoſe is completely defeated by cramming them full of dead bruſh-wood, which not only prevents the extenſion of the branches, but from the violence and injury that is committed in thruſting in dead thorns, the plants are often materially hurt; and when this bruſh-wood decays, the opening, in place of being diminiſhed, is conſiderably enlarged: the miſchief is the ſame where they are thruſt under the hedge, the practice of which, when continued, never fails to render it naked at bottom.

The uſe of ſtones for mending hedges is equally abſurd and pernicious: where dead wood is uſed in the way above-mentioned, the hedge, inſtead of being improved, is made worſe. The utmoſt that can be ſaid of ſtones is, that though they do no additional harm, the hedge is not bettered by them; and from the opening being filled up in that way, the defect is perpetuated, and both the uſefulneſs and beauty of the fence are impaired.

In ſome inſtances where the attempt has been made, the defects of grown-up hedges have been very completely, and indeed almoſt immediately, repaired, by planting ſtrong beeches in the openings; theſe ſhould be at leaſt ſix or ſeven feet in height, and ſhould be ſupported by a couple of pieces of coarſe railing put acroſs the opening. If planted early in the winter, they ſuffer no check whatever, and grow ſo vigorouſly in the ſpring as to fill up the vacancy the firſt ſeaſon, as repreſented at *fig.* 2. in the ſame plate.

And the ground in this, as indeed in every other caſe where young plants are uſed, ſhould be well dug, and enriched either with dung or compoſt; the plants ſhould be the healthieſt and ſtrongeſt that can be procured, and the whole of their roots as carefully preſerved as poſſible, as very much depends upon proper attention in theſe reſpects.

Diſeaſes of hedge-plants.—With regard to the diſeaſes of hedge-plants, it is ſuppoſed that the principal one to which they (eſpecially thorns) are liable, is being covered with moſs, which, when it arrives at any conſiderable height, gradually deſtroys them. Upon certain ſoils, ſuch as till or cold wet clay, it may be remarked, woody plants of every deſcription are ſubject to this malady; and as it is evidently owing to the nature of the ſoil, it becomes a matter of importance to be able to apply a proper remedy. Lime is well known to be unfriendly to the growth of every deſcription of moſs, and in every inſtance where it is applied the moſs diſappears. This circumſtance, once known, furniſhes a cheap and effectual remedy, both for preventing the diſeaſe upon young hedges, and curing it upon ſuch as are grown up. If the hints formerly thrown out with regard to the preparation of the ſoil before a young hedge is planted are properly attended to, and a ſufficient quantity of lime incorporated with the earth, let the former quality of the ſoil be what it may, its nature will be ſo much altered as effectually to ſecure the hedge from every riſk of being hurt by moſs. The ſame remedy may be applied with equal ſucceſs to old hedges, that are over-run with this vegetable vermin, and in which, though there may be plants enough in the ground, yet they are of no value, from the want of branches. To recover ſuch hedges, and render them afterwards good fences, they ſhould be cut down cloſe by the ſurface, cleared completely of weeds, and the earth well dug for at leaſt half a yard on each ſide of the roots. After this operation, which ſhould be done about the end of autumn, the ſpaces ſo dug ſhould be well limed upon the ſurface: it ſhould be ſuffered to remain in that ſtate during the winter, and early in the ſpring dug again, and the lime pointed in and incorporated with the ſoil. In the caſes where this has been done, the plants have ſent out a number of uſeful vigorous ſhoots, which ſoon made good hedges, and no moſs has afterwards appeared. It is from theſe experiments to be preſumed, and it is hoped experience will confirm the idea, that in every caſe where either trees or hedge-plants are infeſted with moſs, the uſe of lime, in the way here pointed out, will prove a ſufficient remedy for the evil.

Compound hedge-fences.—Theſe are ſuch hedges as do not wholly of themſelves conſtitute or form perfect fences, but which have the addition of ſome other ſort to render them complete.

Single hedge and ditch.—This is a ſort of fence that may either have a railing, paling, or ſome other defence added to it, or be wholly without them, according to the particular circumſtances of the caſe. And it is a deſcription of fence in which the ditch is of very different dimenſions according to the nature and circumſtances of it; the thorns being, for the moſt part, as Mr. Sommerville has obſerved, placed upon the common ſurface, upon what is termed a ſcarcement, or projection of ſix or ſeven inches, on which they lean, and which ſerves as a kind of bed, when they are cleaned. By placing the plants thus far back from the edge of the ditch, they are in a great meaſure ſecured againſt the accidents to which they would otherwiſe be liable, if they were placed immediately in the front of the bank; as there are few ditches, however carefully they may have been made, into which the earth does not afterwards ſlide and fall in. In caſes, therefore, where the thorns are planted immediately in the face, or what is termed the brow of the ditch, if any portion of the earth falls in, it either carries the plants along with it, or deprives them of their nouriſhment; whereas, by placing them at the diſtance of ſix or eight inches back from the front, there is no riſk whatever of their being injured by the earth falling down. It appears alſo, that the ſpace commonly allowed for a ſcarcement is by far too little, being ſeldom more than four inches. In place of which it ought never to be leſs than twelve or fourteen inches. This would have ſeveral advantages, as it would not only prevent all riſk of the earth tumbling in, and bringing the plants along with it, but would at the ſame time afford ample room for weeding the hedge completely, and drawing up the earth to the roots of the plants. Theſe are matters of conſiderable importance, and which, along with their deſtroying weeds, promote the growth of the hedge, by affording ſufficient paſture for the plants, and enabling them to reſiſt the effects of drought, froſt, &c. much more completely than they would have been able to do if planted directly in the face of the ditch. It is common to lay the hedge-plants upon the plane ſurface, without any preparation whatever. But in other caſes, the firſt ſpadeful that is taken out of the ditch is laid on the front, and the plants placed above it: whatever the ſoil or ſituation may be, it is of importance to place the plants upon a bed of good, rich, well prepared earth, capable of affording them not only a due degree of nouriſhment, but into which their roots may ſtrike with the utmoſt eaſe. Upon a very dry ſoil, and in elevated ſituations, it is ſometimes neceſſary to place the hedge-plants conſiderably below the common ſurface, to prevent them from ſuffering by drought: where this is practiſed, the ditch is firſt dug of the ordinary dimenſions, and the earth that is taken out of it laid about twenty inches back from the hedge; the labourer then, with a ſpade, cuts down a ſpace about fifteen inches broad, and ten or twelve inches deep, along the whole front of the ditch; this ſpace, when cut, reſembles a ſhelf: an inch or two of the beſt mould, well broke down, and pulverized with the ſpade, is laid upon this ſhelf, or ſcarcement, upon which the plants are then laid, not exactly in a horizontal direction, but with the tops a few degrees higher than the roots. The earth taken out in forming the ſhelf is then replaced above the roots in ſuch a manner as to form a good ſlope from the front of the ditch backwards: and where the ſoil is deep enough to admit of this being properly done, there are few ſituations, however dry, where the hedge will run any riſk of ſuffering from too much dry weather at any ſeaſon of the year.

It may be farther remarked, that in very cold wet ſituations this practice is reverſed; and in place of planting the hedge upon or below the common ſurface, it is found neceſſary to raiſe it conſiderably higher; for that purpoſe the firſt two ſpadings, or ſpits, taken out of the ditch, and which always conſiſt of the beſt earth, are laid about ten inches back from the front; this, when properly done, forms a bed of from twelve to fifteen inches in thickneſs, upon which the plants are laid; the roots are then covered with the remainder of the beſt earth, and the bank formed in the ordinary way.

Where the hedge is either white thorn, crab, or beech, the precaution of raiſing it above the common ſurface is eſſential to its welfare upon cold or wet ſoils; and in many of theſe ſituations good hedges are made in this way, that could not poſſibly have been done by any other means. It muſt be admitted, however, that by raiſing it ſo much above the common ſurface, the paſture of the plants is in a great meaſure confined to the bank formed by the earth taken out of the ditch; and, in many inſtances, when the winters are ſevere, and much black froſt happens, it penetrates the bank ſo completely, as entirely to deſtroy the hedge.

In all caſes where hedges are to be made either in this or any other way, the ſoil, ſo far as circumſtances will admit, ought, as has been already noticed, to be cleared, pulverized, and enriched with lime, compoſt, or other manures, which will not only enable them to puſh away vigorouſly, but at the ſame time prevent, in a great meaſure, the diſtempers of moſs, or cankering, which hedges upon ſtiff clays, or other cold wet ſoils, are very liable to be affected with, and of courſe much injured by them.

In ſpeaking of the *ſimple ditch fence*, notice was taken of the neceſſity of giving it a proper ſlope, to prevent its tumbling in after froſt, or being excavated by the run of the water. Where a hedge is added to the ditch this precaution is equally eſſential, indeed more ſo, as the injury done to a ſimple ditch can be repaired with the ſpade at little or no expence; whereas, when a hedge is planted in the front, any conſiderable portion of the earth falling down brings the plants along with it, and makes a breach in the hedge, which no induſtry will afterwards be able to remedy. To keep them pretty broad at top, and gradually tapering towards a point at bottom, ought to be a conſtant and invariable rule; ditches ſo conſtructed are ſeldom, if ever, undermined, and retain their ſhape for many years. Upon ditches ſo formed, from their containing little water at bottom, the greateſt preſſure and action of the fluid are upon the upper part, and upon that, from the nature of the ſlope, its effects are loſt. Thoſe who have made ſufficient obſervation know, that in every inſtance where water acts upon a perpendicular ſurface (eſpecially if the ſoil is of a ſoft incoherent nature) its force is greateſt; whereas, when it operates upon a ſloping bank its face is ſhort, and it conſequently does no injury. A knowledge of the laws of hydroſtatics explains this. The preſſure and operation of fluids is always in proportion to their altitude or perpendicular height. Upon a ſloping bank this preſſure is loſt; and the more gradual the ſlope, the leſs effect the water has. It is owing to this circumſtance that the low ſloping parts, both upon the banks of rivers, and on the ſea-coaſt, continue unaltered for many ages, while the high bold parts of the ſhore, unleſs they are entirely of rock, are continually tumbling down. The ſame thing holds good in regard to ditches; whatever the height of the column of water may be in the middle, or however rapid the current, the narrowneſs of the ditch at bottom, and its ſloping gradually upwards, divides and diminiſhes the force ſo completely, that it is ſcarcely felt upon any part of it; whereas, when the ditch is wall-ſided, and of one uniform width from top to bottom, the water, by being confined almoſt entirely to the under part, runs away the ſoil, and excavates and undermines the ſides of the ditch, which occaſions their breaking down and being carried away.

In caſes where the purpoſes of the proprietor or occupier require that the fields recently incloſed with ditch and hedge ſhould be made fencible at once, it is very common either to ſurround them with a railing or paling placed upon the top of the bank, formed by the earth taken out of the ditch, or with a wall of coarſe looſe ſtones, in the form of a Galloway-dike, placed alſo upon the top of the bank. Where ſtones are in plenty, this laſt forms an excellent fence for the purpoſe of confining the cattle, and is at the ſame time a good ſhelter for the hedge. *Fig.* 4. in the plate, repreſents a young hedge protected by an open wall of this kind, which anſwers well, and has a neat appearance.

For caſes in which a railing or paling is placed upon the top of the bank, they are made of different materials, according to the circumſtances of the particular caſe; in ſome ſituations they are made of ſlabs, in others of laths, the prunings of fir plantations, &c. in all of which, when properly executed, they not only anſwer the purpoſe of a temporary fence, but at the ſame time ſerve as a complete protection to the young hedge, from the depredations of ſheep and other ſorts of live ſtock.

Hedge and bank.—This is a kind of fence that conſiſts of a hedge planted upon the plain ſurface, with a bank or mound of earth raiſed behind it by way of protection. A very good idea of this fence may be formed from the figure. This bank, in ſome inſtances, is faced with ſod on both ſides, ſloping gradually towards the top; while in others, and indeed by far the greateſt number, it is only faced on one ſide, which is nearly perpendicular, and has a gradual ſlope on the other, ſimilar to the bank made with the earth taken out of an ordinary ditch. The hedge is frequently planted at the bottom of the perpendicular ſide that is faced with ſod; but in many caſes it is planted on the other ſide, near the bottom of the ſloping bank of earth. The laſt is certainly the beſt ſituation for the hedge; for if the earth with which the bank is made has been taken, as it generally is, from the ſide that is faced with ſod, this fencing will form a kind of ſunk fence, the bottom of which will be conſiderably below the common ſurface: of courſe, any hedge planted in ſuch a ſituation will not only be put into the worſt of the ſoil, but will at the ſame time be in danger of periſhing from the moiſture lodging there, and chilling the roots; whereas, when it is planted on the other ſide, near the bottom of the ſlope, the plants have the beſt of the ſoil to ſtrike into, and are in a great meaſure ſecured againſt the bad effects of ſtagnant moiſture and wetneſs.

It may be remarked, that in bleak expoſed ſituations, where hedges cannot be ſucceſsfully reared without ſhelter of ſome kind or other, the bank of earth is a good contrivance, as it ſcreens the young plants from the inclemency of the weather, till they acquire a degree of ſtrength ſufficient to enable them to reſiſt the rigour of the climate, which it is now well known many plants are able to do when they reach a certain age and ſtrength, that would have been completely killed, had they been expoſed in the ſame ſituation, without ſhelter, at an earlier period. In ſuch caſes of courſe earthen mounds, ſimilar to what has been deſcribed, or ſtone walls, are eſſential to the rearing of good hedges, eſpecially of white-thorn. But as this fence, like the common turf-wall, cannot be erected without a conſiderable deſtruction of the adjoining ſurface, it ſhould never be uſed but in caſes of the ſtrongeſt neceſſity. The only inſtance in which it can be made without any loſs is upon the ſides of highways, where the road is not bounded by a ditch, but ſlopes gently to each ſide; in that caſe a ſufficiency of turf and earth for facing and forming the bank may be had from the ſide of the road. This will have a double advantage; the earth, if taken from the road with judgment, and in ſuch a way as to form a gradual ſlope from the middle towards the ſides, will produce two very conſiderable advantages; the ſlope will keep the road perfectly dry, and the earth taken from it will, with the aſſiſtance of a ſlight paling, completely incloſe the field, and ſerve as a protection to the young hedge. It is worthy of remark, that when the hedge is planted behind the bank, the paling ſhould not be upon the top, as is commonly the caſe; but on the ſide next the field, to ſerve as a protection againſt the cattle grazing in it; when it is next the road, however, the paling may be placed upon the top, in which caſe it will render the fence more inacceſſible and ſecure from all ſorts of depredations. *Fig.* 3. in the firſt plate on fences, explains the manner of forming it.

Hedge in face of bank.—This is a kind of fence that differs from the former principally, in having the hedge in the front of the bank conſiderably above the common ſurface, in place of having it at the bottom, as already deſcribed. The work is executed in the following manner: the bank, faced with ſod on one ſide, and having a gradual ſlope on the other, is raiſed to the height of eighteen inches or two feet; the top is then levelled, and covered with two inches of good earth, above which the plants are laid horizontally, with their tops projecting about a couple of inches over the edge of the bank; the roots are afterwards covered with the ſame mould, and the bank raiſed to the deſired height. This fence is greatly inferior to that already deſcribed, as the hedge-plants, by being raiſed ſo much above the common ſurface, are liable to great injury, not only from the bank decaying and mouldering down, and by that means depriving them of their nouriſhment

ment and ſupport, but alſo from the effects of froſt, drought, &c. In many inſtances, however, it may be uſeful, eſpecially in the incloſing of wet lands, where hedges would not thrive, if placed upon the common ſurface; but in ſuch caſes it is worth while to notice, that great advantage will ariſe from placing the hedge-plants about eight or ten inches back from the front, upon a ſort of ſcarcement, ſimilar to what is done in the common ditches. When planted in this way, there is little or no riſk of the bank mouldering down; and the ſhelf or ſcarcement left admits of the hedge being completely cleaned, and the earth drawn up to the roots of the plants; circumſtances of importance in the growth of the hedge. This method of forming a hedge is ſhewn at *fig.* 5. in the plate.

There is another deſcription of hedge and bank fence which is met with principally by the ſides of highways, in ſituations where the ground has a ſudden declivity towards the road; in theſe caſes it is common to cut down the face of the bank, in a ſloping direction, to within eighteen or twenty inches of the bottom, where a bed is made of about two feet in breadth, covered with good earth broken very ſmall; upon this the plants are laid, with their extremities about nine inches from the front; the roots are then covered with eight or nine inches of good mould; the bed below with the projection, in this caſe, ſerves the ſame purpoſe as the ſcarcement of the common ditch, and affords complete room for cleaning and drawing up the earth to the roots of the hedge-plants. In the conſtruction of this fence it is eſſential to give the face of the bank ſuch a ſlope, as to prevent the earth from tumbling down; if this is neglected, it will be continually falling in large maſſes after every froſt, or fall of ſnow or rain. It is ſometimes the practice, however, inſtead of planting the hedge within eighteen inches of the bottom, as here deſcribed, to ſlope the bank firſt in ſuch a way, as to inſure it againſt tumbling down, and plant the hedge upon the top, at the diſtance of about a foot and a half from the verge of the bank. A hedge planted in this way, when it thrives, will certainly look much more formidable than one planted at the bottom; but it will be liable to more accidents than the other, from drought, froſt, and the falling in of the bank. It is ſhewn at *fig.* 6. in the plate.

Hedge on top of bank.—This is a ſort of fence common in many parts of England, and alſo in ſome parts of Scotland, and conſiſts of a high bank of earth taken from the adjoining ground, pretty broad at bottom, and tapering gradually towards the top, upon which the hedge is planted. It is, however, to be objected to on account of the great waſte of ſoil, the want of moiſture, and its prediſpoſition to the production of moſs. It is ſeen at *fig.* 7. This ſort of fence is not unfrequently planted on the top with coppice-wood plants cut off ſhort.

Mound, or Devonſhire fence.—This is a ſort of hedge and bank, as it conſiſts of an earthen mound ſix or ſeven feet wide at bottom, five feet in height, and four feet broad at top, being moſtly carried up between two ſod banks, and upon the middle of which a row of quicks is planted, and on each ſide, at two feet diſtance, a row of willow ſtakes, of about an inch in diameter each, and from eighteen inches to two feet long, are ſtuck in, ſloping a little outwards; theſe ſtakes ſoon take root, and form a kind of live fence for the preſervation of the quicks in the middle. This fence nearly reſembles the hedge on the top of a bank, and is equally expenſive in the erection; the formation of the bank deprives the adjoining ſurface of its beſt ſoil, and the plants made uſe of are liable to every injury that can poſſibly ariſe from drought, froſt, and the gradual decay or crumbling down of the mound. The addition of the willows to this fence is certainly a diſadvantage; if the quicks require protection, dead-wood is equal to every purpoſe that could be wiſhed or expected; and at the ſame time poſſeſſes the additional advantage of requiring no nouriſhment, and having no foliage to ſhade the quicks or other plants. It is ſeen at *fig.* 8.

Different ſorts of hedge-woods may be proper in forming fences of this nature in different ſoils and ſituations. In poor thin ſoils, in bleak expoſed diſtricts, furze is often found to afford a good fence, as well as conſiderable ſhelter. But in this caſe the ſides ſhould be kept pruned, ſo as to preſent a cloſe firm face above the top of the bank. In ſimilar expoſed high tracts of land, the beech and ſycamore are likewiſe found beneficial in raiſing fences. But in lower, more favourable expoſures for the growth of hedge wood, the hazel, oak, and aſh may be had recourſe to for this purpoſe. The ſallow is alſo a ſort of wood that often grows well on the more high and dry aſpects, and may be uſeful as a fence-wood in ſuch places.

Hedge with poſt and rails.—This is alſo a ſort of fence ſometimes employed; the railings being frequently employed for the protection of hedges, as well thoſe that are planted upon the plain ſurface, as for the hedge and ditch united. The addition of a paling is, however, more immediately neceſſary, in caſes where the hedge is planted upon the plain ſurface, eſpecially when the fields ſo incloſed are in paſture. If only one field is incloſed in this way, and the adjacent lands are under a corn crop, a ſingle railing on the inſide of the incloſed field will be quite ſufficient for its protection; but when the adjacent fields are alſo under paſture, a double railing becomes neceſſary; or, in other words, a railing placed on each ſide of the young hedge, at a ſufficient diſtance to prevent the ſheep or cattle from cropping it; without ſuch protection the hedge plants are not only liable to cropping, but alſo to being trodden and deſtroyed by their feet; an injury which, when it happens at an early period of their growth cauſes the plants to continue low and ſtunted ever afterwards. It is ſhewn at *fig.* 9. Any ſort of coarſe wood, as the thinnings of timber plantations, anſwer well for this purpoſe.

Hedge and dead hedge.—This is a fence that conſiſts of a row of quicks, or other hedge-plants, ſet either upon the plain ſurface, or in the face of a ditch or bank, having a dead hedge to protect them. This dead hedge anſwers a double purpoſe, namely, that of protecting the young plants from the injuries they may receive from cattle, or the inclemency of the weather; and at the ſame time forming a temporary incloſure, which laſts till the hedge is grown up. Where dead hedges are made of proper materials, ſuch as the cuttings of thorn hedges, &c. and are well let into the ground, they anſwer theſe purpoſes very completely, and ſhould always be uſed for the protection of young hedges, where the materials can be obtained at an eaſy rate. It is worthy of notice, however, that in every inſtance where dead hedges are uſed for the protection of live ones, in place of cramming them cloſe together, as is commonly done, there ſhould be a diſtance of at leaſt three feet between them. In that way the hedge plants will have room to grow and ſpread out their lateral branches at bottom; a thing eſſentially requiſite to the formation of a good hedge, while an opportunity will at the ſame time be afforded of weeding the hedge, and looſening the earth completely on both ſides of the plants. This ſort of fence is ſhewn at *fig.* 10. in the plate.

Hedge and wall fence.—This is of two kinds, one of which will be afterwards deſcribed, namely, a coarſe open wall, made of looſe ſtones, reſembling a *Galloway dike*, made upon the top of the bank formed by the earth taken out of the ditch. The ſecond is chiefly uſed when hedges are planted upon the plain ſurface ; in which caſe the wall, though thin and low, is regularly built, and anſwers the double purpoſe of ſheltering and encouraging the growth of the plants, while they are in a weak tender ſtate, and afterwards prevents the poſſibility of the hedge becoming open below ; where gardens are entirely, or in part, ſurrounded by hedges ; and in the incloſing of fields by the ſides of highways, eſpecially in the vicinity of great towns, where dogs and other deſtructive vermin are apt to creep into the incloſures, and annoy the ſtock ; the low wall forms a valuable addition to the fence. It is cuſtomary in ſome caſes, after the hedge has attained a certain height, and is thought to be out of danger, either to remove the wall entirely, or allow it to decay. This, according to Mr. Sommerville, is certainly a bad practice, as it not only leaves the bottom of the hedge naked and open, but at the ſame time deprives the roots of the plants of a protection to which they have been accuſtomed, and the removal of which operates as a ſevere check to their growth. In every inſtance where the wall is intended to be removed, care ſhould be taken to cover the roots of the plants that are left expoſed with good earth ; by that means they will be prevented from being hurt by expoſure to the weather, and they will ſuffer little, if any, check. It frequently happens, however, to the utter diſgrace of the proprietor, that the wall is removed, and the roots of the plants left naked, and expoſed to every injury. In ſuch caſes, if the hedge has been planted a little above the common ſurface, as ſoon as the wall is removed, the earth begins to moulder, and fall down, and continues to do ſo till the plants, deprived of their ſupport, tumble down alſo, and the hedge is by that means entirely ruined. A repreſentation of this ſort of fence is given at *fig.* 11. in the plate.

It may be remarked, that there is another deſcription of hedge and wall which properly comes under conſideration in this place ; that is, where the hedge is planted upon the top of the wall : this differs from a hedge on the top of a bank already deſcribed, only in one particular, which is that of the bank being faced with ſtones, inſtead of ſod or earth. When ſuch a fence is attempted in a level country, the wall muſt be very broad, not leſs than four or five feet, and the middle of it filled with earth ; in ſhort, the conſtruction ſhould be nearly the ſame as the Devonſhire fence, already deſcribed, only the facing on each ſide to conſiſt of ſtones in place of turf. The objections made to the Devonſhire fence apply with equal propriety to this, being expenſive in the erection, troubleſome to keep in repair, and in its nature by no means durable.

And there is ſtill another kind of this fence, which, it is obſerved, in particular ſituations, is extremely uſeful ; that is, where the land has a conſiderable declivity, which terminates abruptly on the ſide of a highway, or an incloſure running along the ſide of high grounds that leans very much to that ſide where the fence is intended to be made. This is commonly executed with a perpendicular front, and without any contrivance for carrying off the moiſture ; in conſequence of which, after bad winters, or long continued rains, the earth ſwells, the wall burſts, and is thrown down ; when the wall is of dry ſtone, there is, however, little riſk of this accident happening, as its open texture readily admits of the moiſture paſſing through it ; but when the wall conſiſts of ſtone and lime, ſtone and clay, or any other ſubſtance that prevents the diſcharge of the moiſture, the earth, as already mentioned, ſwells, and the wall burſts, and is thereby deſtroyed. In order to render a facing of this ſort durable, it is requiſite, if the wall is built with ſtone and lime, or a mixture of clay, turf, or any other materials that reſiſt the paſſage of water through them, inſtead of building it perpendicular, as is commonly done, to give it an inclination of ſome degrees backward, and to have openings at the bottom, at regular diſtances from each other, for diſcharging the moiſture that may iſſue from the bank. And in order to render theſe openings as completely uſeful as poſſible, it ſhould have a ſpace at the back of the wall, and immediately at the bottom of about twelve inches broad and the ſame depth, filled with ſmall round ſtones ; theſe, by ſerving as a kind of drain, will receive the moiſture that ſoaks down, and afford it a ready paſſage by the openings that have been mentioned. This deſcription of fence is ſhewn at *fig.* 12. in the plate.

Hedge in middle, or face of wall.—This is a ſort of fence ſomewhat like that laſt deſcribed, but which can only be made in the face of a bank where the land riſes immediately behind it ; the practice Mr. Sommerville conſiders as new, ingenious, and deſerving of attention. It is executed in the following manner : the face of the bank is firſt cut down with a ſpade, not quite perpendicular, but nearly ſo ; a facing of ſtone is then begun at the bottom, and carried up regularly, in the manner that ſtone walls are generally built ; when it is raiſed abont eighteen inches or two feet high, according to circumſtances, the ſpace between the wall and the bank is filled up with good earth, well broken and mixed with lime or compoſt : the thorns are laid upon this earth in ſuch a manner as that at leaſt four inches of the root and ſtem ſhall reſt upon the earth, and the extremity of the top ſhall project beyond the wall. When the plants are thus regularly laid, the roots are covered with earth, and the building of the wall continued upwards ; when completed, the wall is finiſhed with a coping of ſod, or ſtone and lime. When the plants begin to vegetate, the young ſhoots appear in the face of the wall riſing in a perpendicular manner. This kind of fence is ſhewn at *fig.* 1. *Plate* XX.

It may be remarked, that ſir James Hall, of Dunglaſs, has adopted this mode of incloſing pretty extenſively upon his eſtates in Eaſt Lothian, and is the firſt who introduced that plan on the eaſt coaſt of Scotland from Gallom. The appearance is at once new and handſome ; the whole ſeems to be in a very thriving condition, and in ſeveral parts the hedges have made great progreſs. Moſt of them, however, being young, no deciſive opinion can be formed as to the real advantages or defects with which this mode of incloſing may be attended. Apparently, it is liable to ſeveral objections. In the firſt place, if from weakneſs, or other accidents, any of the plants ſhould ſicken or die, a circumſtance by no means uncommon, even where every poſſible care has been taken to ſelect the ſtouteſt and beſt ; the defect thereby occaſioned cannot be repaired without taking down the wall, at leaſt as far as the place where the hedge was laid ; this will be found highly expenſive and inconvenient ; the inconvenience would, however, be leſs ſenſibly felt, if the failure of the plants happened only in one part of the wall ; but when, as will always be the caſe, the plants miſgive in many different places, it will be found a very expenſive and arduous buſineſs to take down and rebuild the wall in every place where two, three, or more thorns have failed. Were this labour and expence repaid by any extraordinary advantages, the practice might derive additional ſtrength therefrom ; that, however, is far from being the caſe ; for though the plants in a hedge of this ſort are, from the great quantity of earth laid upon their roots, leſs liable to injury from drought, froſt, &c., they are at the ſame time further removed from the genial influence of the ſun and the air.

Walls formed with or without lime have been raiſed on the banks behind the new-planted quickſet hedges, inſtead of a paling or railing, to the height of about two feet and a half, with great ſucceſs by ſir George Suttie in Scotland. The baſe of the wall is placed about nine or ten inches, or a foot, from the plants of the hedge, being made two feet thick at the bottom, battering to one at the top, and coped with flat ſtones and turfs. Where ſtones are plentiful theſe are found cheap and uſeful in rearing the young hedges.

Hedge and ditch, with row of trees.—This kind of fence differs from thoſe which have been deſcribed only in having a row of trees planted in the line of the fence along with the hedge.

The advocates for this practice ſay, that by planting hedge-rows of trees in the direction of the fence, the country is at once ſheltered, beautified, and improved; and that the intereſt of the proprietor is ultimately promoted by the increaſing value of the timber raiſed in theſe hedge rows. It is alſo ſaid that ſuch trees produce more branches for ſtack-wood, knees for ſhip-builders, and bark for the tanners, and they ſell at a higher price *per* load than trees grown in woods and groves. Beſides, cloſe-pruning hedge-row trees to the height of twelve or fifteen feet prevents their damaging the hedge; the ſhelter which they afford is favourable to the vegetation both of graſs and corn; it alſo tends to produce an equable temperature in the climate, which is favourable both to the production of, and greater perfection and beauty in animals, and of longevity to man. Though the practice of planting hedge-rows of trees is very common (eſpecially in England), though its advocates are numerous, and though theſe arguments are urged in its favour, yet the objections are alſo entitled to very ſerious conſideration. When trees are planted in the line of a fence, if that fence is a hedge, the plants of which it conſiſts will, Mr. Sommerville ſays, not only be deprived of a great part of their nouriſhment by the trees, but will alſo be greatly injured by the ſhade they occaſion and the weight of the drop that falls from them during wet weather; upon this point little reaſoning is neceſſary, for, if we appeal to facts we ſhall find that no good hedge is to be met with where there is a hedge-row of trees planted along with it. The miſchief is not, however, confined ſolely to hedges; the effects are equally bad, perhaps worſe, where the fence is a ſtone wall; for though in this caſe the ſhade or drop of the trees is hardly, if at all felt, yet when they have attained a certain height, the working andſtraining of the roots during high winds are ſuch, that the foundations of the walls are ſhaken and deſtroyed; accordingly, whenever large trees are found growing near ſtone walls, the fence is cracked and ſhaken by every gale of wind, is perpetually falling into large gaps, and coſts ten times the expence to keep it in repair, that would otherwiſe be required if no trees were near it. Admitting, however, that the trees in hedge-rows were no way prejudicial to the fence, which we have already ſhewn is by no means the caſe, another argument may be ſucceſsfully uſed againſt the practice. It is ſeldom, indeed, that trees planted on hedge-rows arrive at any great ſize; on the contrary, they are generally low and ſtunted, and while they occaſion a viſible loſs by the miſchief they do the fence, their utmoſt worth, when they come to be ſold, will ſeldom be found adequate to the loſs and inconvenience they have occaſioned. This is very ſatisfactorily accounted for from the want of ſhelter; trees planted in hedge-rows being expoſed to every inclement blaſt, by that means they are deprived of what is very eſſential to promote their growth, and which is in fact the cauſe why trees in large plantations thrive better than when they are planted ſingly; namely, the mutual ſhelter which they afford to each other; it being obſerved that all trees on the ſkirts of plantations are much lower than thoſe more removed from the extremity; this is owing to their bearing the firſt guſt of the wind which after being once broken its violence is gradually abated, and in proportion as the trees recede from the verge of the plantations they feel it leſs, and riſe to a larger ſize and dimenſions.

It may be further obſerved, that hedge-rows of trees are in a ſtill more unproductive ſituation than thoſe which form the ſkirts of a plantation; the latter being expoſed to the violence of the wind only when it blows in one direction: this is what is generally termed the prevailing wind; when the gale is from any other quarter they can hardly be ſaid to feel it; whereas, hedge-rows are expoſed to the ravages of every blaſt, in whatever direction it may blow. There are, no doubt, ſome favoured ſpots where not only hedge-rows, but even ſingle trees, may thrive and attain a great ſize, without any protection whatever; the caſes in which this happen are, however, but few, and can in no ſenſe be quoted in ſupport of the general practice of planting trees in this manner. Where the practice is adopted, the method ſhewn at *figs.* 2. and 3. in the plate may be followed.

It has been ſuggeſted by ſome, that various ſorts of fruit-trees and ſhrubs might be planted in hedge-rows, with great profit to the proprietor and farmer, ſuch as thoſe of the plum, bullace, cherry, apple, gooſeberry, and filbert kinds. How far any material benefit could be procured in this way to the farmer or the nation is uncertain, as few trials have yet been made; but it is well known that where trees of any deſcription are ſet out in hedge-rows, they quickly deſtroy the hedge-plants which are near them, and, of courſe, ruin the fence. And this would certainly be the caſe if they were planted in the cloſe manner that has been adviſed. Beſide, hedge-rows formed of ſuch ſorts of plants alone would never become fences of any great utility in the view of incloſing the lands, except in the caſe of the gooſeberry, which has long been known to conſtitute an excellent fence. This plan of raiſing fruit is likewiſe liable to various other objections, grounded on the impoſſibility of protecting the produce.

Hedge and ditch, or wall, with belt of planting.—This ſort of fence in expoſed ſituations is ſtrikingly uſeful and ornamental, while, upon the low grounds, it is not only unneceſſary, but in ſome inſtances abſolutely hurtful. For inſtance, in deep and broad valleys ſurrounded by hills, and ſheltered from ſevere blaſts, belts of planting are not only unneceſſary, but even hurtful and ruinous to the ground they occupy, which could certainly be employed to greater advantage, and the original expence of incloſing and planting ſaved. There are many inſtances, both in Scotland and England, of low, flat, rich lands being incloſed, and completely protected from the inclemency of the weather, without any aid whatever from this fence. There are other ſituations, however, where, though the lands are very flat, and the ſoil good, yet, from the want of hills and high grounds in the neighbourhood, they are ſo much expoſed to the ſea blaſts, and a current of air, paſſing over a great extent of country without any interruption, that the value of the ſoil is thereby very much diminiſhed. The peninſula which forms the county of Caithneſs in Scotland is a ſtriking proof of this: with a ſoil of a very good quality and highly improveable, its value is greatly impaired by the circumſtance of its being ſo much expoſed to ſea winds, which, coming from a very inauſpicious quarter, and blowing over a conſiderable extent of country, without meeting with any obſtacle to break the force or change their direction, blow with uncommon ſeverity and fierceneſs, and in that way are an effectual check to vegetation. There are very extenſive tracts in England, in nearly the ſame ſituation, the whole of which might at a ſmall expence be ſheltered and rendered completely productive, by interſecting the country in a judicious manner with plantations and hedges, either ſeparately or conjoined, as in the hedge and belt of planting. They ſhould be properly diſpoſed in directions ſo as to oppoſe the moſt injurious and offenſive winds, and where their force can be the moſt effectually broken and warded off. Acroſs valleys, dips, and expoſed plains, as well as on the ridges, points, and hangs of hills, they may frequently be found particularly beneficial. In the formation of them conſiderable pains and attention will be found neceſſary. It is eſſential that the plants made uſe of ſhould be well ſuited to the nature of the ſoil and expoſure. Where the ſituations are of the bleak and barren deſcription, the larch may be moſt beneficial as timber, but much inferior to the common fir in the view of ſhelter in the winter ſeaſon, when moſt ſtood in need of. Where live ſtock are to derive advantage in this way, the plants employed ſhould be ſuch as are cloſe at the bottom, otherwiſe miſchief may ariſe, eſpecially to ſheep, from ſnow driving through and drifting on the contrary ſide. Where larch is uſed, therefore, the common fir ſhould be had recourſe to for the outward margin, which, by being cut or headed down to about twelve or fourteen feet, will afford the neceſſary ſhelter for a great length of time, as they would, in that caſe, throw out lateral branches, and become feathered to nearly the bottom, while the larch, by riſing to conſiderable height, would leſſen the force of the winds above, and render the air more mild.

In leſs expoſed ſituations the beech, by retaining its leaves through the winter ſeaſon while young, conſtitutes a good plant for this purpoſe. Where the ſoils are deep, the oak may alſo be uſed in the ſame intention: and the holly is a ſort of plant that, in particular caſes, is capable of application in the ſame view.

In every caſe where it is meant that the hedge and belt of planting ſhall conſtitute a durable and efficient fence, it muſt be made of a certain breadth; from forty to fifty feet is the very leaſt breadth that ſhould be allowed: and in caſes where the ſituation is very elevated, and the intrinſic value of the ſoil ſmall, the belts ſhould be three times this breadth; ſuch a ſpace will allow abundant room for planting ſuch a number of trees as will, by the mutual ſhelter which they afford to each other, promote their growth, and protect them againſt the blaſts which are ſo ſeverely felt in thoſe elevated regions. The more effectually to promote the deſirable purpoſe of ſheltering the young trees, they ſhould be planted very thick; perhaps four or five times the number that is meant to be allowed to grow to the full ſize ſhould be planted. The expence of the plants in the firſt inſtance will be very trifling, and much more than repaid by the value of the weedings after they have attained a certain age; with this additional benefit, that the whole plantation will grow faſter, and in that way ſooner anſwer the purpoſe of ſheltering the lands. Planting an extra number of trees is alſo beneficial in another point of view, namely, that of affording a choice of the moſt healthy plants to be left, when the plantation is thinned out at firſt. This ſort of ſcreen fence is repreſented at *fig.* 4. in the plate.

It may be remarked that the manner of protecting theſe belts is different in different ſituations; where wood is plentifull, a ſimple paling, or ditch and paling, forms the fence; where ſtone abounds, a wall is frequently made uſe of; but in by far the greateſt number of caſes the ditch and hedge already deſcribed, or ſunk fence with a hedge upon the top, are adopted; or any of theſe, when properly executed, will anſwer this purpoſe extremely well; but as there are ſome of them better and more durable than others, and a permanence ought never to be loſt ſight of, either in this, or any other mode of incloſing, it is of conſequence to fix upon that which unites immediate uſe with durability. The ſtone wall, ſunk fence, and ditch and hedge, are certainly the moſt durable; the two firſt are indeed complete at once, and every benefit that can be derived from their uſe is immediately obtained; the hedge and ditch, on the other hand, riſes by very ſlow degrees, during which the belts are expoſed both to the weather and the injuries ariſing from ſheep and cattle breaking into and trampling upon the young trees: after all, it is very ſeldom that a hedge which ſurrounds a belt of planting forms a good or uſeful fence, as being very liable to fall into gaps and open places.

Fences of this nature are obviouſly beneficial in ſeveral different points of view, as, by defending the ſoil and live ſtock upon it, from too much cold and expoſure; by warding and breaking off the more ſevere winds and ſtorms; and by promoting a general warmth and mildneſs of the atmoſphere in ſuch ſituations.

Hedge and ditch, or wall with corners planted.—This is a mode which is employed upon ſome eſtates inſtead of the belt of planting. Upon an extenſive property, and where the fields are not very large, it is a mode of incloſing that has a good effect upon the ſcenery of the country, and anſwers the purpoſe of general ſhelter extremely well. It certainly has a more pleaſing and natural appearance to the eye than the ſtiff formal look of a number of ſtraight belts running in parallel lines; it is, however, greatly inferior to the belt of planting, for the purpoſe of ſheltering particular fields. But as in every field there is a ſpace in each angle that cannot be ploughed, by planting theſe ſpaces, which would otherwiſe be left waſte, the country is thereby ornamented, and many valuable trees raiſed with little expence, and with ſcarce any waſte of land. This is a plan which is particularly recommended in the Staffordſhire Report. “ In every act for an incloſure, let there be,” ſays the writer, “ a clauſe obliging the proprietor of the new incloſed land to plant a certain number of oaks in proportion to his ſhare of the incloſure, and directing the plantations to be made in the angles of the fields; by adopting which plan a leſs quantity of poſts and rails would be required, and the angles of each field would be converted to a profitable uſe, and corn would grow cloſe up to the rails: whereas no corn will now grow in ſuch angles. This is not the only advantage that would ariſe from this plan; the trees, full grown, would afford good ſhade for cattle, and an eaſy communication through theſe plantations would be from field to field. It would alſo be very ornamental to the country.” Others, however, doubt the utility of this practice, as, in point of fact, the greater number of ſuch corners are neceſſarily occupied by gateways that could not, without conſiderable inconvenience, and increaſing the farmer's labour, be made uſe of in any other way. The method in which plantations are formed is ſhewn at *fig.* 5. in the plate.

Furze, or whin fence.—It is evident that hedges of this kind may be had recourſe to with advantage, whenever ſuch plants are found to grow vigorouſly in a ſoil; and others of a better kind cannot be had. Fences of this nature are moſtly made upon mounds or banks of earth by ſowing the ſeed of the plant. Sometimes the bank is only ſloped on one ſide, but at others on both; in the former caſe the front is perpendicular, and faced with turf or ſtone. From theſe fences being raiſed ſo conſiderably above the common ſurface, they are very liable to injury from froſt and other cauſes in ſevere winters. Different fences of this ſort are repreſented at *figs.* 6. and 7. in the plate.

Railing and paling fences.—Theſe are ſuch as are conſtructed of ſome ſort of woody material, either in a rough or more finiſhed manner. In ſpeaking of paling or timber-fences in general, it has been obſerved by Mr. Sommerville, in his excellent eſſay on this ſubject, that in all permanent plans of incloſure, palings are only to be conſidered in a ſecondary light; for of whatever wood they are made, however ſubſtantially they may be executed, or in whatever ſituation they are placed, their decay commences the inſtant they are erected. The ſlighteſt attention will be ſufficient to convince every perſon of obſervation of this truth. Where permanent uſe therefore is required, palings ought never to be adopted; but for ornament in pleaſure-grounds, or for the protection of young thorns, they are highly valuable. When the different kinds of palings come to be ſpoken of, notice will be taken of the mode of conſtructing each; but as there are certain circumſtances which may be conſidered as common to all palings, this is judged the moſt proper place to mention them

In all caſes where either dead hedges or palings are uſed, the decay and ultimate loſs of the fence is owing to that part of it which is let into the ground being rotted by the moiſture. Where dead hedges are planted, it is no eaſy matter to provide a remedy againſt this evil; as the ſtems are ſo numerous, that to give each of them a preparation that would completely defend it from the effects of moiſture, would be attended with an expence equal to, if not greater than, the value of the fence. Where palings, however, are uſed, eſpecially the moſt expenſive and ſubſtantial kind of them, and ſuch as are meant both for duration and ornament, it is deſirable to prepare the ſtandards, or upright parts that are placed in the earth, in ſuch a manner as will enable them to reſiſt the moiſture for many years. In the ſouth of England, the poſt is always more bulky at the lower end than the upper, and is fixed in the ground by digging a hole, placing it therein, ſhovelling the ſoil in gradually, and ramming it round the poſt till it be firmly fixed. It has been a practice, time immemorial, to *burn* or *char* that part of the ſtandards or palings intended to be ſet or driven into the earth: the reaſon aſſigned for this practice was, that the fire hardened the parts thus ſubjected to it, and by rendering them impervious to moiſture, made them more durable than they would have been without ſuch operation: but it probably depends upon their being thus rendered leſs capable of decompoſition. The beſt defence at preſent known againſt the effects of the weather is, the above writer aſſerts, the bark of the tree. This covering it has from nature, and it is poſſeſſed of every requiſite that is neceſſary, being impregnated with oil, reſin, and other matters, which ſecure it completely, not only againſt moiſture, but other injuries ariſing from the operation of air, light, heat, &c.; of this we have ſtrong proofs by obſerving what happens where the bark of any tree is deſtroyed, by cutting off a branch, or otherwiſe. If the ſurface laid bare by the wound is conſiderable, the body of the tree oppoſite to it begins immediately to decay, and continues to waſte, unleſs ſome covering is made uſe of to ſupply the place of the bark for that purpoſe; nothing has yet been found ſo effectual as a coat either of boiled oil, or of oil-paint, which, by completely excluding both air and moiſture, not only preſerves the tree from rotting, but alſo prevents it from bleeding and waſting itſelf by an effuſion of juices from the wound. When trees are cut down and ſawn into planks, whether for palings or any other purpoſe, where they are afterwards to be expoſed to the weather, the ſame thing happens that we have mentioned as taking place with the growing tree when deprived of its bark, but in a much greater degree, as the whole ſurface is then without a covering. To prevent this decay the ſame remedy ſhould be applied, *viz.* painting the whole of the wood, or otherwiſe filling the pores with oil in ſuch a manner, as to prevent the entrance of moiſture. There are now coarſe oil-paints ſold of all colours ſo cheap, as to enable perſons erecting palings, or other works of wood, to paint them at a ſmall expence. Another very good remedy is to be had at a moderate price, (lord Dundonald's coal-varniſh,) into which, if the points of the ſtandards that are to be drove or ſet into the earth are dipped while the varniſh is boiling hot, it will preſerve them from the bad effects of moiſture for a very long time; previouſly to the dipping, they ſhould be properly ſharpened, and upon no account whatever charred or burnt, as every attempt of that kind will, upon inquiry, be found to injure the texture of the wood, and haſten its decay. This application, which has been found highly valuable for many purpoſes, and for which the noble diſcoverer is entitled to the gratitude of his country, has only one fault; namely, that it does not penetrate deep into the wood, and after being laid on a few months, is very apt to ſcale and throw off with froſt, or the action of the ſun: it has the farther diſadvantage of hurting the appearance of the wood, and giving it an old, black, decayed look. Common tar, or melted pitch, may alſo be ſucceſsfully employed for the purpoſe of defending the extremities of the upright parts of palings from moiſture: linſeed and train oils may alſo be uſed with ſucceſs; the great object being to fill the pores completely with ſome unctuous or greaſy matter, ſo as to prevent the admiſſion of moiſture. The poſts ſhould be completely dry before they are dipped in any of theſe preparations; for if they are either made of green wood, or have imbibed much moiſture, if after being dipped they are expoſed to the ſun, or a ſevere froſt, the moiſture will become ſo much expanded thereby, as to burſt through, and bring off the coat of paint and varniſh, &c.; whereas, when they are made of well-ſeaſoned wood, and are at the ſame time perfectly dry, and the pitch, oil, varniſh, &c. boiling hot, it readily enters the pores, and by filling them completely, prevents the acceſs of moiſture, and conſequently the injurious effects produced by it.

It is further remarked, that in a few inſtances, a method different from many of theſe has been tried, and found in ſome degree to anſwer. Inſtead of ſharpening the points of the ſtandards, they are left of the ſame thickneſs at both ends; and the extremities, inſtead of being drove into the earth in the ordinary way, are let into large ſtones ſunk into the earth, with round or ſquare holes cut in them, of ſuch a ſize as to admit the round or ſquare ends of the poſts. In this way the upright poſts of palings certainly laſt longer than when they are drove into the earth without any preparation; but the difference of durability in the two caſes bears no kind of proportion to the difference of expence; and as the ſtones are ſunk into the earth, and of courſe within the reach of the moiſture, the decay of the paling, though ſomewhat protected thereby, is in the end equally certain. Upon the whole, when the expence and durability of theſe different methods are compared, it will be found by much the beſt way to drive the ſtandards into the earth, after having previouſly prepared them by dipping the extremities into any of the articles we have mentioned, and of which any of the coarſe oils are ſuppoſed by far the beſt. In addition to which he has to add, that this dipping and preparation ſhould be ſo applied as to riſe ſeveral inches above the ſurface of the earth after the ſtandard is drove into the ground; for if no more is dipped than what is driven in, the wood will imbibe the moiſture at the ſurface, and very ſoon rot and decay at that place. Thus much is neceſſary to be ſaid of the preparation of that part of the wood which is drove or ſet in the earth. To render the whole paling as durable as poſſible, it ſhould receive a covering of lord Dundonald's varniſh, or one of the coarſer kinds of oil-paint, or oil. Where uſe only is wanted, and the appearance of the paling is not an object, a coat of varniſh or oil will anſwer very well, but when a paling is made of dreſſed wood, ſubſtantially executed, and in ſight of the road, or of a gentleman's houſe, it becomes neceſſary to unite uſe with ornament. In ſuch caſes a coat of white or green oil-paint will defend the wood equally well, and look much better; where it is intended that the paling ſhould appear viſible at any great diſtance, and convey an idea of incloſure, the white paint ſhould be uſed; but when it is meant to conceal the fence, and give an unbroken view of extenſive lawns or pleaſure grounds, the green paling is preferable; next to the ha-ha, or ſunk fence, it is the beſt contrivance for that purpoſe, being of the ſame colour with the graſs, it is not viſible to the eye at any great diſtance. After having thus mentioned what appears moſt eſſential reſpecting palings in general, we may proceed to notice the different kinds that are made uſe of for the purpoſe of incloſing land in different circumſtances and ſituations.

Simple nailed paling.—This is a ſort of paling, or railing fence, that conſiſts of upright poſts drove or ſet into the earth at certain diſtances, and croſſed in three, four, or more places, with pieces of wood in a horizontal direction. This deſcription of railing, or paling, is for the moſt part made of coarſe ſawn wood, without any dreſſing whatever; in Scotland it is, Mr. Sommerville ſays, termed a ſlab-paling, and is the one commonly employed for the protection of hedges, and for ſtrengthening ditches, &c. For temporary purpoſes he thinks it anſwers extremely well; but that, where durability is required, and no other fence is uſed, it will be found a very inſufficient ſort of fence. A method of conſtructing it is ſhewn at *fig.* 8. in the plate.

This railing is often made with only two horizontal pieces, and anſwers well where no great height of fence is required, as in defending young thorn hedges, and many other ſimilar purpoſes. It has likewiſe, in ſome caſes, only one longitudinal piece, ſawn in a triangular form, nailed firmly down upon the tops of the upright poſts.

Jointed horizontal paling.—This fence conſiſts of maſſy ſquare piles, drove or ſet into the earth at regular diſtances, through which mortiſes, or openings, are cut, for the extremities of the horizontal pieces which traverſe them. When properly executed, this fence, it may be obſerved, has a neat and durable appearance. It is, however, much leſs ſo than it appears to be, as the points of the piles drove into the earth ſoon rot, and the mortiſes, or openings, cut in the body of the piles for the reception of the horizontal pieces, weaken them very conſiderably; ſo much ſo, that, in many inſtances, the railings, or palings, decay faſt at thoſe places where the joinings, or mortiſes, are made. It may be further remarked, that where valuable palings of this kind are made, there is an eaſy method of faſtening the horizontal to the upright parts of the paling, without cutting or weakening any part of the upright poſts. This conſiſts in fixing the croſs, or horizontal bars, to the upright poſts with iron ſtaples. Theſe, while they anſwer every purpoſe that can be expected, from binding and connecting the different parts of the fence, have, it is conceived, not the ſmalleſt tendency to diminiſh the ſtrength, or accelerate the decay of any part of the fence. This ſort of paling is repreſented at *fig.* 9. in the plate.

Upright lath-paling.—This is made by driving or ſetting a number of ſtrong piles into the earth at regular diſtances, and croſſing theſe at top and bottom, and ſometimes in the middle, with horizontal pieces of equal ſtrength; upon theſe laſt are nailed, at from ſix to twelve inches diſtance, a number of flat, or ſquare pieces of ſawn wood, of the ſhape and ſize of the laths that are uſed for the roofs of tiled houſes. This ſort of paling, when properly executed, looks very well; and, notwithſtanding its apparent ſlightneſs, if well ſupported by props, or reſts, at regular intervals, laſts a long while; and, where there are plantations of young firs in the neighbourhood, laths may be made at a trifling expence. For the protection of young hedges, &c. it will, the writer juſt mentioned thinks, be found ſuperior to almoſt every other, as the cloſeneſs of the upright pieces prevents the ſheep or cattle from putting their heads through between them, and cropping the young hedge; an advantage which horizontal palings do not poſſeſs. For gardens it will likewiſe, it is conceived, be found both uſeful and ornamental, and infinitely better adapted to the training of fruit-trees and currants than the eſpalier-railings commonly uſed. It is ſeen in the plate at *fig.* 10.

Horizontal young wood-paling.—Young firs, or the thinnings, or weedings, of any other ſorts of young trees, may be beneficially employed in this way. They may be had recourſe to with great advantage upon eſtates where there are extenſive woods, or where they are ſurrounded by belts of thriving plants; the thinnings of ſuch woods, or belts, being highly valuable for making ſuch palings, eſpecially when the plantation conſiſts chiefly of firs; the palings of young firs are of two kinds, either horizontal or upright. The horizontal reſembles the jointed, dreſſed paling, deſcribed at *fig.* 9; but the upright is ſimilar to the lath-paling, and is ſeen at *fig.* 11. In the repreſentations that are here given, the young fir boughs, of which *figs.* 11. and 12. in the plate are formed, have their lateral branches cut off at the diſtance of about three inches from the trunks. This method has ſeveral advantages, as that of rendering them ſtronger than they can poſſibly be when the lateral branches are cut cloſe by the trunk; the labour required to prune them is alſo leſs, and they make a better fence than ſuch as are cloſe trimmed, as the ſharp projecting points prevent the ſheep or cattle from leaning or rubbing upon them ſo much as in other caſes. For rough purpoſes they anſwer perfectly well.

The upright paling of young firs, repreſented at *fig.* 12. however, in place of being made in the manner above deſcribed, is ſometimes formed by driving the upright parts into the earth, and covering them at the top with a piece of flat ſawn wood, through which holes have been previouſly bored with a large auger, to admit the ſharpened points of the upright piles: this forms a very neat paling, and, when well ſecured with ſpurs, or reſts, at the back, laſts a conſiderable length of time without the neceſſity of being much repaired.

Horizontal chain-fence.—This is a ſpecies of fence which is made by fixing a number of ſtrong ſquare poſts, or piles, into the earth at regular diſtances, in the direction in which the fence is to run ; each of theſe piles has three ſtrong ſtaples, or iron hooks, drove into it on each ſide ; one near the top, one within eighteen inches of the bottom, and one in the middle ; to theſe ſtaples, or hooks, chains are faſtened and ſtretched horizontally, in the ſame manner as the pieces of wood are in a common horizontal wooden fence. When it is meant that the fence ſhould be laid open for any temporary purpoſe, hooks are drove into the poſts in place of ſtaples, and the chains hung upon them; but where this is not wanted, the ſtaples will be found the moſt ſecure method. In ſome caſes the upright parts of this fence, in place of wooden-piles, ſuch as have been deſcribed, conſiſts of neat pillars of maſon-work, with hooks or ſtaples batted into them for faſtening the chains to ; theſe, when properly executed, look extremely well, and laſt much longer than the wooden poſts. In a few inſtances the purpoſe of poſts is anſwered very completely by large growing trees, into which hooks or ſtaples are drove, for faſtening the chains, as in gentlemen's avenues, public walks, &c. For the confinement of horſes or cattle, a chain-fence will anſwer very well ; and if the pillars are of ſtone, will be very durable, but will be found totally unfit for incloſures, where ſheep, hogs, &c. are meant to be paſtured ; it is beſides ſo very expenſive, that it can never come into general uſe. In avenues, however, and public walks, and for ſtretching acroſs rivers, and pieces of water where there are no flood-gates, and where no other fence can be made to complete the incloſure, they will be found preferable to every other contrivance that can be had recourſe to. There is a fence of this ſort repreſented at *fig.* 1. *Plate* XXI. There are a great many varieties of fences of this deſcription, ſome being made very light, while others have great ſtrength and weight. The chain is uſually procured from the ironmonger, being ſold at different prices by the pound.

Net-fence.—This is a method of fencing chiefly uſed in ſhrubberies and pleaſure-grounds, and conſiſts, like the laſt, of a number of ſquare piles of wood drove or ſet into the earth, at regular diſtances, each of which has a couple of holes bored through it, one at top, and another at bottom, large enough to admit a rope of about twice the ſize of a man's finger ; theſe ropes, after being drawn through the holes, are ſtretched the whole length of the fence, and well ſecured, and upon them a ſtrong net is faſtened, of a length and breadth ſuited to the fence, either by ſewing or tying it at regular diſtances with ſtrong cord or rope-yarn at top and bottom ; it is farther ſecured below by one or more wooden hooks drove into the earth between each of the piles ; this completes the fence; but to render it durable not only the piles, but alſo the net and ropes, ſhould be covered with a coat or two of good oil-paint. When well finiſhed this fence has a very pretty appearance, but is neither a durable nor uſeful one, as ſheep and cattle readily entangle themſelves in it, and tear and deſtroy it with their horns ; indeed, in many inſtances the ſheep get themſelves ſo much entangled, that in ſtruggling to diſengage themſelves they are either much hurt, or entirely ſtrangled. In point of utility, the net fence has nothing to recommend it ; but as it will in many inſtances give a neat finiſhed look to pleaſure-grounds, it may be worthy of a place among fences of theſe kinds. A net-fence is ſhewn at *fig.* 2. in the plate. The netting employed in this way is of different ſizes and weights, being ſold in the rope ſhops by the pound.

Rope fence.—This is a fence of nearly the ſame kind as the former, that is, it conſiſts of upright poſts, drove into the earth at regular diſtances, with holes bored through them for the ropes to paſs ; in general they conſiſt of three, and in ſome caſes of four, courſes of ropes, like the chain fence. This can only be uſed for confining cattle or horſes; for ſheep they will be found quite incompetent : for ſtretching acroſs rivers or pieces of water, as has been noticed when ſpeaking of the chain fence, the ropes will be uſeful ; or even for adding to the height of a ſtone, or turf-wall, eſpecially the latter, into which if poſts are drove at certain diſtances, and one courſe of ropes put through them, ſuch an addition will render a very inſufficient fence ſecure and valuable. One obſervation ſeems, Mr. Sommerville thinks, neceſſary upon the ſubject of this fence, namely, that the perforating of the poſts for paſſing the ropes through weakens them conſiderably ; notice has already been taken of a ſimilar miſchief in the jointed horizontal paling, or poſts and rails framed, and a remedy pointed out, *viz.* that of fixing the croſs bars or horizontal pieces to the upright parts by ſtaples. In the rope fence this may be reſorted to with equal advantage, as ſtaples or ring-bolts drove into the wood anſwer every purpoſe, without impairing, in the ſmalleſt degree, the ſtrength of the poſts that are uſed. The appearance is not however ſo neat in this way, as where holes are made in the poſts for the ropes. A fence of this deſcription is ſhewn at *fig.* 3. in the plate.

Flake, hurdle, or moveable fence.—This is a ſort of fence which is ſeen at *fig.* 4. in the plate, and 11. and 12. in *Plate* XXII. It has hitherto been principally employed in caſes where ſheep or cattle are fed with turnips in the field, to divide a certain portion off with their food at a time, and in this way they are extremely uſeful, as the ſheep or cattle, by having a given quantity of food allotted them at once, eat it clean up without any loſs, which they would not do if allowed to range at large over the whole field. There are, however, many other purpoſes to which flakes may be applied with equal advantage. They form a ready method of diviſion in all caſes where ſmall portions of graſs land are to be fed down cloſe with ſheep, in order to render the herbage more fine ; and likewiſe in arable lands under the folding ſyſtem, where the improvement of them by the manure is chiefly the object. See HURDLE.

Oſier, willow, or wattled fence.—This ſort of fence is made by driving a number of piles of any of the different kinds of willow or poplar, about half the thickneſs of a man's wriſt, into the earth, in the direction of the fence, and at the diſtance of about eighteen inches from each other. They are then twiſted, or bound together at different places, with ſmall twigs of the willows or poplars, as repreſented in the ſketch. This kind of fence has ſome advantages peculiar to itſelf; it not only forms a cheap and neat paling, but if it is done either about the end of autumn, or early in the ſpring, with willows or poplars that have been recently cut down, the upright parts or ſtakes will take root, grow, and ſend out a number of lateral branches ; and if pains are taken the following autumn to twiſt and interweave theſe branches properly, a permanent fence, ſo cloſe as to be almoſt impenetrable, may be formed in two or three years. For the incloſing of marſhy lands, or for completing any incloſure, where a part of the line in which the fence ought to run is ſo wet as to be unfit for the growth of thorns, or the building of a wall, the willow-paling will be found an excellent contrivance, and the uſe of it will render many incloſures complete, that could not otherwiſe have been formed. This mode of fence is ſeen at *fig.* 5. in the plate.

Growing tree-fence.—This is a kind of fence which is made by planting beech, larch, or other ſorts of trees in the direction of the fence, at about a yard diſtant from each other, more or leſs, as may be thought neceſſary ; theſe trees ſhould be protected by a common dead paling till they are ten or twelve feet high, when they ſhould be cut down to ſix feet, and warped or bound together with willows at top, and in the middle; the cutting off the tops will have the effect of making them puſh out a great number of lateral branches, which, if properly warped and interwoven with the upright part of the trees, in the manner deſcribed for the willow fence, will both have a beautiful effect, and will at the ſame time form a fine fence, which, in place of decaying, will grow ſtronger with time, and may with very little trouble be kept in perfect repair for a great length of time. In theſe caſes ſometimes the fences are formed by railings being nailed to the growing trees as poſts, and then the living parts warped with them. A fence of this kind is ſhewn at *fig.* 6. in the plate.

Horizontal and upright ſhingle fences.—Theſe are chiefly made of firs, coarſely ſawn into deals, of from half an inch to an inch thick, and of different breadths, according to the diameter of the tree, pretty ſtrong ſquare poſts or piles are drove or ſet into the earth, and the deals nailed horizontally upon them, in ſuch manner that the under edge of the uppermoſt deal ſhall project or lap over the upper edge of the one immediately below it; the fence, when finiſhed in this manner, will have nearly the ſame appearance as the bottom of a boat or cutter. This deſcription will be well underſtood by thoſe who have been in North America, where not only the roofs, but the walls of many of their houſes, are made with ſhingles. When completed, this fence is nearly as formidable as a ſtone wall, though, as may naturally be ſuppoſed, it is much leſs durable. An upright fence is ſometimes made with ſhingles, which, when properly executed, looks extremely well, and is indeed highly ornamental; this fence is made by fixing perpendicular poſts in the earth, nailing three pieces of wood horizontally, and covering theſe with ſhingles placed perpendicularly; in this caſe the ſhingles are not above three inches broad, and the extremities of each are pointed at the top. Several fences of this kind are to be ſeen upon the road from Edinburgh to Glaſgow, eſpecially upon the property of ſir W. Cunningham of Livingſtone, Walter Campbell, eſq. of Shawfield, and ſome others. Theſe upright ſhingle fences are painted white, and have a very handſome appearance. It is ſeldom that incloſures of any conſiderable extent have been made with theſe ſhingle fences: for folds they anſwer extremely well, and can be ſhifted with as much eaſe as flakes from one field to another; they are alſo uſeful for temporary purpoſes in gardens, &c. and where turnips are eaten with ſheep upon the field, theſe ſhingle fences will be found preferable to the common open flakes, from the ſhelter they afford to the ſheep. Theſe fences may be made in many ſituations with advantage, and are ſhewn at *figs.* 7. and 8. in the plate.

Warped paling fence.—This fence conſiſts of ſlender pieces of wood drove into the earth, bent down in different directions, interwoven with each other, and their tops faſtened together with a ſlender ſort of eddering; this fence reſembles the *chevaux-de-friſe*, with this only difference, that in place of leaving the points ſtanding up, as is the caſe with that part of fortification, they are bent down and tied together. When made of dead wood this fence is equally periſhable with others of the ſame deſcription; but when made of growing plants it will be found very laſting. It is ſeen at *fig.* 9. in the plate.

Thorn hedges are ſometimes made in the chequered method, and have a curious, though not inelegant appearance, while they are perfectly ſecure againſt moſt ſorts of live ſtock when perfectly grown up. They are, however, liable to the objections of being more troubleſome and expenſive in making, and at the ſame time apt to be much injured by the conſtant rubbing of the different parts of the plants againſt each other. They in this way much ſooner fall into decay than by the other methods of forming and managing them.

Light open paling fence interwoven with thorns, or branches of trees.—This fence differs from the common nailed fence already deſcribed, only in being warped either with thorns or the branches of trees. When properly done it forms at once a very complete fence; but, like all fences made with dead wood, it will be found very periſhable, and require many repairs. It has, however, an advantage, *viz.* that when properly executed, it is proof againſt the entrance of animals of any kind. It is ſhewn at *fig.* 10 in the plate.

Wall fences.—Theſe are conſtructed of different ſorts of materials, but uſually of earth, earth and ſtone, ſtone alone, or brick, and are of various kinds; eſpecially in the ſtone wall ſorts, as *open*, *dry*, *ſingle*, *double*, &c. according to the nature and ſize of the ſtones, and the intended uſe of the fence. In England they are all commonly known by the name of *walls*, but in Scotland, the firſt ſorts more frequently by the title of *dikes*. They are for the moſt part good fences, though ſome of them, as thoſe of the earthy kinds, are not by any means durable, therefore ſhould not be formed where other better ſorts can be had recourſe to. The ſtone wall fences are the moſt uſual ſort in mountainous ſtony ſituations, where ſhelter is not particularly requiſite, and are commonly the moſt adapted to ſuch expoſed regions. They are likewiſe often met with in lower expoſures, where the diſtricts abound with ſuch materials, as on the borders of riſing grounds; but in ſuch places their appearance is by no means pleaſing.

By running *dry*, or *ſingle ſtone walls* up in as *open* a manner as the nature of the ſtones will admit, the advantages of their being leſs apt to be thrown down by winds, and at the ſame time to their being ſcaled by ſheep, are gained in ſome ſituations. In theſe caſes they ſhould only, however, be coped with looſe ſtones.

Dry ſtone walls.—In the conſtruction of *dry ſtone walls* it is in general eſſential that the ſtones be either taken from a quarry, or conſiſt of the largeſt land-ſtones broken in ſuch a manner as that they may have a good flat ſurface, in order that they may bind well; that they be built by maſons; and well pinned; that they have as dry and deep a foundation as poſſible, in order to guard againſt froſts, &c.; that they be made wide at the bottom, and tapering upwards to about the breadth of ten inches, when the coping is to be applied; that the coping conſiſt of materials that cannot be readily overturned or removed; as upon the manner in which it is finiſhed much of the future value and durability of the wall will be found to depend.

It is obſerved that dry ſtone walls are ſometimes erected by common labourers, with the round ſtones gathered from the fields, and coped with ſod; in other caſes they are made with quarried ſtones, upon which ſome pains have been beſtowed to put them into proper ſhape; a third kind, known by the name of *Galloway dike*, and ſo denominated from the circumſtance of its being originally uſed in that county. The firſt of theſe, *viz.* the wall or dike made with round or land ſtones by labourers, and covered with a coping of ſod, is, it is ſaid, a very indifferent fence. In moſt inſtances it is not only very ill conſtructed as to ſhape, being of one uniform thickneſs from top to bottom, but the ſtones, from their round figure, do not preſent a ſufficient ſurface to each other, to bind and give ſtability to the building. This fence has long been known, and is ſtill very common, in the remote parts of the country, upon eſtates where the firſt rude eſſay is made in the way of improvement, and where maſons cannot readily be had. In ſuch ſituations it has a two-fold benefit; the ſurface is cleared of many ſtones that would otherwiſe have preſented a conſiderable obſtacle to its cultivation, and the field is at the ſame time incloſed; but though theſe objects are accompliſhed for a time, their benefit is not permanent, as the wall is perpetually tumbling down; even the cattle rubbing againſt it make conſiderable gaps in many places; in that way great trouble and expence are annually required to keep it in repair. A dry ſtone wall, coped with brick, is ſhewn at *fig.* 11; and at *fig.* 12. the ſame ſort of wall covered with a coping of turf.

It is aſſerted, that when the ſtones with which dry walls are built are quarried, and done by ſkilful maſons, broad at bottom, tapering gradually upwards, and finiſhed at the top with ſubſtantial coping, the fence has a very neat appearance, and has been known to laſt thirty and even forty years without repairs. A good foundation is highly eſſential in the conſtruction of this fence; from nine to twelve inches is the ſmalleſt depth that it ſhould be below the common ſurface, eſpecially if the ſoil is open and porous, and the largeſt and heavieſt ſtones ſhould always be laid undermoſt. In caſes where the materials do not require to be brought from any great diſtance, a hundred yards in length, by ſix feet in height of ſuch a wall, may be built for 18*l.* or 20*l.* There is one other material point in the building of theſe ſorts of walls, which is, that they be well kept together by the judicious placing of the longeſt ſtones.

It is cuſtomary in ſome parts of England to plant ivy both upon their dry-ſtone walls, and upon ſuch as are conſtructed of ſtone and clay; this has a good effect, not only in point of appearance, but, after a while, it binds and ſtrengthens them very conſiderably. There are ſeveral kinds of ivy, *viz.* the large and the ſmall-leaved, the dark green and the variegated, all of which look well; thoſe kinds, however, ſhould have a preference that grow faſteſt, and have the greateſt tendency to aſcend. Particular care ſhould be taken, we are however told, not to plant ivy in the immediate neighbourhood of young trees or hedges, as, next to moſs, nothing can be more deſtructive to trees or hedge-plants than this.

It is noticed that where dry-ſtone walls are built, that which we have juſt deſcribed deſerves a preference on account of its neatneſs and durability. It is not only much cheaper than one made with ſtone and lime, but is equally uſeful, looks as well, and admits of being practiſed in many ſituations, where lime is either exceedingly ſcarce, or not attainable but at an enormous price. In many caſes it is common, after raiſing this wall to the wiſhed-for height, to level the top of it with looſe ſtones, and leave it in that ſituation without any coping or other ſecurity. The conſequence is what might naturally be expected, the firſt perſon who attempts to climb over it, or the firſt horſe or bullock that puts its head over the top, or attempts to rub itſelf againſt it, infallibly throws down a part of the ſtones, and in that way the fence is gradually deſtroyed; whereas, when a ſubſtantial coping of ſtone and lime is given, the wall is ſo completely bound together and conſolidated at top, as to bid defiance to any common injury. The copings of turf and mud, ſo common in many places, are by no means entitled to approbation; for though they may for a ſhort time ſecure the top of the building they ſoon decay, and cannot be procured but by paring and cutting off the adjoining ſurface; for theſe reaſons, turf or mud copings are improper, even upon dry ſtone walls; upon thoſe made with ſtone and lime, or ſtone and clay, as we ſhall afterwards have occaſion to notice, they are wholly to be rejected as uſeleſs.

Such perſons as are inclined to raiſe fences of the *ſtone wall* deſcription, ſhould carefully examine thoſe that have been built in their immediate vicinities, and afterwards determine upon the modes of conſtruction and dimenſions which may ſeem the moſt ſuitable and proper, under the different circumſtances, conſulting thereafter with proper workmen in reſpect to their building, having previouſly their eſtimates, as is the caſe in other ſorts of erections of this nature.

Stone and lime walls.—With regard to ſtone and lime walls, in order to render them durable, they ſhould be conſtructed in the manner above deſcribed for dry-ſtone walls: that is, have a good foundation, deep enough to prevent them from being hurt by froſt, with a broad baſe, tapering gradually upwards. This fence, when properly executed, is, next to hedges, the moſt durable of any; it is, however, very expenſive; and its ſuperiority over the dry-ſtone wall is ſo trifling in point of durability, as to render the latter the moſt eligible, it being greatly cheaper, and anſwering every purpoſe of a fence equally well. For the building of this wall, ſtones taken from the quarry are to be preferred to the common land-ſtones; for though a maſon may be able to remedy, in ſome meaſure, the inequality of ſurface in land-ſtones, by mixing plenty of lime with them, yet experience proves, that walls made with ſuch ſtones, notwithſtanding every care on the part of the builder, are much leſs perfect, and laſt a much ſhorter time than where quarried ſtones are employed. This, like every other ſtone fence, ſhould be ſecured at the top with a ſubſtantial coping of ſtone and lime; the beſt and moſt durable is, it is ſaid, that which is made with ſtones of the flag kind, laid together in the form here repreſented Λ; the ſpace between them being filled with a mixture of ſmall ſtones and mortar. This coping, from its wedge-like ſhape, and the ſolid impenetrable ſurface which it preſents to the weather, ſeems the beſt calculated of any for the preſervation of the building. When a ſtone and lime wall is left without a coping, which is too often the caſe, the moiſture finds its way readily into the heart of it; it is, beſides, liable to all thoſe accidents already mentioned in ſpeaking of dry-ſtone walls, when they are left without a coping. When ſtone and lime walls are built, the ſeaſon of the year at which the work is done is none of the leaſt important conſiderations; for if they are erected either at a late period of the autumn, during the winter, or very early in the ſpring, the froſt acting upon the moiſture contained in the lime will ſeparate and diſunite its parts, and by that means deſtroy the coheſion of the building; the binding power of the lime, in ſuch caſes, is entirely loſt, and when ſummer arrives it reſembles dry ſand mixed with the ſtones. Late in the ſpring, during the ſummer, or early in the autumn, ſeems to be the moſt proper time for building ſtone and lime walls; at any, or all of theſe periods, there is every proſpect of the lime drying properly, and not the ſmalleſt riſk of its binding quality being hurt by the effects of froſt, or other cauſes of that nature.

Galloway dike, or wall.—The Galloway dike, as has been already noticed, owes its name to the circumſtance of its being firſt uſed as a fence in that part of the country. It is now, however, very common in moſt parts of Scotland, and in ſome of the Engliſh counties. It is principally employed for incloſing high grounds that are depaſtured with ſheep, for the confining of which it ſeems well calculated. From two feet to two and a half at the bottom, it is built in a regular, compact manner, with dry ſtones, in every reſpect the ſame as a dry-ſtone wall, with a broad baſe, tapering gradually upwards; the building is then levelled with a courſe of flat ſtones, reſembling a coping in ſuch a manner as that theſe flags, or flat ſtones, will project two or three inches over the wall on each ſide. Above theſe flat ſtones is laid a courſe of rugged round ones, placed upon each other in a way ſecure enough to give ſtability to the building, but at the ſame time ſo open as to leave a conſiderable vacuity between each; by which means a free paſſage is afforded to the light and wind, which blows through them with a violent whiſtling noiſe. This rough open part of the building is generally raiſed three feet above the regular part of it, gradually tapering upwards, till it terminates in a top of about nine inches broad, every courſe of the rough ſtones being ſmaller than that immediately beneath it. The tottering appearance is ſo well calculated to prevent ſheep, cattle, or other animals from approaching it, that it is ſeldom indeed that any attempt is made to leap over it. This circumſtance, together with the eaſe with which the ſtones are procured, in moſt ſituations where the Galloway dike is uſed, render it a valuable fence. The expence of erecting it will be very different in different ſituations, according to the eaſe or difficulty of procuring ſtones, the price of labour in the country, and other circumſtances. In many caſes where the fields to be incloſed are infeſted with large ſtones, the removal of which ought always to be a previous ſtep in every plan of improvement, the incloſure may be made for a trifle, merely for the expence of maſon-work. In no inſtance can it be dear, and in moſt ſituations, where the confinement of the ſtock, or the partition of a crop, are the ſole objects, this will be found to anſwer the purpoſe equally well, if not better, than more expenſive fences. It has, however, one defect, it is obſerved, in common with all other ſtone fences, *viz.* that it neither ſhelters nor ornaments the country; indeed, in point of ſhelter, it is the moſt defective of any; for compact ſtone walls, of a proper height, are capable of affording conſiderable ſhelter to the grazing ſtock in ſtormy, inclement weather, an advantage which cannot poſſibly be expected from the Galloway dike, on account of its openneſs. On that account it appears much more eligible for the lower parts of the country, where the land is valuable, where little ſhelter is required, and where the confinement of the ſtock, or the protection of the crop, are the ſole objects to be conſidered in the buſineſs.

The advantages of ſtone fences of every deſcription are, it may be remarked, very conſiderable: they not only form complete incloſures at once, and by that means allow the proprietor to enter into immediate poſſeſſion of every advantage that can ariſe from the incloſing of his fields, but by the little room they occupy, a conſiderable proportion of land is ſaved that would have been occupied by ſome other fences; and even that proportion of ſoil near the ſides of ſtone walls, which is at preſent, for the moſt part, waſte, admits of being profitably employed, either in raiſing grain, potatoes, or other vegetables; and the walls, as we have already obſerved, may be uſefully employed in rearing of fruit-trees, or the different kinds of currants, gooſeberries, &c. To theſe benefits we have, however, to oppoſe ſome defects. The beſt and moſt ſubſtantial fences of this deſcription are periſhable in a greater or leſs degree, according to the materials of which they are made, and the judgment ſhewn in their conſtruction, and, after a certain time, require conſiderable attention and expence to keep them in repair: the ſhelter they afford to the ſtock, crop, or paſture, is alſo ſmall, and in place of improving the ſcenery they are injurious to it. This deſcription of fence is ſhewn at *Plate* XXII. *fig.* 1.

Stone and clay walls.—In the conſtruction of walls of ſtone and clay, the clay is uſed like lime, and is meant to anſwer the ſame purpoſe. It requires ſlender obſervation to convince intelligent perſons, that a wall made with ſuch materials, in the uſual way, cannot but be an ordinary one; for if the clay made uſe of in building the fence has been very moiſt, the ſummer's heat will dry it ſo much, as to leave conſiderable chaſms in the building; theſe chaſms muſt neceſſarily deprive many of the ſtones of that ſupport which they require, and in that way endanger the building. This, however, is not the only inconvenience with which this kind of wall is attended; the effect of the ſummer's ſun upon the clay parches it ſo completely, that when the wet weather commences about the end of autumn, it abſorbs the moiſture like a ſponge, and if it is overtaken by froſt while in that ſtate, the fabric ſwells, burſts, and tumbles down. Even with the very beſt coping that can be given it, a ſtone and clay wall muſt, it is remarked, always be conſidered as a very exceptionable fence, as, however well it may be defended at top, the moiſture will penetrate at the ſides; if it is left without a cope, however, or is only coped with mud or ſod, the evil will be greater, as the moiſture will, in that caſe, find a ready paſſage downwards, and in that way accelerate the deſtruction of the wall or fence.

And walls of ſtone and clay daſhed with lime differ in no reſpect from that juſt now deſcribed, except in the harling or daſhing that is given them. Where that operation is well performed, and at a proper ſeaſon of the year, the coating of lime, by preventing the entrance of moiſture, will add greatly to the durability, as well as beauty of the wall; ſo much ſo indeed, that ſome fences made in this way, when the clay was properly tempered, and did not contain too much moiſture, and where a harling or daſhing of lime was afterwards given, have been known to laſt nearly as long as walls made entirely from ſtone and lime. The durability of this, as well as the foregoing fence, however, depends upon its being properly coped or covered at the top with ſome proper material.

Dry ſtone walls lipped with lime.—Theſe differ from the ordinary dry-ſtone walls in having about two or three inches of them on each ſide lipped with lime, which gives them the appearance of being built entirely with ſtone and lime. Where the external appearance of a fence is an object, ſomething is gained by this practice; in point of real duration, however, they ſeem to poſſeſs very little advantage over the common dry-ſtone walls, which, when properly executed, laſt equally long with them.

Dry ſtone walls lipped and harled.—Theſe are much the ſame, nothing more being added than a harling or daſhing of lime after the other work is finiſhed: this addition is to be conſidered merely as an improvement upon their appearance, and not as contributing to increaſe their utility, or render them more durable as fences.

Dry ſtone walls pinned and harled.—Theſe are much the ſame; the maſon only carefully pins or fills up all the interſtices of the building with ſmall ſtones, after they have been built in the ordinary way, and afterwards daſhes or harles them over with lime. The pinning, by filling up every vacant ſpace, and affording complete ſupport to the ſtones in every part of the ſurface, adds conſiderably to the durability of the building, and the harling afterwards gives the whole a finiſhed, ſubſtantial appearance, which renders them at once agreeable to the eye, and laſting as fences.

Dry ſtone walls, with light palings upon the top.—Theſe are ſometimes made, and for particular purpoſes anſwer well, and have a handſome appearance when well executed. but they are expenſive. This ſort of fence is ſhewn at *fig.* 2. in the plate.

Brick walls.—Theſe ſorts of fences are ſeldom had recourſe to for ordinary incloſures, except in ſituations where ſtones are extremely ſcarce; as is the caſe in many of the Engliſh counties, for pleaſure grounds, or for garden walls. Where brick walls conſiſt of bricks only, they are built either with the brick on edge, in bed, or acroſs. When the wall is built with bricks on edge, they are laid up with the edge or narroweſt part of each applied to the other; the thickneſs of the brick in ſuch a caſe conſtitutes the thickneſs of the wall. When brick in bed is uſed, the bricks are laid flat, and the thickneſs of the wall is proportioned to the greateſt breadth of the brick. When they are laid acroſs, the thickneſs of the wall is then equal to the length of the brick that is employed for the purpoſe.

It may be obſerved, that the moſt valuable uſe to which bricks are applied, is either for facing walls built with coarſe ſtones, for gardens, or for heightening old ſtone walls; for the firſt purpoſe they are an excellent article; and any wall fronted with brick is, for the purpoſe of rearing fruit trees, of equal value with one of the moſt expenſive hewn ſtone. Where it is intended to heighten a ſtone wall that is too ſlender to bear a heightening of ſtone, bricks either in bed, or on edge, will anſwer the purpoſe very effectually, without rendering the wall top-heavy. It is to be noticed, however, that in every caſe, either where a wall is made entirely of brick, or heightened with it, there will be a neceſſity for ſtrengthening it at the back with pillars at certain diſtances from each other, as repreſented at *figs.* 3. and 4. in the plate. Theſe will add to the ſtability of the building, and, if properly executed, will render it equally durable with a ſtone wall. For hot walls they are very valuable, as they not only, by their numerous ſeams, allow the trees to be regularly and neatly trained, but are at the ſame time extremely convenient for ſhaping the flues that conduct the heat. Where the price of labour is low, and clay of a proper quality, together with fuel, can be eaſily obtained, bricks may be uſed with advantage for almoſt any purpoſe where ſtone is at preſent employed: we believe, however, that their uſe will be chiefly confined to the facing of garden walls, to the walls of hot-houſes, to hot-walls, or the heightening of old ſtone walls; in all of which they will be very valuable, and will, at a ſmall expence, anſwer the ſame purpoſe as ſtone that has been prepared by hewing. From the increaſed duties upon them they are now become, however, by no means a cheap material. A wall conſtructed with bricks is ſhewn at *fig.* 5. in the plate.

The copings of walls of this deſcription are formed in various ways. In ſome inſtances they are made with common brick ſet up in ſuch a manner as to form an angle upon the top; in others, with a ſort of tiles reſembling the letter A, flat below and angular above, with a border projecting a little over the wall on each ſide. In many parts of the kingdom this ſort of coping is found to anſwer the purpoſe very effectually; in ſome caſes it is, however, made quite flat, but which is diſapproved of, on account of its not affording ſo ready a deſcent to the moiſture, which is apt to hang upon it for that reaſon.

Frame wall.—It is a kind of wall which is conſtructed in the following method: a frame of deal boards, of a width and height ſuited to that of the intended fence, is formed and placed upon the line in which it is deſigned to be made, the foundation having been previouſly dug in a proper manner. This frame is then filled with ſtones of all ſorts, gathered moſtly from the neighbouring lands; and, when filled in this way to the top, a quantity of liquid mortar is poured in amongſt them, ſufficient to fill up every interſtice, the whole being ſuffered to continue in that ſtate until it is ſuppoſed that the mortar has acquired a proper degree of firmneſs to give ſtability to the building, which, in the dry ſummer ſeaſon, will not be longer than a day or two. The frame is then removed and placed a little farther on the ſame line, in ſuch a way, as that one end of it may join immediately with that part of the work from which it has been removed. In this way the line of fence is gradually completed, which, when the lime has been well tempered, and the proper pains taken to incorporate it with the ſtones, preſents a ſmooth uniform ſurface, and has the appearance of being a firm ſubſtantial fence.

Turf walls.—Fences of theſe kinds are common in moſt of the hills and upland ſituations of the kingdom, being found convenient for temporary purpoſes. They are frequently uſed for incloſing fields in particular diſtricts, being had recourſe to in an extenſive manner: while, in others, they are employed for the forming of pens, folds, and other places for confining different ſorts of live ſtock during the night ſeaſon. In common they are made ſimply of turf, which is pared off from the adjoining ſurface, and uſed without any mixture of earth; but in other caſes the wall conſiſts of a facing of turf on each ſide, while the ſpace between is filled up with looſe earth.

For incloſing, when durability is required, this is a ſort of fence that can never, however, be had recourſe to with propriety, as, from the very moment it is finiſhed, its decay commences, and no pains or attention will be able to keep it in repair, after it has ſtood two or three years: in very expoſed ſituations, however, it may be uſeful as a protection for young hedges during the firſt three or four years of their growth; but, as a wall of this kind can in no inſtance be made without a great deſtruction of the adjoining ſurface, which, upon good land, is a ſerious loſs, the protection of young hedges will be anſwered equally well by low ſtone dikes, which, while they perfect the incloſure, will, at the ſame time, ſhelter the young plants, and clear the field of the ſtones it may be incumbered with. This ſort of turf fence is ſhewn at *fig.* 6. in the plate.

Stone and turf walls.—Theſe are alſo very common ſorts of fences in many ſituations, where better and more durable ones could be made at equal, perhaps leſs, expence. In many inſtances, however, they are had recourſe to from neceſſity, where lime is either very dear, or not attainable at any price. The ſtones uſed in the conſtruction of fences of this kind are in general the ordinary land-ſtones; with theſe, and the turf taken from the adjoining ſurface, the walls are made, uſing alternate layers of each. For temporary purpoſes this ſort of fence may be adopted in almoſt every ſituation, as it is reared at ſmall expence, and the materials are every where to be met with almoſt without trouble; but in all caſes where permanent fences are wanted this will be found very deficient and inferior even to the common turf-wall; for, by the intervention of ſtones between every layer of turf, the ſod is dried, the plants die, the turf, as might naturally be expected, ſoon decays, and the wall crumbles down; whereas, when it is built entirely of turf, with a ſloping bank of earth behind, the herbage continues growing, and the whole turf, of which the wall is made, ſoon conſolidates into an uniform green ſod, which, with proper care, will laſt a conſiderable length of time. A fence of the ſtone and turf kind is ſhewn at *fig.* 7. in the plate.

Mud-walls, with a mixture of ſtraw.—Theſe kinds of walls are very frequent in many parts of England, not only for ſurrounding their ſmall incloſures and ſtack-yards, but alſo for conſtructing the walls of many of their farm-houſes, cottages, and offices. In North Britain they are uſed alſo for ſimilar purpoſes, and for ſub-dividing houſes into different apartments, for which purpoſe they anſwer equally well as lath and plaſter, and are nearly as durable. They are a ſort of *cab-dab* fences.

It may be remarked that, when either the outſide walls, or the inſide diviſions of a houſe, are made of theſe materials, the cuſtom is to take a ſmall quantity of ſtraw, and incorporate it with a ſufficient proportion of clay; the ſtraw in this caſe anſwers the ſame purpoſe as hair in plaſter-lime. When a ſufficient number of theſe are made, the work is begun, by laying a ſtratum at the bottom of the intended wall; when this is done, and the different pieces firmly kneaded or wrought together with the hand, a flat deal board is applied on each ſide, which being properly preſſed and rubbed againſt the buildings in a horizontal direction, not only ſerves to conſolidate the work, but gives it a degree of ſmoothneſs and uniformity: ſucceſſive ſtrata are added till the wall is raiſed to the intended height, taking care to taper it gradually upwards. Walls made in this way, if properly conſtructed, will laſt for many years, and if daſhed or harled with lime, at a proper ſeaſon of the year, will have an appearance no way inferior to ſuch as are made with ſtone and lime, along with this addition to their appearance: the harling or daſhing with lime if properly done, will, by preventing the acceſs of moiſture, render them much more durable. When walls of mud and ſtraw are to be made, pieces of wood, properly joined and ſecured, ſhould be ſet up in the direction in which the fence is to run. Theſe ſhould be in the form of a double paling, and calculated to anſwer the ſame purpoſe as the ſtandard employed in making brick diviſions in a dwelling-houſe; the upright parts ſhould be placed in ſuch a manner as to be immediately oppoſite to each other, and at a diſtance equal to the thickneſs of the intended wall. Theſe ſtandards will not only render the fence firm and more durable, but, at the ſame time, ſerve as a direction to the workmen in keeping it of a regular thickneſs and ſhape. In England, where ſtones are ſcarce, and in many of the counties not to be had, walls of this deſcription are the *ſine qua non* for many purpoſes, and when, properly conſtructed, laſt a conſiderable time; but in every inſtance where ſtones are procurable at a reaſonable price a fence made with them is greatly to be preferred, as it is in general built with leſs trouble and expence, and is at the ſame time more firm and durable. At beſt it is, however, of a very periſhable nature, and the great expence required to keep up ſuch fences has long ſince taught both proprietors and occupiers that they are by much the moſt expenſive of any. *Fig.* 8. diſplays a fence of this nature.

In the conſtructing of all ſorts of ſtone walls, it is of eſſential conſequence that they be carried up in a regular manner, which is beſt performed by having recourſe to a proper plumbing frame. One which has been found to anſwer this purpoſe perfectly is repreſented at *fig.* 9. in the plate.

In the raiſing of both *ſingle* and *double* ſtone walls, it is a matter of great importance to give them a proper *tapering* form upwards, or what the workmen call "batter," which is gradually narrowing them as they riſe in height. This is uſually done in the proportion of about one inch to every foot in height on each ſide, which is diſtinctly ſhewn in the ſection of a dry ſtone wall given at *fig.* 10. in the plate.

It is a matter of very great importance to the proprietors and occupiers of land, that the fences of farms, whatever their nature may be, ſhould be in a good condition, and well kept in repair, as without attention in theſe different reſpects ſerious injuries muſt be conſtantly ſuſtained by them. The moſt convenient and eaſy method of effecting theſe ends is, probably, that of annually going over a certain extent of them, in proportion to the nature and ſize of the farm, as, by ſuch a practice, there will never be more to be done in any one year than can be eaſily accompliſhed. See INCLOSING *of Land*, and CANAL.

FENCE-*Month*, (*menſis prohibitionis*, or *menſis vetitus*,) is a month wherein the female deer fawn; for which reaſon it it unlawful to hunt in the foreſt during that time.

It begins fifteen days before Midſummer, and ends fifteen days after, being in all thirty days.

There are alſo certain fence or defence months, or ſeaſons for fiſh, as well as wild beaſts, as appears by ſtat. Weſtm. 2. cap. 13. in theſe words:

" All waters, where ſalmons are taken, ſhall be in defence for taking of ſalmon, from the nativity of our Lady, unto St. Martin's day. And likewiſe, young ſalmons ſhall not be taken or deſtroyed by nets, &c. from the midſt of April, to the nativity of St. John Baptiſt," &c.

FEN-CHOUI, in *Geography*, a town of China, of the third rank, in Tche-kiang; 25 miles N.N.W. of Yen-tcheou.

FENCING, the art of defence, or of uſing the ſword, to wound an enemy, and preſerve ons's ſelf from his attacks.

Fencing is one of the exerciſes learnt in the academies, &c.

The art of fencing is acquired by practiſing with foils, called in Latin *rudes;* whence fencing is alſo denominated *gladiatura rudiaria.*

Pyrard aſſures us, that the art of fencing is ſo highly eſteemed in the Eaſt Indies, that none but princes and noblemen are allowed to teach it. Theſe maſters wear a badge or cognizance on their right arms, called in their language *eſaru*, which is put on with great ceremony, like the badges of our orders of knighthood, by the kings themſelves.

Montaigne informs us, that when he was a youth, the nobility all ſhunned the reputation of being good fencers, as ſomething too ſubtle and deſigning, and apt to corrupt virtuous manners.

Fencing is divided into two parts, *ſimple* and *compound*. *Simple* is that performed directly and nimbly, on the ſame line; and is either *offenſive*, or *defenſive*. The principal object of the firſt is whatever may be attempted, in puſhing, or making paſſes, from this or that point, to the moſt uncovered part of the enemy. The ſecond conſiſts in parrying, and repelling the thruſts aimed by the enemy.

The *compound*, on the offenſive ſide, includes all the poſſible arts and inventions to deceive the enemy, and make him leave that part we have a deſign on, bare and unguarded, upon finding we cannot come at it by force, nor by the agility of the ſimple play.

The principal means hereof are feints, appeals, or appels, which conſiſt in a ſudden beat of your blade on the contrary ſide to that on which you join your adverſary, and a quick diſengagement to that ſide again, claſhings, and entanglings, of the ſwords, half-thruſts, &c. and in the defenſive, to puſh in parrying.

The proper attitude in fencing is to hold the head upright, though the body hath an inclination forward on a longe, and all the weight reſts on the left haunch when on guard.

The feet, hand, body, arm, and ſword, muſt be to the line. For an explication of other terms in this art, ſee the articles Beat, Caveating, Flanconade, Glizade, Lock, Lurch, Thrust, &c.

FEND, in the *Sea Languaage*, imports the ſame as *defend.* Hence the phraſe *fending the boat*, &c. that is, ſaving it from being daſhed againſt the rocks, ſhore, or ſhip's ſide. Hence alſo

Fenders, any pieces of old cable-ropes, or billets of wood, &c. hung over the ſhip's ſide, to fend or keep other ſhips from rubbing againſt her; or to prevent her from ſtriking or rubbing againſt a wharf or quay.

Fender-*Bolts.* See Bolts.

FENDUE en Pal, in *Heraldry*, a French phraſe, applied to a croſs, to denote it cloven down from top to bottom, and the parts ſet at ſome diſtance from one another.

FENEGUE-HOTUN, in *Geography*, a town of Chineſe Tartary; 360 miles E.N.E. of Peking.

FENELON, Francis de Salignac de la Motte, in *Biography*, the celebrated archbiſhop of Cambray, and pre-eminently diſtinguiſhed among his contemporaries, was deſcended from an ancient family, and born at the caſtle of Fenelon, in Quercy, in the year 1651. The charge of his education, which, till his 12th year, was domeſtic, and proſecuted for ſome time in the univerſity of Cahors, was afterwards undertaken by his uncle, the marquis of Fenelon, a man no leſs diſtinguiſhed by his piety than by his valour. At an early age our Fenelon made a rapid progreſs in literature, and being deſigned for the eccleſiaſtical profeſſion, he became a popular preacher in his 19th year. His uncle, dreading the pernicious influence of popular applauſe on an youthful mind, endued with ſingular ſenſibility, placed him under the tuition of M. Tronſon, the excellent ſuperior of the congregation of St. Sulpice, who guarded him by his admirable inſtructions and diſcipline from the danger to which he would otherwiſe have been expoſed. Between the pupil and the preceptor, in this ſtate of ſecluſion from the world, an attachment was formed which terminated only with their exiſtence; and it appears from letters that are extant how highly he reſpected the guide and guardian of his earlier years, and with what grateful ſenſibility he acknowledges his uncle's wiſdom and kindneſs in placing him in a ſituation ſo favourable to his improvement both in knowledge and piety. At the age of 24, Fenelon entered into holy orders, and began to exerciſe the moſt laborious offices of his miniſtry in the pariſh of St. Sulpice. During his reſidence in this ſchool of genuine and elevated piety, for ſuch it was at the period to which we refer, his ardent mind formed and cheriſhed a deſign, which ſome may probably conceive to be romantic and extravagant; for it was nothing leſs than that of joining the miſſion to Canada, with a view to the inſtruction of the barbarous natives in the truths of the goſpel. This project, however, being defeated by the authority of his uncle, the biſhop of Sarlat, he ſoon afterwards ſolicited to be ſent on a ſimilar errand to the Levant; but this deſign was never executed. An occupation ſomewhat analogous was found for him by M. de Harlai, archbiſhop of Paris, who, apprized of his diſpoſition and character, named him ſuperior of the New-Catholics, and of the ſiſters of Magdalen of Traiſnel, while he was yet only 27 years of age; an employment which was uſually entruſted to eccleſiaſtics of mature experience, and who had grown old in the moſt delicate functions of the miniſtry. The object of this inſtitution, in which the ſiſters were bound by no vows, was to confirm the new converts, and to ſupply inſtruction to thoſe who were deſirous of becoming proſelytes. The recent converſion of M. de Turenne, and the well-known diſpoſition of Louis XIV. had given freſh celebrity to this eſtabliſhment; and, therefore, de Harlai was induced to look out for a diſtinguiſhed perſon as its ſuperior, and to fix on the abbé de Fenelon. His preſent ſituation, and the duties connected with it, coincided with his original views, and he engaged in the diſcharge of them with peculiar ſatisfaction. Without encountering equal dangers of a perſonal kind, the taſk which he had to perform was not leſs dangerous; "for it is," as he himſelf ſays, "often more difficult to triumph over error than idolatry, and to eradicate opinions which have been adopted as being more pure and correct, than to diſpel ſuperſtitious extravagancies, which neither ſeduce the mind nor gratify ſelf-love." About this time, in conſequence of the recommendation of his uncle, the marquis, Fenelon formed thoſe connections, to which were owing his future high elevation, and the ſingular perſecutions and reverſes which it was his deſtiny to undergo. He was introduced, among others, to the duke de Beauvilliers and Boſſuet; the latter of whom directed his ſtudies, and manifeſted every token of eſteem for him; though he afterwards proved his moſt inveterate enemy. It was alſo about this period that the biſhop of Sarlat reſigned, in favour of his promiſing nephew, the canonry of Carance, worth from three to four thouſand livres a year; the only preferment that was enjoyed by Fenelon till he reached the age of 44 years. Ten years of his life were occupied in ſuperintending the community of female converts; and in this delicate ſituation he conducted himſelf not only irreproachably, but with the higheſt degree of probity and honour. At this time he was in the cloſeſt intimacy with Boſſuet; and was recommended by him to Louis XIV. as a proper perſon to be employed in converting the ſectaries of Poitou and Saintonge. This miſſion formed a part of thoſe odious meaſures by which this monarch was led to believe that he ſhould annihilate proteſtantiſm in his dominions; and we cannot but regret that ſuch a character as that of Fenelon ſhould be implicated in this diſhonourable buſineſs. His conduct, however, in the execution of it, furniſhes cauſe for admiration. Before he embarked in this proſelyting ſcheme of his ſovereign, he petitioned, that the troops and all the trappings of war might be removed from the diſtricts within his miſſion. The requeſt was granted, and he, together with his companions, who were ſelected from families of rank, proceeded to the ſcene of their labours. Great ſucceſs ſeemed to attend them; the aſſociates of Fenelon flattered themſelves with encouraging proſpects; but the more diſcerning Abbé was not to be deluded by falſe appearances; nor would the ingenuouſneſs of his mind allow him to countenance impoſture. He candidly ſtates, that diſtruſt, and conſiderations purely human, occaſioned moſt of the converſions; and that it was to no purpoſe he had cauſed all the apparatus of war to be removed from the view of the terrified multitude, ſince the relations of violences committed in other provinces had filled them with alarm. "Were it propoſed to them," he ſays in a letter to Boſſuet, "to abjure Chriſtianity and follow the Koran, you have only to ſhew them the Dragoons." Fenelon, ſeemingly ſuſpecting that at leaſt the immediate effects of his zeal and exertions were the reverſe of beneficial, became weary of his employment; and he was in a little while recalled. Upon his return to Paris, he preached frequently, and cultivated an acquaintance with perſons of known religious character; and by the graces of his elocution, and the gentleneſs of his diſpoſition and manners, acquired increaſing reputation. This indeed was a period of the greateſt intereſt in the life of Fenelon. The duke of Burgundy, eldeſt ſon of the Dauphin, had attained an age which required the ſuperintendance of a governor. Louis XIV. appointed to this office the duke de Beauvilliers, a nobleman eminently diſtinguiſhed for his virtue and piety, and highly reſpected by the king, who entruſted him with the nomination of all the perſons who were required to concur in the young prince's education. The duke, on the day preceding that of his own appointment, propoſed to the king, and obtained his conſent, that the Abbé de Fenelon ſhould be preceptor. At this time, *viz.* September 1689, when the perſons appointed to their reſpective offices in the education of the young prince commenced the fulfilment of them, Fenelon was no more than 38 years of age. Never, it is ſaid, was an inſtance of union like that which reigned among the inſtructors of the duke of Burgundy. They had but one heart and ſoul, and the ſoul was that of Fenelon.

Fenelon was fully conſcious of the importance of the charge that was committed to him; this was the education of the future head of a monarchy, which had reached the higheſt ſplendour:—the abſolute maſter of twenty millions of men, whoſe happineſs or miſery would depend on the perſonal character of the ſovereign. Nor was he unappriſed that the nature of the youth, whom he was appointed to inſtruct, was extremely unpropitious. Hiſtory repreſents the duke of Burgundy as diſplaying in infancy all the ſymptoms of a perverſe nature;—invincible obſtinacy, a revolting pride, iraſcible propenſities, and the moſt violent paſſions, are deſcribed as its odious features; but they were joined with a great capacity for acquiring all kinds of knowledge. "He was born terrible," ſays St. Simon, "his behaviour made all who beheld him tremble." By various means, happily combined, by a continued ſeries of appropriate and pertinent obſervations, by patience, gentleneſs, and unintermitting attention, the preceptor at length ſucceeded in gradually breaking the violent character of his pupil, and in calming his impetuous paſſions. Beauvilliers and Fenelon directed all their ſolicitude and exertions to realize this deſign; they ſucceeded, and were remunerated for it; for hiſtory ſhews, that of all the princes, he who was the leaſt flattered by his inſtructors, and to whom the moſt harſh and cutting truths were told in his infancy and youth, retained the moſt tender regard for the virtuous perſons who preſided over his education. Of the talents, fidelity, and aſſiduity of Fenelon, as a preceptor, we may form ſome judgment by the aſtoniſhing proficiency of the royal ſcholar. At the age of ten, we are told, the prince wrote Latin with elegance, and tranſlated the moſt difficult authors with an exactneſs and a felicity which ſurpriſed the beſt judges; he was perfectly maſter of Virgil, Horace, and the metamorphoſes of Ovid, and was ſenſible to the beauties of Cicero's orations. At eleven, he read Livy throughout, and began a tranſlation of Tacitus, which he afterwards finiſhed. The Abbé Fleury, atteſting theſe facts, ſays, that his mind was of the firſt order, and that he was not contented with ſuperficial knowledge, but ſought to penetrate to the bottom of every thing; his curioſity was immenſe. Great pains were alſo taken with regard to his religious education; and one of the biographers of Fenelon cloſes the relation of various circumſtances that reſpect the attainments of the young prince with aſking, "What muſt we think of inſtructors who were able to ſtore the mind of a youth of 14 with all that is eſſential in religion, whether we regard its doctrines or its hiſtory; with all that moſt enchants in mythology, and which ſupplies the principal ſubjects of literature and of the fine arts; and with all the leading facts of ancient and modern hiſtory? He had been taught with preciſion the elements of ſeveral other ſciences. It was not eaſy, ſaid the eſtimable and correct Abbé de Fleury, to find in the whole kingdom, not merely a gentleman, but any man, better informed than the prince. At 18, his letters were cited for the eaſe and good taſte which they diſplayed. This teſtimony was borne to them by Madame de Maintenon." The accounts of the talents and attainments of the prince, we are told, ſurpriſed even Boſſuet, who had a great diſtruſt of ſuch premature geniuſes, and a ſecret jealouſy of the riſing fame of the preceptor; and he took an opportunity of ſatisfying himſelf by an interview and examination.

The ſervices of Fenelon in the education of his pupil were rewarded, in 1695, with the ſplendid preferment of the archbiſhopric of Cambray, which included a dukedom. But this he accepted on condition that he ſhould be allowed to devote nine months in the year to his ſee, and three to the princes; and at the ſame time he reſigned a valuable abbacy. At the moment of his elevation to one of the higheſt dignities of the church, a ſtorm was gathering which could not leſs than alarm his tranquil mind. The reputation of Fenelon, and the aſcendency which his attractive and commanding qualities ſeemed certain of obtaining, alarmed the jealous mind of Boſſuet. The unſucceſsful preceptor of the father could not hear with indifference the applauſe which all France beſtowed on the preceptor of the ſon; nor liſten without envy to the accents of gratitude which echoed from every corner of the realm to the man to whom the people owed the proſpect of a wiſe and beneficent reign. Although Fenelon never refuſed ſubmiſſion to Boſſuet in matters of religious doctrine, this would not ſuffice. The latter found, that if he did not pull down Fenelon, he muſt ſee himſelf eclipſed; and hence he became his unrelenting perſecutor. The diſgrace of Fenelon is the real object, but the intereſts of religion are the ſhallow pretence; no tie, human or divine, reſtrained the prelate of Meaux; but conſcience, honour, decency, all were ſet aſide, that the ruin of his rival might be accompliſhed. In order to effect this plan, Louis XIV. muſt act the part of an abject tool, and Madame de Maintenon be guilty of baſe treachery; venerable prelates muſt contradict their ſolemn acts, and degrade and diſhonour themſelves; the Abbé Boſſuet, the prelate's own nephew, and another eccleſiaſtic, muſt circulate the groſſeſt falſehoods and the fouleſt calumnies; the court muſt ſacrifice, and throw on the wide world, moſt meritorious characters, in order to terrify Rome, and influence it in its judgment; the empty pompous monarch muſt bully the pope; and the ſee of Rome itſelf muſt be vilified, and pronounce a deciſion againſt its judgment, to inſure a nefarious triumph to the biſhop of Meaux over the archbiſhop of Cambray. A ſentence of a tribunal, which his arts and practices had degraded at the expence of the coſtly ſacrifices, already enumerated, iſſued againſt his adverſary; but the tribunal of the public avenged the injuſtice; and the genius of Fenelon ſecured a victory to his innocence, in which diſtant empires, and ſucceeding generations have felt participation and joy.

The origin of theſe differences between the two prelates muſt be traced to the connection formed by Fenelon, at a preceding period, with Madame de Guyon, and to his having afterwards adopted and defended her peculiar ſentiments. (See GUYON.) When they were firſt announced, Fenelon had conceived prejudices againſt them, but on his return from his miſſion into Poitou, he had the curioſity, on paſſing near Montargis, to pay a viſit to M. Guyon, and to inquire into her courſe of life. The report he received was very favourable, and the ſtatements that were made to him of her piety and charity removed his prejudices, and induced him to imbibe her myſtical tenets. Indeed, Fenelon ſeems to have had an early taſte for myſtical devotion, and to have particularly ſtudied the writings of thoſe who cheriſhed it. On further acquaintance with M. Guyon, he was confirmed in this predilection. But when the "quietiſm" of this devotee excited attention, and became a ſubject of converſation and inquiry, Fenelon adviſed her, as it has been ſuppoſed, to ſubmit her doctrine and conduct to the judgment of Boſſuet, who is ſaid to have treated her with great kindneſs, and to have gained her confidence to ſuch a degree, that ſhe put into his hands her printed works, and alſo a manuſcript life, containing many extravagances; though ſhe had never placed the ſame kind of confidence in Fenelon. Boſſuet, however, being diſſatisfied, ſhe demanded to be judged by commiſſaries; and the biſhop of Chalons, and M. Tronſon, director of St. Sulpice, were added to the biſhop of Meaux, in order to examine her caſe; and with them was afterwards aſſociated Fenelon, on his elevation to the ſee of Cambray. Theſe commiſſioners met at Iſſy, the country-houſe belonging to St. Sulpice, and diſcuſſed the tenets of M. de Guyon; and as Boſſuet was an entire ſtranger to the myſtical writers, he deſired Fenelon to ſupply him with a ſelection of them, and in order to aid his judgment, the archbiſhop of Cambray furniſhed him with comments and remarks. Theſe comments and remarks firſt excited the orthodox prelate's ſuſpicion of the other's partiality to their principles and maxims. Indeed, Fenelon avowed and defended his doctrine of the diſintereſted love of God, without any reference to eternal happineſs as a reward; while Boſſuet contended that a reference to the reward was a ſpecific motive to it, but heſitated to pronounce that Fenelon's notion was erroneous. After the conference at Iſſy, Boſſuet had employed himſelf on a work which was intended to demoliſh "Quietiſm," and which he intitled "the State of Prayer." When M. Guyon was arreſted, Fenelon reſolved not to become a party to the publication of this work, though Boſſuet had previouſly deſired it, nor to give it his teſtimonial. He alſo induced Madame de Maintenon, the biſhop of Chartres, and the cardinal de Noailles, to approve his refuſal, on condition that he ſhould publiſh a tract on the points in diſpute, in which he ſhould ſtate his own opinion. This agreement produced the famous book which was the cauſe of all his troubles, *viz.* "The Explication of the Maxims of the Saints," 1697. With Boſſuet for an enemy, and M. de Maintenon and the king averſe to him, it was difficult for an honeſt man to write a treatiſe which ſhould ſtand the teſt of orthodoxy; but having fulfilled an imprudent engagement, Fenelon ſubmitted his compoſition to the cardinal of Noailles, the biſhop of Chartres, M. Tronſon, and other theologians of high authority, admitting all their corrections: and all theſe perſons not only approved it, but ſome of them highly commended it. Thus fortified, the book was uſhered to the public, and it muſt be owned that it met with univerſal diſapprobation. Boſſuet was his moſt malignant adverſary, and ſtirred the king, not partial to Fenelon before this event, and the whole court againſt him. The prelates of Paris and Chartres, and the other divines who had given their ſanction to the "Explication," joined in the cry againſt the book. The archbiſhop, thus overpowered by his perfidious friends and open enemies, was baniſhed to his dioceſe. About this time his palace at Cambray, with all its furniture and books, was conſumed by fire. He ſuſtained the loſs with unexampled firmneſs and tranquillity: for when news was brought him of the cataſtrophe, he obſerved, "That it was better all theſe ſhould be burned, than the cottage of one poor family." Boſſuet perſiſted in his enmity, and determined to force Fenelon abſolutely to retract the errors of the work which had cauſed ſuch an alarm and outcry. Fenelon, on the 27th of April, 1697, referred his publication to the judgment of the pope; and declining the conferences which Boſſuet propoſed, he adhered to his purpoſe of appealing to Rome. In the mean while his enemies purſued him with implacable violence; and he received a mandate from the king, dated Auguſt 1, 1697, commanding him to retire to his dioceſe, and there to remain. Every meaſure was adopted, which the malignity of Boſſuet could ſuggeſt, for enforcing a ſentence of condemnation at the court of Rome; till at length the reluctance of that court was overcome, and pope Innocent XII. was prevailed upon, in 1699, to iſſue a brief of cenſure againſt Fenelon's work, and 23 propoſitions extracted from it. The archbiſhop himſelf teſtified the moſt profound ſubmiſſion to the ſentence of the holy ſee, read his own condemnation from the pulpit, and compoſed a "mandement" againſt his book. He even cauſed to be repreſented, for the expoſition of the ſacrament, a ſun borne by two angels, one of whom trampled under foot ſome heretical books, among which appeared the title of his own. This was almoſt, as a man of wit called his conduct on the occaſion, "the coquetry of humility;" it had, however, all the appearance of ſincerity, and his whole after-conduct was conformable to it. When the news arrived of the condemnation of his work at Rome, he was preparing to mount the pulpit; and to deliver a diſcourſe ſuitable to the ſolemnity of the day, which was the feſtival of the Annunciation; but after a few moments of recollection, he changed his purpoſe, and made his diſcourſe turn ſolely on the ſubmiſſion which is due to ſuperiors. His numerous audience had been previouſly apprized of the fact; and the admirable preſence of mind, the ſelf-command, and the religious calm, which he diſplayed, ſuffuſed every countenance with tears of ſympathy, reſpect, and admiration. So highly pleaſed was the court of Rome with the obedience of the archbiſhop of Cambray, that the whole college of cardinals petitioned the pope to ſend a complimentary letter in his own name to the pious and venerable prelate; but the Abbé de Meaux no ſooner heard of this deſign, than he cauſed the papal epiſtle to be frittered down to a few cold expreſſions of regard. So amiable, indeed, was the whole deportment of Fenelon, that a celebrated writer ſaid of him, "I know not whether Fenelon was a heretic in aſſerting that God ought to be loved for himſelf, but I know that Fenelon deſerved to be ſo loved." In his dioceſe he united the characters of a nobleman and of a Chriſtian paſtor. In the latter capacity nothing could ſurpaſs his ſimplicity of manners, his charity, his minute attention to all his duties, his fervent piety united to indulgence and moderation. He viſited the cottages of the peaſants in the moſt condeſcending manner, and adminiſtered conſolation and relief in their diſtreſſes. When they were driven from their habitations by the alarms of war, he received them into his houſe, and even ſerved them at his table. To one of his clergy, who aſſumed merit to himſelf for having aboliſhed the Sunday dances of the peaſantry in his pariſh, he ſaid, "M. le Curé, let *us* not dance, but let us permit theſe poor people to amuſe themſelves; why ſhould we hinder them from forgetting for a moment how wretched they are?" His hoſpitality was boundleſs, and blended with the moſt genuine politeneſs. During the war his houſe and table were open to all officers, many of whom, when ſick and wounded, he lodged and provided with every kind of neceſſary relief. Beſides his conſtant hoſpitalities to the military, he performed a moſt munificent act of patriotiſm after the diſaſtrous winter of 1709, by opening his granaries, and diſtributing gratuitouſly to the ſoldiers corn to the value of 100,000 livres.

We may reckon it among the moſt pleaſing anecdotes of modern war, that the duke of Marlborough, and the other generals of the allies, when in poſſeſſion of that part of Flanders, expreſsly exempted the archiepiſcopal lands of Cambray from all pillage or exaction, regarding them as devoted to the purpoſes of common beneficence. They frequently paid their reſpects to the worthy prelate, and always received from him the ſtrongeſt impreſſions of eſteem and admiration. Among the illuſtrious viſitors who reſorted to Cambray to render homage to its venerable archbiſhop, was "The young Pretender;" and from the converſations of Fenelon with this prince, it appears that the prelate was a warm admirer of the Britiſh conſtitution. When he adviſes him, if he ſhould ever regain the throne of his anceſtors, never to conſtrain his ſubjects to change their religion, he ſays, "No human power can force the impenetrable intrenchments of the freedom of the mind. Violence can never perſuade men, it only makes hypocrites. When kings interfere in matters of religion, inſtead of protecting her, they reduce her to ſlavery. Give to all, then, civil liberty; not as regarding every thing as indifferent, but as enduring with patience what God permits." Referring to the political conſtitution of the ſtate, he aſks, "Is not the ſovereign ſufficiently powerful? If we ſay that the king can do nothing without the parliament, is not a monarch happy who is at liberty to do all the good which he chuſes, and has only his hands tied when he would do wrong? Every wiſe prince ought to wiſh to be no more than the executor of the laws, and to have a ſupreme council to moderate his authority;" with much more to the ſame purpoſe.

The French courtiers were afraid of being known to viſit a perſon lying under the diſpleaſure of their maſter. This was actually the caſe; and an incident had happened which placed an inſurmountable bar to the reſtoration of Fenelon to court favour. Beſides his delinquency in point of orthodoxy, Fenelon had been guilty of writing "Telemachus," a work which was denounced to the jealous monarch, Louis XIV. as a moſt daring ſatire on his reign. Indeed he had never heartily approved of his appointment to be the preceptor of the princes, regarding him rather as a "bel eſprit," than a man of the world; and the maxims of Telemachus confirmed him in this opinion. Telemachus ſaw the light through the infidelity of a ſervant, who, judging highly of its value, took a copy for himſelf, whilſt he was tranſcribing it by the archbiſhop's order. This MS. he ſold to a bookſeller; and thus was given to the public a performance that ſecured a degree of fame to its author which he did not anticipate, and involved him in ſufferings which he did not merit. However, he ſtopped the impreſſion of the work which was going on from a copy thus ſurreptitiouſly obtained; and, after the death of the duke of Burgundy, he burned every manuſcript of the preceptor which he found among his papers. Beſides the offence which Telemachus gave to the king, he had alſo offended beyond forgiveneſs Mad. de Maintenon, by his honeſt advice to the king, when conſulted, not to marry her; advice which his majeſty had the meanneſs to betray. The enmity of Louis, ariſing from theſe and ſome other circumſtances, may be inferred from the pains which the duke of Burgundy was obliged to take, in order to renew his communications with his preceptor. After four years' ſilence from the period of the archbiſhop's diſgrace at court, a correſpondence began which terminated only with the death of the prince; no leſs honourable to himſelf than to his preceptor.

After the death of the firſt Dauphin, and the great change which conſequently took place in the ſituation of the duke of Burgundy, Fenelon conceived it his duty to addreſs new counſels to his pupil. He is no longer Mentor, whoſe gentle and paternal voice teaches the young Telemachus how to reign in the ſmall iſle of Ithaca, but the pontiff armed with the power and the majeſty of religion, who reveals, in the name of heaven, to the heir of a great empire the fearful duties impoſed on him. While flattering courtiers and trembling miniſters ſpoke only of his power, and the ſplendour of his ſupreme rank, Fenelon, in his ſublime but auſtere leſſons, traces great dangers and great duties. "It is time," ſays he, in a letter written to his pupil on this occaſion, "to render yourſelf beloved, reſpected, and eſteemed; to become the counſel of his majeſty, the father of the people, the conſolation of the afflicted, the ſupport of the poor, the ſtay of the nation, the defender of the church, and the enemy of innovation. Let flatterers be kept at a diſtance, and no confidence be placed in them; let merit be diſtinguiſhed, ſought, anticipated, and employed; liſten to every thing, but believe nothing without proof; and learn to excel all, ſince you are placed above all. Be the father of your people, and not their maſter. All muſt not be for one, but one ought to be for all, to enſure their happineſs." The reputation of the pupil reflected the higheſt credit at this period on his preceptor; it ſpread from Verſailles to the extremity of France; and Fenelon began to enjoy the fruits of his exertions and cares. Fenelon, at this ſeemingly auſpicious period, had the ſatiſfaction of conſidering that his counſels had never any other object than the prince's glory, and the good of the people whom he was to govern. In this great change of affairs, and which ſo materially affected the ſituation of Fenelon, he never diverted his thoughts to himſelf. However, the ambitious now courted the excellent prelate; and the ſpring of 1711 produced clear proofs of the change which had taken place. Cambray became the road to every part of Flanders. Yet with all this attention on the part of courtiers, he conducted himſelf with ſo much modeſty and ſo much prudence, that he did not awaken the royal jealouſy; prone enough to be excited, and to take offence. As ſoon as the duke of Burgundy appeared in arms, and took a part in public affairs, the good archbiſhop became by turns a general, a diplomatiſt, and a miniſter; and diſcerning perſons cannot fail to be highly ſtruck with this amazing verſatility, and with the excellent counſels which he imparted in each character. According to the plan of government, which he prepared for the conſideration of his pupil, and the leading arrangements of which he drew up in the form of tables, enliſtment into the army was to be voluntary, and the ſervice was to be for five years.—All offices were to be diſcharged by principals, and none were to be allowed to ſerve by deputy.—No reverſions of places were to be granted.—Each province was to have its ſtates on the model of thoſe of Languedoc; and the impoſition of taxes was to be intruſted to theſe aſſemblies. The *gabelle*, and other oppreſſive taxes, were to be aboliſhed, and ſuch as were more equal to be ſubſtituted in the room of them. The *Eſtates-General* were to be revived, and to be aſſembled every three years. They were to have only the power of making repreſentations, and the king was to decide. The courts of the feudal lands were to be aboliſhed, and the ſuitors were to have recourſe to the baillages. Commerce was to be free, &c. &c. Three months had ſcarcely elapſed after theſe plans had been ſketched, when the premature death of the duke of Burgundy extinguiſhed the ſanguine hopes which had been ſo univerſally indulged. When Fenelon heard the afflicting intelligence, the only words which he uttered were, "all my ties are broken. Nothing now binds me to the earth." In a letter written ſoon after this ſtroke, he ſays, among other things, "God has taken away all our hope for the church and the ſtate. He had formed this young prince, he had adorned him, he had prepared him for doing great good, he ſhewed him to the world, and immediately he has withdrawn him from it; I am ſtruck with horror; and I find myſelf ſinking without any bodily complaint. In weeping over the dead prince, my heart is torn to pieces, but I am alarmed for the living."

The ſucceeding removals of his friends and admirers, the dukes of Chevreuſe and Beauvilliers, were additional blows to his feelings and expectations. Nevertheleſs, the declining ſtate of the king's health, and the favourable ſentiments entertained of him by the duke of Orleans, encouraged his hopes; all which were terminated by a fever, ſucceeding the accident of being overturned in his carriage, which proved fatal to him in January 1715. One of his laſt acts was that of writing a letter to the king, concerning the ſpiritual affairs of his dioceſe, which alone ſeemed to be his remaining concern. He expired in perfect tranquillity, deeply lamented by all the inhabitants of the Low-Countries, and eſpecially by the flock committed to his charge. So well had he balanced his worldly affairs, that he died without money, and without a debt. The following portrait of Fenelon is given by the duke de St. Simon in his Memoirs; "He was a tall, lean, well-made man, with a large noſe, eyes whence fire and ſenſe flowed in a torrent; a phyſiognomy reſembling none which I have elſewhere ſeen, and which could not be forgotten after it had once been beheld. It combined oppoſites; it had both gravity and amenity, ſeriouſneſs and gaiety, and equally ſpoke the theologian, the biſhop, and the nobleman. His prevailing expreſſion, as well as that of his whole perſon, was ſenſe, ſagacity, grace, decorum, and eſpecially elevation. It required an effort to ceaſe to look at him. His manners were correſponding; they were marked with that eaſe which makes others eaſy, with that taſte and air of good company which is only acquired by frequenting the great world. He, moreover, poſſeſſed a natural, ſweet, and flowery eloquence; an inſinuating, but noble and diſtinguiſhing politeneſs; a ready, clear, and agreeable elocution; a power of making himſelf underſtood upon the moſt perplexed and abſtract ſubjects. With all this he never choſe to appear wiſer or wittier than thoſe to whom he ſpoke, but deſcended to every one's level, with a manner ſo free and enchanting, that it was ſcarcely poſſible to quit him. It was this rare talent which kept his friends ſo cloſely attached to him, notwithſtanding his fall; and which, during their diſperſion, aſſembled them to talk of him, to regret him, to long for his return, and to unite themſelves to him more and more." The principal works of Fenelon are as follow; *viz.* "Sur le Miniſtère des Paſteurs," and a treatiſe "De l'Education des Filles," both printed in 1688, "Maximes des Saints ſur le Vie interieure" 1697, already noticed as the oſtenſible occaſion of his diſpute with Boſſuet; "Dialogues of the Dead," two vols. 12mo. "Dialogues on Eloquence in general, and on that of the Pulpit in particular, with a letter on Rhetoric and Poetry," 12mo.; the latter being addreſſed to the French academy, of which he became a member in 1693; "Philoſophical Works, or Demonſtration of the Exiſtence of God by natural proofs," 12mo.; "Letters on different Religious and Metaphyſical Subjects," 12mo.; "Spiritual Works," four vols. 12mo.; "Sermons," 12mo.; ſeveral pieces in favour of the bull Unigenitus and the Formulary. "The moſt touching charm," ſays M. d'Alembert, "of his works, is the ſenſation of peace and repoſe with which he inſpires his reader; he is a friend who joins himſelf to you, who ſheds his ſoul into yours, who tempers, and at leaſt for a time, ſuſpends your troubles and afflictions." In his theology he ſeems to give greater ſcope to feeling than to reaſon, which ſufficiently appears from his connection with Madame de Guyon, and his predilection in favour of "Quietiſm;" but if he inclined to myſticiſm, and thus ſeemed to deviate from the eſtabliſhed ſyſtem of his church, he does not appear to have made the leaſt approach to proteſtantiſm. On the contrary, no one has more forcibly inculcated the danger of putting the ſcriptures into the hands of the people, (a fundamental tenet of popery,) than Fenelon has done in his "Letter to the Archbiſhop of Arras." Submiſſion to the deciſions of the holy ſee is likewiſe exemplified in his whole conduct as well as in his writings.

Indeed, Fenelon ſeems to have been one of thoſe, who, either from early prepoſſeſſions, or from falſe reaſonings upon human nature, or from an obſervation of the powerful impreſſions made by authority on the credulity, and a pompous ritual on the ſenſes of the multitude, imagine, that Chriſtianity, in its native form, is too pure and elevated for vulgar ſouls; and, therefore, countenance and maintain the abſurdities of popery, from a notion of their utility.

Fenelon alſo wrote againſt the Janſeniſts; partly to pleaſe the court-jeſuits, with views of conciliation, but principally, becauſe their doctrine, which he termed "pitileſs" and "overwhelming," was directly oppoſite to his own religious ſentiments. "God," ſaid he, "is to them only the "terrible" being; to me he is the "good" being: I cannot reſolve to make him a tyrant who firſt fetters us, and then commands us to walk, and puniſhes us if we do not." He was, however, though inimical to their opinions, indulgent to their perſons, and never permitted them to be proſecuted; and when it was repreſented to him that the Janſeniſts were his avowed enemies; "that," ſaid he, "is an additional reaſon for tolerating and pardoning them."

Of all Fenelon's writings his "Telemachus" was the moſt intereſting and popular. It has been publiſhed in a great variety of forms, and tranſlated into moſt modern languages. It is properly an epic poem in proſe, and intended to be the inſtitute of a prince, to which purpoſe it is admirably adapted: for never were purer, more uſeful, and more elevated maxims of public and private conduct offered to the heir of a monarchy. Louis XIV. could not have more ſeverely ſatirized himſelf than by proſcribing ſuch a picture of wiſe and humane government, and of the evils proceeding from unjuſt ambition and oſtentatious profuſion. What were the author's views in compoſing this work appear in a memorial which he drew up after the death of Boſſuet, his principal enemy, in order to diſſuade his friends from attempting to reſtore him to court: "God is my witneſs that I wrote the condemned book ſolely for the purpoſe of rejecting the errors and illuſions of Quietiſm; and as to Telemachus, it is a fabulous narrative in the form of an heroic poem, like thoſe of Homer and Virgil, in which I have introduced the principal actions that become a prince who is deſtined to govern. I compoſed this work at an epoch in which I was honoured with marks of the king's confidence and favour; and I muſt not only have been the moſt ungrateful of men, but the moſt graceleſs, had I ever deſigned to introduce into it ſatirical and offenſive portraits. I abhor the very thought of ſuch an intention. It is true that I interwove in thoſe adventures all the truths which are neceſſary for government, and all the faults which may be committed by the ſovereign power; but I ſtated none of them ſo as to form portraits and characters; and the more the work is read, the more it will appear that it was my plan to do juſtice to my ſubject, without painting any individual in particular. The narration was compoſed in haſte, in ſmall parts at a time, and on different occaſions; it affords much room for correction; and the printed copy is moreover not conformable to the original. Yet I have preferred the letting it remain imperfect and disfigured to printing it exactly as I wrote it. I thought only of amuſing the duke of Burgundy, and of inſtructing him while I amuſed him, without ever obtruding the work before the public; and all the world is aware that its appearance was occaſioned by the infidelity of one of my domeſtics. All the king's beſt ſervants know what my principles of honour and religion are, with reſpect to the ſovereign, the ſtate, and the country, and what a lively and grateful recollection I retain of his majeſty's favours." Telemachus, as a work of invention, ſays Dr. Aikin, has great merit, and is read with pleaſure for the beauties of its ſtyle, and the elegance of its fictions, by thoſe who are little intereſted in its political leſſons. Moreri. Mem. du Duc de St. Simon. Eloges Academ. par d'Alembert. Hiſtoire de Fenelon, &c. par M. L. F. de Bauſſet, late biſhop of Alais, &c. 3 vols. 8vo. Paris, 1808. Moſheim's Eccl. Hiſt. vol. 5. Gen. Biog. Monthly Review, vols. 57, 58, 59.

FENERA, a ſmall iſland in the gulf of Venice, near the coaſt of Iſtria. N. lat. 44° 54′. E. long. 14° 8′.

FENESTRA, in *Anatomy*, a name given to two ſmall holes which appear in the cavity of the tympanum, and which are diſtinguiſhed from each other by the epithets *rotunda* and *ovalis*. See EAR.

FÉNÉTRANGE, in *Geography*, a town of France, in the department of the Meurthe, and chief place of a canton in the diſtrict of Sarrebourg, ſeated on the Sarte, formerly the capital of a lordſhip of the ſame name, which being veſted in the duchy of Lorraine, was ceded with it to France; 33 miles E.N.E. of Nancy. The place contains 1355, and the canton 9923 inhabitants, on a territory of 217½ kiliometres, and in 21 communes.

FENGELD, in our *Ancient Writers*, is uſed for a tax or impoſition raiſed for repelling of enemies.

It comes from the Saxon *feind*, an *enemy*, and *geld*, *money*.

FENG-HOA, a town of Aſia, in the kingdom of Corea; 25 miles W.S.W. of Ping-hai.

FENIT, in *Geography*, a ſmall iſland on the weſtern coaſt of Ireland, in the bay of Tralee, county of Kerry.

FENKI, a town of the kingdom of Corea; 36 miles N.N.W. of Long-konang.

FENNEL, in *Botany*. See ANETHUM.

Fennel, in *Gardening*, the common name of a well known plant of the tall growing culinary kind. See ANETHUM.

There are three ſorts of this plant, Common Fennel, Sweet-Fennel, and Finochio.

Common fennel has a ſtrong fleſhy root that penetrates to a great depth in the ſoil, and which continues for ſeveral years. It is capable of being raiſed in moſt ſoils and ſituations.

Sweet fennel does not riſe ſo high in the ſtem as the common ſort, and the leaves are more long and ſlender, and do not terminate in ſo many points. The ſeeds have greater length, and are more light in their colour. They are uſually brought from Germany and Italy.

Finochio has been long in cultivation in Italy as a ſallad herb, but is rather ſtrong to the palate. It is ſaid to have been brought from the Azonian iſlands. See ANETHUM and FINOCHIO.

Fennel, in the *Materia Medica*. See ANETHUM *fœniculum*.

Fennel-*flower*, or, *Devil in a Buſh*. See NIGELLA.

Fennel-*flower of Crete*. See GARIDELLA.

Fennel-*giant*. See FERULA.

Fennel, *Hog's*. See PEUCEDANUM.

Fennel, *Scorching*. See THAPSIA.

Fennel, *Sea*. See CRITHMUM.

FENNY River, in *Geography*, a branch of the Ganges, which diſcharges itſelf into the bay of Bengal. N. lat. 22° 49′. E. long. 91° 33′.

Another branch of the Ganges, which runs into the ſame bay, is called "Little Fenny river." N. lat. 22° 51′. E. long. 91° 29′.

Fenny-*Stratford*, a ſmall decayed market-town in the hundred of Newport, and county of Buckingham, England, is ſituated on the road to Liverpool, (the ancient Watling ſtreet,) and is partly in the pariſh of Bletchley, and partly in that of Simpſon. The town conſiſts of one principal ſtreet on a riſing ground, with a ſtone bridge over the river Loſield. The chapel, which is in Bletchley pariſh, having been dilapidated ever ſince the reign of queen Elizabeth, was rebuilt in 1724 by ſubſcriptions, procured by the exertions of Browne Willis. Fenny-Stratford is 46 miles from London, and contained, according to the late return to parliament, 81 houſes, and 469 inhabitants. It had from time immemorial a market on Mondays, which was confirmed by charter in 1609; being diſcontinued during the civil war, it was revived after the reſtoration. In 1665 this town was much depopulated by the plague, of which 139 perſons died; the inns were ſhut up, and the road was for a time turned into another direction: this calamity alſo proved fatal to the market, which has never flouriſhed, and has for many years fallen into diſuſe. Four fairs are annually held; a grant for one was procured in the year 1269, two others were eſtabliſhed by the charter of 1609. An act of parliament was paſſed in 1790 for incloſing the hamlet of Fenny-Stratford. Lyſons's Magna Britannia, vol. i. 4to.

FENTÉ, a town of Egypt; 15 miles N. of Abu-Girgé.

FENTON, Edward, in *Biography*, who flouriſhed in the reign of Elizabeth, was deſcended from an ancient family in Nottinghamſhire, where he had ſome property, which he ſold, as did alſo his brother Geoffrey, being, it is ſaid, more inclined to truſt to their abilities, than the ſlender patrimony deſcended to them from their anceſtors; and they were, ſays an accurate obſerver of mankind, among the very few of thoſe who take ſuch daring reſolutions in their youth, without living to repent of them in their old age. The inclination of Edward led him to the choice of a military and active life, and he ſerved ſome time with reputation in Ireland, but upon ſir Martin Frobiſher's report of the probability of diſcovering a north-weſt paſſage into the South ſeas, he reſolved to embark with him in his ſecond voyage, and was accordingly appointed captain of the Gabriel, a bark of twenty-five tons, in which he accompanied ſir Martin in the ſummer of the year 1577, to the ſtraits that now bear his name, but in their return he was ſeparated from him in a ſtorm, and arrived ſafely at Briſtol. In a third expedition, which proved unſucceſsful, he commanded the Judith, one of fifteen ſail, and had the title of rear-admiral; the miſcarriage of this voyage had not convinced Fenton of the impracticability of the project; he ſolicited another trial, and it was, after much application, granted him, though the particular object of this voyage is not eaſily diſcovered; his inſtructions from the privy-council, which are ſtill preſerved, ſay, that he ſhould endeavour the diſcovery of a north-weſt paſſage, and yet he is told to go by the Cape of Good Hope to the Eaſt Indies, thence to the South ſeas, and to attempt his return by the ſuppoſed north-weſt paſſage, and not by any means to think of paſſing the ſtraits of Magellan, except in caſe of abſolute neceſſity. The truth appears to be, he had intereſt enough to be allowed to try his fortune in the South ſeas. He ſailed in the ſpring 1582, with four veſſels, and was making to Africa, thence he intended to ſail to Brazil, in his courſe to the ſtraits of Magellan, but having learnt that there was already a ſtrong Spaniſh fleet there, he put into a Portugueſe ſettlement, where he met with three of the Spaniſh ſquadron, gave them battle, and after a ſevere engagement, ſunk their vice-admiral, and returned home. Here he was well received, and appointed to the command of a ſhip ſent out againſt the famous Armada. In ſome accounts of this action he is ſaid to have commanded the "Antelope," in others the "Mary Roſe," but his talents and bravery in the action are univerſally acknowledged, and it is certain he had a very diſtinguiſhed ſhare in thoſe actions, the fame of which can never be forgotten while England remains, as we truſt ſhe ever will, a free and independent ſtate. Little more is recorded of him than that he ſpent the remainder of his days at or near Deptford, where he died in 1603. A monument was erected to his memory in the pariſh church of Deptford, at the expence of Richard earl of Cork, who had married his niece. According to Fuller he died within a few days of his miſtreſs queen Elizabeth, and he remarks; "Obſerve how God ſet up a generation of military men both by ſea and land, which began and expired with the reign of queen Elizabeth, like a ſuit of clothes made for her, and worn out with her; for providence deſigning a peaceable prince to ſucceed her, in whoſe time martial men would be rendered uſeleſs, ſo ordered the matter, that they all, almoſt, attended their miſtreſs, before or after, within ſome ſhort diſtance, unto her grave." Biog. Brit.

FENTON, *Sir* GEOFFREY, brother to the above, being inclined to books rather than the buſtle of a military life, became a learned and elegant writer, and an active, able ſtateſman, privy counſellor, and ſecretary of ſtate in the kingdom of Ireland. We find him a privy counſellor in the year 1581, under the patronage of Arthur lord Grey, then lord-deputy in that kingdom. He not a little ſtrengthened his intereſt at court by his marriage with Alice, daughter of Dr. Robert Weſton, the lord chancellor of Ireland; and it ſhould ſeem that he required only an opportunity to diſplay his talents to make his own way. When once he was fixed in his office of ſecretary, he rendered himſelf ſo uſeful to the governor, that none of the changes to which that government was ſubject cauſed any alteration in his ſituation; and he never failed to uſe his power and influence for the intereſt of his country. He took every opportunity of perſuading the queen that the Iriſh were to be governed only by the rules of ſtrict juſtice, and that the ſafety and glory of her government in that iſland depended on her ſubjects enjoying equal laws and protection of their property. The queen frequently ſent for her ſecretary, Fenton, to conſult with him on her Iriſh affairs, which were ſometimes in a moſt difficult and alarming ſituation; this ſhews the high opinion ſhe entertained of his underſtanding, though it often happened that when he was returned to his duty, the adviſers of Elizabeth perſuaded her to adopt meaſures the reverſe of what Fenton had recommended. He was the means of extinguiſhing more than one rebellion, and of totally reducing the kingdom to ſubmit to Engliſh government. In 1603 ſir Geoffrey married his only daughter to Mr. Boyle, afterwards earl Cork, which proved to all parties a ſource of great ſatisfaction. At this period, *viz.* the acceſſion of James I. to the throne, the zeal and high ſervices of ſir Geoffrey Fenton procured him the entire confidence of ſir Arthur Chicheſter, the new lord deputy. He continued to hold his office in full poſſeſſion of his credit and authority till October 1608, when he died at his houſe in Dublin, and was interred with every mark of reſpect in the cathedral church of St. Patrick, leaving behind him the character of a polite writer, an accompliſhed courtier, an able ſtateſman, and true friend to his country. He was perfectly acquainted with the French, Spaniſh, and Italian languages, and his tranſlations from them are ſuppoſed to have firſt brought him into the notice of perſons of rank and conſideration at court: the tranſlations mentioned in the Biographia Britannica are, 1. An Epiſtle to the Paſtors of the Flemiſh Church in Antwerp, written by Anthony de Carro, 1578; 2. An Account of a Diſpute at Paris between two Doctors of the Sorbonne, and two Miniſters of God's word, 1571; 3. Golden Epiſtles, from the Latin, French, and Italian, 1577; and, 4. The Hiſtory of the Wars of Italy, by F. Guicciardini, in twenty books, 1599. Biog. Brit.

FENTON, ELISHA, was born at Newcaſtle, in Staffordſhire, about the cloſe of the 17th century. His father was a gentleman of conſiderable property; but Eliſha being the youngeſt of twelve children, was deſtined to a profeſſion, and was accordingly entered at Jeſus college, Cambridge. His ſcruples reſpecting the terms of conformity precluded him from all expectations of academical honours and eccleſiaſtical preferment. He left the univerſity with no other proſpects than thoſe which his literary talents could afford. At firſt he engaged in the humble employment of uſher to a ſchool in Surrey, and was afterwards maſter of the foundation ſchool at Seven-Oaks, a ſchool which at this time is in conſiderable repute, though probably diverted from the intentions of the founder. In 1710 he engaged as ſecretary to Charles, earl of Orrery, at Bruſſels, and tutor to his ſon. He had already given ſpecimens of his talents in poetry, and when his engagement with lord Orrery had ceaſed, he obtained, through the recommendation of Pope, a ſituation with ſecretary Craggs, who, aware of the deficiencies of his own education, wiſhed for a companion, a man of taſte and learning, from whom he might acquire occaſional inſtruction. He next undertook, for Pope, the tranſlation of the firſt, fourth, nineteenth, and twentieth books of the Odyſſey, for which he received the ſum of 300*l.* His tragedy of Mariamne rendered him more known; it was performed in 1723, with very great applauſe, and produced him 1000*l.* with which he was enabled to diſcharge a debt incurred during his attendance at court; "an inſtructive compariſon," ſays his biographer, "between the patronage of the public, and that of a king or miniſter." Thus freed from an embarraſſment, that probably hung heavy on his mind, we hear but little more of him as a writer. His exertions in this reſpect appear to have been more the product of neceſſity, than the ſpontaneous effuſions of a mind delighted with the employment. He now undertook the domeſtic education of the ſon of lady Trumball, widow of ſir William Trumball; afterwards he went with him to Cambridge, and then reſided with the lady herſelf as auditor of her accounts. Thus eaſy in his ſituation, he had recourſe to the preſs only for amuſement. To an edition of Milton's poems he prefixed a life, written with candour and elegance. He then publiſhed a ſplendid edition of Waller, with notes; this was in the year 1729, and in the following year he died at Eaſthampſtead, in Berkſhire. His early death was brought on by want of exertion and indulgence. His pupil, lord Orrery, ſays of him, "Poor Fenton died of a great chair and two bottles of port a-day;" but he adds in atteſtation of his character, "He was one of the worthieſt and modeſteſt men that ever belonged to the court of Apollo. Tears ariſe when I think of him, though he has been dead above twenty years." Fenton's poetry is little read now, but his "Ode to lord Gower" was pronounced by Pope to be exceeded by none in the Engliſh language, except Dryden's on St. Cecilia's day. His tragedy of Mariamne, founded on the ſtory of Herod, as related by Joſephus, maintains a reſpectable rank among dramatic compoſitions, though it is never acted. Johnſon's Lives of the Poets.

FENUGREEK, in *Botany*. See TRIGONELLA.

FENUGREEK, in the *Materia Medica*. The ſeeds, which are brought to us from the northern parts of France and Germany, have a ſtrong diſagreeable ſmell, and an unctuous farinaceous taſte, accompanied with a ſlight bitterneſs. An ounce renders a pint of water thick and ſlimy. To rectified ſpirit they give out the whole of their diſtinguiſhing ſmell and taſte, and afterwards to water a ſtrong flavourleſs mucilage. Theſe ſeeds are never given internally; their principal uſe being in cataplaſms and fomentations, for ſoftening, maturating, and diſcuſſing tumours; and in emollient glyſters. They were alſo an ingredient in the "oleum e mucilaginibus" of the ſhops; but this has no longer a place in the pharmacopœia. Lewis. Woodville.

FEN-Y, in *Geography*, a town of China, of the third rank, in Kiang-ſi; 20 miles E. of Yuen-tcheou.

FEO, FRANCISCO, in *Biography*, a Neapolitan compoſer, and one of the beſt maſters of his time. He may be numbered among the illuſtrious compoſers who had immortalized the Neapolitan ſchool, and eſtabliſhed its ſupremacy over all other nations. Its fire, fancy, energy, and expreſſion, and the accuracy of its ſtyle, are the characteriſtics of his compoſition. No one conducted an orcheſtra in a ſuperior manner to Feo, who flouriſhed about the year 1740.

FEODAL, FEODALIS, or *Feudalis*, of or belonging to a feud, or fee. See FEE, FEUD, and FEUDAL.

FEODALITY, the fealty paid to the lord by his feudal tenant. See FEALTY.

FEODARY, FEUDARY, or *Feudatory*, an officer anciently made and authorized by the maſter of the courts of wards. 32 Hen. VIII. cap. 26.

His office was to be preſent with the eſcheator, at the finding any office of lands; and to give evidence for the king, concerning the tenure, and the value thereof: to ſurvey the land of the ward after the office found, and rate it. He alſo aſſigned the king's widows their dowers, and received the rents of ward's lands. This office is taken away by ſtat. 12 Car. II. cap. 24.

FEODATARY, or FEUDATARY. See FEUDATARY.

FEODER, a meaſure for liquids, uſed throughout Germany. See MEASURE.

FEODITAS, in *Old Writers*, is ſometimes uſed for *fidelitas*, or *fealty*, which ſee.

FEODUM, or FEUDUM, the ſame with *fief*, or *fee*.

FEOFFMENT, derived from the verb *feoffare*, or *infeudare*, *to enfeoff*, *to give one a feud*, in *Common Law*, is the moſt ancient method of conveyance, and ſignifies a gift or grant of honours, caſtles, manors, meſſuages, lands, or the like corporeal or immoveable things, to another in fee-ſimple; that is, to him and his heirs for ever, by the delivery of ſeiſin, and the poſſeſſion of the thing given. See FEE, and LIVERY.

When this is done by writing, it is called the *deed of feoffment*.

In every feoffment the giver is called the *feoffer*, or *feoffator*, and he that receives, the *feoffee*.

The proper difference in our law between a feoffer, and a donor, is, that the feoffer gives in fee-ſimple; and the donor in fee-tail. Litt. l. 1. c. 4.

This conveyance is now but very little uſed, except where no conſideration paſſes, as in caſe of truſtees of lands for a corporation, &c. It is ſtill, however, a formal, valid, and effectual mode of conveyance; but of late years it has been almoſt entirely ſuperſeded by the conveyance by *leaſe and releaſe*, which ſee.

FEORME. See FARM.

FEOU-CHAN, in *Geography*, a town of China, of the third rank, in Chan-ſi; 20 miles E.S.E. of Pin-yang.

FER *de Fourchette*, *croix a fer de fourchette*, in *Heraldry*, is a croſs, having a forked iron at each end, like that formerly uſed by ſoldiers to reſt their muſkets on; by which it is diſtinguiſhed from the croſs fourche; the ends whereof turn forked; whereas in this the fork is fixed on the ſquare ends.

FER *de Moulin*, q. d. *iron of the mill*, is a bearing in heraldry; ſuppoſed to repreſent the iron ink, or ink of a mill, which ſuſtains the moving mill-ſtone.

FERABOSCO, ALFONSO, *the Younger*, in *Biography*, is ſaid to have been born at Greenwich of Italian parents. He ſeems to have acquired conſiderable weight in this country, more from his name and the reputation of his father than real merit. However convinced he may have been himſelf of his ſuperior abilities, we have our doubts concerning the genius, at leaſt, of this author, though he had the poets and dilettanti all on his ſide; as his compoſitions that have come under our inſpection ſeem wholly unworthy of a great profeſſor. The "Ayres," which he publiſhed in London, 1609, with an accompaniment for the lute, contain as little merit of any kind as we have ever ſeen in productions to which the name of a maſter of eſtabliſhed reputation is prefixed: theſe he dedicated, with no great humility, to prince Henry, the eldeſt ſon of James I.

Three herald minſtrels, ycleped Ben Jonſon, T. Campion, and N. Tomkins, proclaimed the high worth and qualities of theſe Ayres in three encomiaſtic copies of verſes, prefixed to the work; but theſe friendly bards, who praiſe not with a very ſparing hand, ſeem to have leſs exalted ideas of the author's merit and importance than himſelf; "For," ſays he to the prince, "I could now, with that ſolemn induſtry of many in epiſtles, enforce all that hath been ſaid in praiſe of the faculty of muſique, and make that commend the worke; but I deſire more, the worke ſhould commend the faculty: and therefore ſuffer theſe few Ayres to owe their grace rather to your highneſſe judgment, than any other teſtimonies. I am not made of much ſpeech; only I know them worthy of my name; and therein, I took paines to make them worthy of yours.

Your highneſſe moſt humble ſervant,
Alfonſo Feraboſco."

Four of theſe Ayres are inſerted in Burney's General Hiſtory of Muſic, vol. iii. The lute accompaniment to which is mere thorough baſe, which the chords implied by the figures placed over the baſe by the editor wholly comprehend.

FERÆ, in *Zoology*, the third order in the MAMMALIA claſs of animals, or thoſe which ſuckle their young by means of lactiferous teats: the order is diſtinguiſhed by having ſix ſharpiſh fore-teeth in the upper jaw, and tuſks ſolitary. The genera comprehended in this order are *Phoca*, *Canis*,

Canis, *Felis*, *Viverra*, *Muſtela*, *Urſus*, *Didelphis*, *Talpa*, *Sorex*, and *Erinaceus*, which ſee reſpectively.

Feræ *Naturæ*, in our *Law*, ſignify birds or beaſts that are wild, in oppoſition to ſuch as are tame; ſuch are hares, foxes, wild geeſe, or the like, wherein no man may claim a property, unleſs under particular circumſtances, as where they are confined, or made tame, &c. 2 Cro. 293. See Game, and Property.

FERAH, or Farree, in *Geography*, a town of Perſia, in Segeſtan; 90 miles N.N.E. of Zareng. N. lat. 33° 20'. E. long. 62° 22'.—Alſo, a river of Perſia, which runs into lake Zere, at Neubendum, in Segeſtan.

FERAHAM, a town of Perſia, in the province of Irak; 72 miles E.N.E. of Nehavend.

FERALIA, in *Antiquity*, a feaſt held by the Romans, on the 21ſt of February, in honour of the dead, or of the Dii Manes. Vide Mem. Acad. Inſcript. tom. i. p. 43.

Varro derives the word from *inferi*, or from *fero*; on account of a repaſt carried to the ſepulchres of thoſe to whom the laſt offices were rendered on that day. Feſtus derives it from *ferio*, on account of the victims ſacrificed. Voſſius obſerves that the Romans called death *fera*, *cruel*, and that the word feralia might ariſe thence.

Macrobius, Saturn. lib. i. cap. 13. refers the origin of the ceremony to Numa Pompilius. Ovid, in his Faſti, goes back as far as Æneas for its inſtitution. He adds, that on the ſame day a ſacrifice was performed to the goddeſs Muta, or Dumb; and that the perſons who officiated were an old woman, and a number of young girls who attended her. This feaſt ſometimes continued for ſeveral days; and at its termination friends and relations kept a feaſt of peace and love, for ſettling differences and quarrels among one another, if any ſuch exiſted.

FERAN, in *Geography*, an iſland in the North Pacific ocean, near the S. W. coaſt of Quadra and Vancouver's iſland, about 16 miles in circumference. E. long. 234° 17'.

FERANZA, a town of Naples, in the Baſilicata; 4 miles N.W. of Acerenza.

FERASTAK, or Ferestack, a town of Egypt; 14 miles S.S.E. of Faoué.

FERBANNA, a town of Africa, in the kingdom of Bambouk, 40 miles N.W. of Bambouk. N. lat. 13° 45'. E. long. 9° 58'.

Ferbanna *Tenda*, a town of Africa, in the country of Dentila, on the W. bank of the river Faléme, 65 miles S.W. of Bambouk. N. lat. 12° 46'. W. long. 12° 6'.

FERBAR, or Ferebr, a town of Great Bucharia, on the Gihon, oppoſite to Amu.

FERCULA, or Forcula, a town of Africa, and principal place of a diſtrict, in the country of Tafilet; 50 miles W. of Sugulmaſſa. N. lat. 31° 40'. W. long. 4° 36'.

FERD-Wit, or Ferd-*Wite*, in our *Ancient Cuſtoms*, a formulary, by which the king pardoned manſlaughter committed in the army.

The word is formed of the Saxon *ferd*, *army*, and *wite*, *puniſhment*.

FERDFARE, from the Saxon *ferd*, *army*, and *fare*, *journey*, in our *Old Writers*, is uſed for being diſcharged from going to war.

FERDINAND I., in *Biography*, emperor of Germany, ſecond ſon of Philip, archduke of Auſtria, by Joanna of Caſtile, was born in Spain in 1503, and being educated in his native country became a greater favourite with the Spaniards than his elder brother Charles V. He was encouraged to expect the regency of Arragon from his grand-father Ferdinand the king, who was perſuaded to alter his laſt will in favour of another. The young prince ſhewed ſymptoms of diſcontent at the change; and, being brought to Madrid, he was kept under the vigilant eye of cardinal Ximenes. Some time afterwards, he was ſent to Germany to viſit his grandfather Maximilian. Here he married Anne, daughter of Ladiſlaus, king of Hungary and Bohemia, and Charles immediately ſettled on him both Auſtrias, and all the domains appertaining to that houſe in Germany. When his brother-in-law, Lewis, was ſlain at the battle of Mohatz, in 1526, Ferdinand laid claim to, and obtained, the crowns of Hungary and Bohemia. Through the influence of his brother, then emperor, he was elected king of the Romans in 1531, notwithſtanding the oppoſition of the Proteſtant electors of Saxony and Brandenburg. Hungary, in the mean time, was invaded by the Turks, with count of Scepus at their head, who eventually gained poſſeſſion of a great part of the country. Ferdinand thought it adviſeable to treat, and to allow the count all he had acquired, with the title of king of Hungary, during his life, but at his demiſe it was to revert to himſelf. At his death, however, a great part of the nation recognized his ſon by the name of king Stephen. Ferdinand now attempted to enforce by arms the performance of the treaty, but Solyman, the Turkiſh emperor, joined the Hungarians, defeated the forces of Ferdinand, and ſeized a great part of Hungary for himſelf. After this, Ferdinand ſubmitted to pay him a tribute for the portion he ſtill held. His attempts to extend his prerogatives in Bohemia, and render its crown hereditary, together with the progreſs of the reformation in that country, having occaſioned an armed confederacy againſt the royal authority; Ferdinand, at the head of a body of imperial troops, diſperſed it, and diſarming the people, reduced them to greater ſubjection than before. He treated the city of Prague with great rigour, and aboliſhed its ancient privileges. In 1551 he invaded Tranſylvania, and obtained poſſeſſion of it by the reſignation of queen Iſabella, mother of Stephen; this province was, however, ſoon wreſted out of his hands by Solyman, who recovered it for Iſabella in 1553. Charles, as we have ſeen, obtained for Ferdinand the title of king of the Romans, but now, on account of his boundleſs ambition, he was deſirous of tranſmitting the imperial crown to his own ſon Philip. Afterwards, indeed, he committed the management of his German affairs almoſt entirely to Ferdinand, who opened the diet of the empire at Augſburg in 1555. In this, toleration was granted and confirmed to Proteſtants, and the peace of religion was for a time eſtabliſhed. Charles again attempted to perſuade his ambitious brother to renounce the ſucceſſion in favour of Philip, but his intreaties were of no avail; he therefore, in 1556, executed a deed of reſignation of the empire, and at the diet of Frankfort, in February 1558, Ferdinand was unanimouſly declared emperor. The pope, Paul IV., refuſed to acknowledge the reſignation of Charles, and ſucceſſion of Ferdinand, becauſe the conſent of the holy ſee had not been previouſly obtained. His ſucceſſor Pius IV. did, however, recognize the new emperor. In his character of emperor, Ferdinand attempted to reconcile the Proteſtants to the Catholic church; his endeavours were unavailing, but he was ſucceſsful in ſecuring the ſucceſſion to his ſon Maximilian. It is highly to his credit that he preſerved the public peace of the empire, made a truce with the Turks of eight years, and terminated a diſpute between the kings of Denmark and Sweden. He died at Vienna in 1564, leaving behind him four ſons and eleven daughters. Ferdinand was undoubtedly ambitious, but he was juſtly famed for his remarkable equity, prudence, munificence, and unwearied application to buſineſs. He ever piqued himſelf on a rigid obſervance of his word and gave a ſtriking inſtance of his punctuality in that reſpect, by beſtowing a favour on an officer, who, after the promiſe, had proved himſelf unworthy of it. "I owe," ſaid the monarch, "a greater reſpect to my word, than to the merits of him to whom I pledged it." Robertſon Ch. V.—Univerſ. Hiſt.

Ferdinand II. emperor, grand-ſon of the preceding, ſon of Charles, archduke of Stiria, by Mary of Bavaria, was born in 1578, and elected king of Bohemia in 1617, and king of Hungary in the following year; but the religious diſputes in Bohemia having cauſed a revolt, Ferdinand was deprived of the kingdom ſoon after the death of his couſin, Matthias, by whoſe influence he had been originally choſen. He was, however, at the ſame time, appointed to the ſucceſſion of the empire, and in the character of emperor he found it neceſſary to form a Catholic league, in order to oppoſe that of the Proteſtants who ſupported the elector Palatine. That unfortunate prince was completely defeated at the battle of Prague in 1620, in conſequence of which Bohemia was obliged to ſubmit to its former maſter. The leaders were put to death, and the exerciſe of the Proteſtant religion was entirely ſuppreſſed. Ferdinand carried his reſentment againſt the elector ſo far as to put him to the ban of the empire, and to invade the Palatinate, which, by means of his general, count Tilly, he entirely conquered, and then transferred the electoral dignity to Maximilian, duke of Bavaria. He was now become ſo formidable to the Proteſtant party, that a league was formed againſt him in the north of Germany, headed by Chriſtiern IV. king of Denmark. Ferdinand, however, triumphed over all his enemies, and then turned his attention to the affairs of Italy, where the death of Vincent, duke of Mantua and Montferrat, had left a diſputed ſucceſſion. The Auſtrian troops invaded and took Mantua, while their allies, the Spaniards, took Cazal, which was defended by the French. In the confidence which theſe ſucceſſes inſpired, the emperor took the moſt hoſtile meaſures againſt the Proteſtants; theſe in their turn applied to Guſtavus Adolphus, king of Sweden, who was not only brave, but the profeſſed enemy of the houſe of Auſtria. A league was formed, to which the king of France acceded, and almoſt before the emperor was appriſed of his danger, a war broke out, which reduced the houſe of Auſtria to the greateſt extremities, but he was enabled to make peace in 1635 with the elector of Saxony and moſt of the Proteſtants. In the following year, at the diet held at Ratiſbon, the emperor procured his ſon Ferdinand to be elected king of the Romans, and in February 1637 he died in the fifty-ninth year of his age, after an anxious and unquiet reign of eighteen years. By the performance of ſeveral vows which he made againſt the Proteſtants, he acquired the appellation of the Apoſtolic Emperor. He is much applauded by Roman Catholic writers, but his conduct as emperor has little claim to praiſe. Mod. Univer. Hiſt.

Ferdinand III. emperor, ſon of the preceding, was born in 1608, and ſucceeded to the empire on the death of his father: he happily tranquillized the interior of Germany, but had the mortification to perceive that the flames of war continued to rage with unabated fury on the frontiers, and that the calamities of the people were prolonged by the abilities of the generals employed. Theſe diſtinguiſhed themſelves by their gallant conduct, and the hoſtile ſovereigns, depending on unfailing reſources in their commanders, were but little alarmed by occaſional defeats. Hoſtilities were conſequently carried on with vigour, and the ill-fated inhabitants of Germany ſtill groaned beneath the yoke of oppreſſion. Various attempts were made to negociate, and at length, in 1648, the peace of Munſter was concluded, which has ſerved ſince as the political baſis of the Germanic conſtitution. By this treaty the king of Sweden acquired a large part of Pomerania, with the dignity of prince of the empire: the king of France became landgrave of Alſace, and the Lutheran and Calviniſtic religions were placed upon an equal footing of authority with the Roman Catholic. A variety of other conditions were agreed on relative to the ſtates and princes of Germany, which were received into the fundamental law of the empire. The pope oppoſed that part of the treaty which allowed the religious claims of the heretics, but his remonſtrances were diſregarded. The emperor procured the election of his eldeſt ſon to the dignity of king of the Romans, in 1652, but that prince's death not long after left the ſucceſſion undetermined. Ferdinand himſelf died at Vienna, in 1657, at the age of 49. He was reckoned a mild, humane, and generous prince, attached to religion, a friend to literature, and liberal to thoſe who ſerved him. Mod. Univer. Hiſt.

Ferdinand I. king of Caſtile and Leon, the firſt in whom thoſe crowns were united, was ſon of Sanchez III. king of Navarre, and of Nugna, heireſs of Caſtile. He was crowned king of Caſtile, in right of his mother, while his father was living. He married Sancha, daughter of Alphonſo V. king of Leon, whoſe brother Bermudo, when come to the throne, engaged in war with Ferdinand, and invaded Caſtile. Bermudo was ſlain in a battle in 1037, and Ferdinand was acknowledged king of Leon in right of his wife. He was now the moſt powerful monarch in Spain, but he conducted himſelf with ſo much moderation towards his various ſubjects, that he obtained their unanimous attachment. He made war on the neighbouring Moors, and puſhed his conqueſts into Portugal, as far as Coimbra, of which he became maſter in 1045; making at the ſame time the kings of Toledo and Saragoſſa his tributaries. Garcias, his brother, was king of Navarre, and being at this time extremely ill, Ferdinand paid him a viſit, but finding that a plan was laid to ſeize his perſon, he retired in diſguſt. The next year Garcias viſited him on a like occaſion, and was actually detained priſoner: he found means, however, to evade the vigilance of his keepers, and a war enſued between the brothers, in which Ferdinand acted on the defenſive. Garcias was killed, and Ferdinand is ſaid to have uſed the moſt extreme moderation after the victory, and to have abſtained from injuring his nephew, the young king of Navarre. But the queen, deſirous of enriching a new church at Leon with the bodies of two virgin martyrs, interred at Seville, cauſed Ferdinand, without provocation, to make an incurſion into the Mooriſh territory, the inhabitants of which he compelled to do him homage, and to comply with his religious requiſition. In the mean time his ſon Don Sanchez, acting as an ally to the king of Saragoſſa, defeated Ramiro, king of Arragon, in a great battle. Rodrigo, better known by the name of Cid, commanded under Sanchez on this occaſion. After this, in an aſſembly of the ſtates, he declared his intention of dividing his kingdoms among his three ſons. The conſequence of this imprudent policy was a revolt of the Mooriſh dependent kings of Toledo and Saragoſſa, who refuſed tribute, and attempted to ſhake off the yoke. Ferdinand marched againſt them with a powerful army, but a ſudden indiſpoſition obliged him to return to Leon, where he died in the autumn of 1065, leaving a high character for civil and military talents, and for an unblemiſhed private life. Mod. Univer. Hiſt.

Ferdinand III. king of Caſtile and Leon, ſon of Alphonſo IX. king of Leon, and Berengara, infanta of Caſtile, was born in 1200. On the death of the king of Caſtile, in 1217, the right to the crown was recognized by the ſtates to belong to Berengara, his ſiſter, who reſigned it to her infant ſon Ferdinand, whom ſhe cauſed to be inaugurated in the cathedral, amidſt the acclamations of the people, but his father, the king of Leon, marched ſuddenly an army into Caſtile, with a view of ſeizing the regency; he was, however, obliged to retreat. In 1219, the young king Ferdinand was married to Beatrice of Suabia, daughter of the emperor Philip, after which he was engaged for ſeveral years in war with the Mooriſh princes, his neighbours, from whom he took a number of fortreſſes. In 1230, the king of Leon died, and by his laſt will divided his dominions between his daughters, which had nearly produced a civil war; for while a part of the ſtates adhered to the infanta's cauſe, the reſt, who were the majority, declared in favour of Ferdinand. At length the ladies, in conſideration of an ample penſion, reſigned their rights to their brother Ferdinand, who thus accompliſhed the re-union of the kingdoms of Caſtile and Leon, which have never ſince been ſeparated. Ferdinand concluded a treaty with the king of Portugal, and continued to purſue his plan of reducing the Moors. After a ſeries of enterprizes, moſt of which were crowned with ſucceſs, as well by land as by ſea, he took Seville in 1248, and in the following year gained poſſeſſion of all the remaining Mooriſh towns and fortreſſes as far as the ſea. He next projected the invaſion of Africa, but a dropſy put an end to his deſign, and, in 1252, terminated his life. He had ſhewn great regard, during his life, to what was then called religion, and he died with all the demonſtrations of profound piety and humility, which are inculcated by the Catholic religion, and was, by his ſubjects, immediately regarded as a ſaint, though he was not canonized at Rome, and admitted to their calendar till 1671, during the reign of Clement X. He left a large family, and was ſucceeded by Alphonſo X. ſurnamed "the Wiſe." See ALPHONSO, or ALONZO X. vol. i. Mod. Univer. Hiſt.

FERDINAND IV. ſon of Sancho, ſucceeded his father in the year 1295, and was ſolemnly inaugurated in the cathedral church of Toledo. His mother aſſumed the regency during the minority, and governed with moderation and prudence, though ſhe was much haraſſed by contending claims, particularly by thoſe of Henry, uncle to the deceaſed king, who made loud demands for the regency. At length Ferdinand took the government into his own hands, and was married to the infanta of Portugal. Henry died without iſſue, after having rendered himſelf obnoxious to the greater part of the nation. His eſtates were all ſeized by the crown, and ſo little reſpect was paid to his memory, that even the rights of ſepulture were neglected till the queen interfered, and expreſſed her intention of following his remains to the tomb. "Let his funeral," ſaid ſhe, "be ſuitable to his rank, for we ought to remember his birth and forget his faults." War was carried on between Caſtile and Arragon for ſome time, and when peace was concluded, Ferdinand reſolved to renew the war againſt the Moors, and urged the expediency of that meaſure with ſucceſs, ſo that the ſtates of Valladolid conſented to defray the whole expence of the campaign. A numerous army was aſſembled by the infant Don Pedro, on the frontiers of Andaluſia, and the city of Alcaideta was quickly inveſted. Upon the arrival of the king at this place, he received information that two perſons, of the name of Carvajal, were in cuſtody, and ſtood charged with the murder of Don Juan Alonſo de Benavides. He immediately ordered the priſoners to be thrown from the ſummit of a rock, without even the form of a trial, though they aſſured him, in the moſt pathetic manner, of their innocence, and even offered to give the moſt irrefragable proofs of it. When the ſavage ſentence was about to be executed, the ſufferers, conſcious, perhaps, of their innocence, ſummoned Ferdinand to anſwer for his injuſtice, within thirty days, at the tribunal of God. This appeal had ſuch an effect on the king, that he ſickened and died on the laſt day of that period, which happened in the year 1312. Mod. Univer. Hiſt.

FERDINAND V. ſurnamed "The Catholic," ſon of John II. king of Arragon, was born in 1452, and married, in 1469, Iſabella of Caſtile, ſiſter of Henry IV., at whoſe deceaſe, in 1474, he was declared king, and Iſabella queen, of Caſtile and Leon. The new ſovereigns were proclaimed amidſt loud acclamations; and the fidelity of their ſubjects enabled them to defeat all the deſigns of their enemies, and to obtain quiet poſſeſſion of the crown, though not till the event of a civil war had decided in their favour. Ferdinand's father dying in 1479, he ſucceeded to the crown of Arragon, and thenceforth the kingdoms of Arragon, and thoſe of Caſtile and Leon, which comprehend all Spain, except Granada, held by the Moors, became inſeparably connected and united. Ferdinand and Iſabella governed with great prudence, but rather like independent ſovereigns than as man and wife; they were not unfrequently jealous of each other in their adminiſtration, though they generally acted upon the ſame principles, and forwarded the ſame purpoſes. While they took great pains in giving vigour to their government, and tranquillity to their people, an intemperate zeal led them to introduce that infernal engine of torture, the court of inquiſition, into their dominions. It was ſaid, indeed, that it was only intended to take cognizance of the frequent apoſtacies among Jewiſh and Mahometan pretended converts, and therefore regarded as a meaſure equally conformable to the intereſts of policy and religion. This, however, was but a ſtate trick, for it was ſoon diſcovered that it was a court authorized by the pope to decide upon the liberty, fortune, and life of any individual who ſhould be accuſed of holding heretical opinions, or of expreſſing any contempt for the ceremonies of the church, without being allowed to offer a defence, or even to be confronted with his accuſer. Two thouſand perſons are ſaid to have ſuffered death under the ſavage Torquemada, the firſt inquiſitor general, and a multitude of Jews and Mahometans quitted the country with precipitation to elude a ſimilar fate. To this horrible engine of torture may be imputed all the degradation to which Spain has ſubmitted ſince that period. The ſovereigns who introduced the inquiſition little contemplated the miſeries they were bringing on their country, or they would have ſhuddered at the idea; they were in their natures moderate and humane, and at all times cauſed civil juſtice to be adminiſtered with equal ſcales without regard to rank or condition. In 1481 they attacked the Moors, and after a war of ten years reduced their kingdom of Granada, and thus the whole of Spain was ſaid to be completely Chriſtian, without perhaps a ſingle individual underſtanding what was implied by the epithet. Iſabella next, for Ferdinand was now become a very ſecondary ſovereign, in the fervour of religious zeal, attacked and expelled the Jews from her dominions. Fortunately for theſe miſerable outcaſts of ſociety, they have always been ready to follow a Chriſtian maxim, when perſecuted in one city, or ſtate, to flee to another. When Iſabella had ſwept from her dominions all heretics, ſhe had leiſure for a project more honourable to her memory; ſhe took a chief concern in fitting out Columbus for the grand expedition, which beſtowed a new world on Spain, ſo little meriting the high honour. (See AMERICA, COLUMBUS, &c.) Another act of this reign muſt not be overlooked; the conquered Moors were at firſt tolerated in their religion, but it was now determined that, by force, or perſuaſion, or pious fraud, they muſt be converted; a ſhort time, in which much blood was ſhed, proved the abſurdity and impracticability of the plan, and Ferdinand compromiſed the matter by allowing theſe unhappy people to retire to Barbary, a meaſure which tended to preſerve the peace of the country, but which was injurious in a high degree to its induſtry and population. The decline of agriculture and manufactures in Spain is dated from this period. In 1502 the archduke Philip, with his wife Joanna, at the deſire of Iſabella, viſited Spain, and were acknowledged by the ſtates of Caſtile as ſucceſſors to the crowns of Caſtile and Arragon. Upon intelligence of a rupture between the emperor and the court of France, the archduke reſolved upon returning into his own dominions, notwithſtanding the remonſtrances of the king, and the entreaties of his wife. He left Madrid on the 19th of December, and gave a freſh cauſe of offence to his father-in-law, by concluding a treaty with the king of France. In march Donna Joanna was delivered of a ſon, who was baptized by the name of Ferdinand, but the conſequences of her delivery deranged her mind, a circumſtance that ſunk ſo heavily in the mind of Iſabella, as ſhortly to bring her to the grave. This event took place in 1504; and though by her will ſhe appointed Ferdinand to the regency of Caſtile during the minority of their grandſon Charles, afterwards the emperor, yet Philip took meaſures to oblige him to reſign in his favour. He enjoyed his power but a ſhort time, dying in Sept. 1506; and his wife being utterly unable to perform the duties of government, the regency was therefore again an object of conteſt, and the competitors were the emperor Maximilian and Ferdinand. About the cloſe of 1511 Ferdinand ſent the duke of Alva, with a ſmall army, to demand a paſſage through the king of Navarre's territories into France, and, on the rejection of his requeſt, made himſelf maſter of Pampeluna, and the greateſt part of the kingdom; this was ſuppoſed to add great luſtre to the Spaniſh crown, and to augment the fame of Ferdinand's admirable policy. He now fell into a languiſhing habit of body, and a deep melancholy ſeemed to ſettle on his mind, which admitted of no diverſion, and baffled the ſkill of the moſt able phyſicians, but which nevertheleſs ſubſided in a meaſure when buſineſs required his attention. He was ſtill as anxious as ever after power; unwilling even at the approach of death to admit a thought of relinquiſhing any portion of his authority; he removed from place to place, in order to fly from his diſorder, or to forget it, but in vain;

——— "no more than from himſelf can fly
By change of place."

He died January 23, 1516, being in the ſixty-fourth year of his age. He left his daughter Joanna heireſs of all his dominions, and afterwards they were to deſcend to the grandſon Charles. Ferdinand had acquired a high reputation for policy and the arts of government, but he was regardleſs of any engagement, provided it interfered with a new deſign; he even made his perfidy a ſubject of boaſt and merriment. Still, where religion was out of the queſtion, he diſplayed towards his own ſubjects much moderation and equity. He was beloved by the lower orders, whom he protected from the oppreſſion of the nobles, and took means to break the power of the feudal nobility. Modern Univer. Hiſt.

FERDINAND VI. ſon of Philip V. by his firſt wife Mary of Savoy, was born in 1713, but did not ſucceed his father till the year 1746, at which time Spain, in union with France, was engaged in war with England, the empire and their allies On this occaſion he diſplayed the humanity of his temper by various acts of clemency and beneficence, and at the ſame time continued to ſupport that ſyſtem of policy which was the baſis of the family compact of the houſe of Bourbon. He readily joined in the peace of Aix-la-Chapelle in 1748, by which one of his brothers was ſeated on the throne of the two Sicilies, and the other acquired the duchies of Parma, Placentia, and Guaſtella. He gladly employed the return of tranquillity in promoting the internal proſperity of his country; he corrected abuſes in the management of the revenue, aboliſhed the burthenſome tribunal of the nunciature, reformed the regular clergy, re-eſtabliſhed the marine, and encouraged commerce, manufactures, and agriculture. Occupied in theſe uſeful and beneficent deſigns, he refuſed to join the French court, in 1754, in a new war with England, and diſgraced his miniſter, who endeavoured to change his meaſures. In private and domeſtic life his virtues ſhone with peculiar luſtre, and his conjugal attachment was ſo ſincere, that he found it impoſſible to diſpel the deep melancholy which reſulted from the loſs of his beloved conſort. He died in Auguſt 1759, when he was ſucceeded by his brother Charles III. Mod. Univer. Hiſt.

FERDINAND, king of Portugal, was born in 1340, and ſucceeded his father in 1367. He was extremely handſome, very courteous, cheerful, and liberal; but his levity and fickleneſs produced the moſt diſaſtrous conſequences to his government and people. He had refuſed, during his father's life time, a proffered marriage with the daughter of Peter the Cruel, king of Caſtile; and at his acceſſion ſent to compliment Henry count of Traſtamere, who had expelled Peter from the throne; yet on the death of Peter he aſſumed to himſelf the title of king of Caſtile, and entered into a war with Henry. Ferdinand, though he had made a league with the king of Arragon, and had actually married by proxy his daughter Leonora, was induced by the mediation of the pope to make peace with Henry, with the condition of marrying his daughter Leonora; but a third Leonora coming in his way, he was led to break his former engagements and marry her. This alliance cauſed a revolt at Liſbon, and proved the ſource of much miſchief and diſaffectoin during his reign. He entered into an alliance with John of Gaunt, duke of Lancaſter, who had a claim on the crown of Caſtile in right of his wife, and engaged in a new war with Henry. In this conteſt Portugal was over-run, and part of the city of Liſbon was taken and burnt, together with the fleet, and Ferdinand was reduced to make peace again. Miſunderſtandings between the Engliſh and Portugueſe, and the natural fickleneſs of Ferdinand, cauſed a ſudden treaty to be concluded between the two crowns of Portugal and Caſtile, with a ſtipulation that the Engliſh troops, who had come out to the aid of Ferdinand, ſhould be inſtantly ſent home. Soon after Ferdinand gave his only daughter Beatrix in marriage to the king of Caſtile, on condition that her children, or her huſband, in caſe ſhe died without iſſue, ſhould ſucceed to the crown of Portugal. The nation would not, however, conſent to this agreement; they felt their own intereſt concerned, and ſpurned the propoſal with indignation. Ferdinand was now in weak health, and had other cauſes of chagrin, beſides public diſappointment; he ſickened, and bore a long and painful diſeaſe with much reſignation, and died in the ſixteenth year of his reign. Mod. Univer. Hiſt.

FERDINAND I., king of Naples, natural ſon of Alphonſo V. king of Arragon, was rendered legitimate by the decree of pope Eugenius IV. and aſcended the throne of Naples on the death of his father, in 1458, and was crowned in the following year. The country was ſoon involved in a civil war, by the interference of ſome diſcontented barons, who demanded John of Anjou as their king. John readily ſeconded their views, entered the kingdom, and gave Ferdinand a ſignal defeat, which cauſed him to be deſerted by the greater part of his ſubjects. He, however, recovered himſelf, and defeated his adverſary at Troia, and, by his ſubſequent conduct, reſtored tranquillity to the kingdom. He employed the years of peace in thoſe internal improvements which render a country great and reſpectable, in the encouragement of learning, arts, and manufactures, and in obtaining for the laws that degree of reſpect which commands obedience. He aſſiſted pope Sixtus VI. in his deſigns againſt Florence, where he had projected the ruin of the family of the Medici. Lorenzo, however, with a magnanimity worthy of him, repaired in perſon to Naples, and threw himſelf into the power and under the protection of Ferdinand. This liberal and candid conduct prevailed on the king to conclude an alliance with the Florentines, without conſulting the pope. In 1480 the Turks ſeized on Otranto, but it was recovered by his ſon Alonzo. To this ſon, who was totally unfit for government, Ferdinand committed the care of the empire, which excited ſo much diſcontent, that pope Innocent VIII. found means to encourage a revolt which threatened the ſafety of the throne. Ferdinand, in his turn, excited diſturbances againſt the pope in the eccleſiaſtical ſtate, which brought about peace. Pardon to the barons was one of its conditions; but this part of the treaty was ſhamefully violated, and many were put to death for their ſhare in the rebellion. Soon after, Charles VIII. king of France, prepared to invade Naples, and Ferdinand, conſcious that he had no claim upon the affections and loyalty of his ſubjects, was much alarmed. He took meaſures of defence, but in the midſt of his cares he was ſeized with a fit of apoplexy, of which he died in 1494, at the age of ſeventy-one, leaving his crown to his ſon Alphonſo. The ſtain of tyranny adheres to his name, but it is allowed that he poſſeſſed, in ſeveral points, the true wiſdom of a ſovereign. He was author of many uſeful laws, was the reſtorer of the univerſity of Naples, to which he introduced ſeveral eminent ſcholars, and was the author of a volume of orations and epiſtles. Mod. Univ. Hiſt.

Ferdinand de Cordova, flouriſhed in the fifteenth century, and has been celebrated in ſubſequent ages for his great learning and almoſt univerſal genius. He underſtood all the oriental languages, as well as Greek and Latin. He was an adept in canon and civil law; in mathematics, medicine, and theology. He is ſaid to have committed to memory the works of the moſt famous ſchoolmen and juriſts, and thoſe of Ariſtotle, Hippocrates, Galen, and Avicenna. To theſe mental acquirements he added a perfect knowledge of martial exerciſes, he played upon all muſical inſtruments, and is ſaid to have excelled in ſinging and dancing. He was at Paris in 1445, commanding the applauſe and admiration of that metropolis; and on account of his wonderful powers he was regarded as a ſorcerer, or even as the antichriſt. It is not known either when or where he died. Some works on theology and law have been attributed to him. Moreri.

Ferdinand de Jesus, a Spaniſh monk, was born in Andaluſia, and embraced the monaſtic ſtate at Granada in the year 1588. He was a great proficient in the different branches of ſacred and profane literature, and was ſo eloquent, that he obtained the name of "Chryſoſtom," or "Golden Mouth." He became a celebrated teacher of theology and morals in the different towns of Spain, and left behind him numerous writings, which are highly eſteemed in that country, where his memory is ſtill regarded as well for his piety as for his extenſive learning. Moreri.

FERDINANDI, Epiphanius, a phyſician of Meſſagna, in the territory of Otranto, where he was born October 2, 1569. He cultivated the ſtudy of the Latin and Greek poets at an early age, and wrote elegant verſes in both theſe languages. In 1583 he went to Naples with the intention of going through the courſes of philoſophy and medicine, and remained there, with the exception of ſix months in the year 159 , when all ſtrangers were compelled by the viceroy to leave the territory, until the year 1594, when he received the degree of doctor in medicine and philoſophy. He then repaired to his native place, where he ſettled himſelf in the practice of his profeſſion, and remained to the end of his life, notwithſtanding ſeveral honourable offers of diſtinction from ſeveral ſeats of learning. The duke of Parma, in particular, preſſed him to take the profeſſorſhip of medicine in the univerſity of his city; and the ſame invitation was given from the univerſity of Padua. He died in 1638, in the ſixty-ninth year of his age.

This phyſician compoſed a conſiderable number of treatiſes, but only the four following are known, as having been printed. 1. "Theoremata Medica et Philoſophica," Venice, 1611. 2. "De vita proroganda, ſeu juventute conſervanda et ſenectute retardanda," Naples, 1612. 3. "Centum Hiſtoriæ, ſeu Obſervationes et Caſus Medici," Venice, 1621; a treatiſe which relates to moſt of the diſeaſes of the body, and is diſtinguiſhed by conſiderable erudition. It has been ſeveral times reprinted in Germany and Holland. 4. "Aureus de Peſte Libellus," Naples, 1631. Mangetus. Bibl. Eloy.

FERDUSI, a celebrated Perſian poet, flouriſhed about the year 1020. He was originally only a ſimple peaſant, but, having diſcovered a natural genius for poetry, he became a diſciple of Aſſedi, and ſoon ſo far ſurpaſſed his maſter as to obtain the admiration of the Eaſt. His principal work was entitled "The Hiſtory of the Kings," containing a narrative, in verſe, of the acts of the ancient ſovereigns of Perſia. It is ſaid to have contained ſixty thouſand diſtichs, for each of which he obtained, of the reigning king, the reward of a piece of gold. It is now ſo much valued, that copies uſually ſell for more than one hundred crowns. Moreri.

FE'RE, La, in *Geography*, a town of France, in the department of the Aiſne, and chief place of a canton in the diſtrict of Laon; ſituated in a marſhy ſoil, near the river Sarre, which joins the Oiſe. The adjacent country may be inundated. It was very ſtrongly fortified by cardinal Mazarine, but afterwards diſmantled; 16 miles N.E. of Paris. The place contains 2,604, and the canton 14,334 inhabitants, on a territory of 195 kiliometres, in 26 communes. N. lat. 49° 40′. E. long. 3° 26′.

Fe're-*Champenaiſe*, a town of France, in the department of the Marne, and chief place of a canton in the diſtrict of Epernay; 12 miles E.N.E. of Sezannes. The place contains 1,880, and the canton 7,042 inhabitants, on a territory of 410 kiliometres, in 21 communes.

Fe're-*en-Tardenois*, a town of France, in the department of the Aiſne, and chief place of a canton in the diſtrict of Chateau-Thierry; 10 miles N.N.E. of this place. The town contains 1,884, and the canton 9,883 inhabitants, on a territory of 275 kiliometres, in 24 communes.

FEREBE, George, in *Biography*, a dilettanti muſician, who diſtinguiſhed himſelf in our country at a barbarous period for every ſpecies of ſecular muſic. This gentleman was maſter of arts of Magdalen college, Oxford, 1595, miniſter of Biſhop's-Cumings, Wilts.; he was a native of Glouceſterſhire, and well ſkilled in muſic. Antony Wood, in the "Faſti Oxon." vol. i. col. 150, has given a curious account of him, which we ſhall inſert in his own words. "This perſon did inſtruct divers young men of his pariſh in that faculty (muſic) till they could either play or ſing their parts. In the year 1613 queen Anne, the royal conſort of king James I., made her abode for ſome weeks within the city of Bathe, purpoſely for the uſe of the waters there. In which time he compoſed a ſong in four parts, and inſtructed his ſcholars to ſing it very perfectly, as alſo to play a leſſon or two (which he had compoſed) on their wind inſtruments. On the 11th June, the ſame year, the queen, in her return from Bathe, did intend to paſs over the Downs at Wendſdyke within the pariſh of Biſhop's-Cumings, of which Ferebe having timely notice, he dreſſed himſelf in the habit of an old bard, and cauſed his ſcholars to be cloathed in ſhepherd's weeds. The queen, having received notice of theſe people, ſhe, with her retinue, made a ſtand at Wendſdyke, whereupon theſe muſicians drawing up to her, played a moſt admirable leſſon on their wind inſtruments, which being done, they ſung their leſſon of four parts with double voices, the beginning of which was this:

"Shine, O thou ſacred ſhepherd's ſtar
On ſilly ſhepherd ſwaynes, &c."

which being well performed alſo, the bard concluded with an epilogue, to the great liking and content of the queen and her company. Afterwards, he was ſworn chaplain to his majeſty, and was ever after much valued for his ingenuity."

FERELE, in *Geography*, a town of Sweden, in Helſingland; 45 miles W.N.W. of Hudwickſwall.

FERENTARII, or FERENDARII, among the Romans, were auxiliary troops, lightly armed; their weapons being a ſword, bow and arrows, and a ſling; which were much leſs cumberſome than a buckler, battle-axe, pike, &c.

The name ſeems to have been derived *a ferendo auxilio*; theſe being auxiliary forces; though Varro thinks they might be ſo called, becauſe the ſling and ſtones *feruntur, non tenentur*.

We have alſo mention of another ſort of ferentarii, whoſe buſineſs was to carry arms after the armies, and to be ready to ſupply the ſoldiers therewith in battle.

Lydius uſes the name ferentarii for the *cataphracti equites*, *i. e.* cavaliers armed cap-à-pée.

FERENTINO, in *Geography*, a town of Naples, in the Capitanata; 11 miles S.S.W. of St. Serviero.—Alſo, a town of the Popedom, the ſee of a biſhop, immediately under the pope, containing 6 churches and 3 convents; 3 miles N. of Alatri.

FERENZA, a town of Naples, in the Baſilicata; 4 miles N.W. of Acerenza.

FERES, a town of European Turkey, in the province of Theſſaly; 12 miles W. of Zeiton.

FERET, a town of European Turkey, in Romania; 36 miles N.N.W. of Gallipoli.

FERETORY, in *Hagiography*, the ſhrine or moveable cheſt in which the body or the bones of ſome perſon of eminent ſanctity was depoſited in ancient churches. Such feretories were generally ornamented with ſilver, gold, and precious ſtones.

FERETRUM, among the Romans, the bier uſed in carrying out the bodies of the dead; which duty was performed by the neareſt male relations of the deceaſed: thus ſons carried out their parents, brothers their ſiſters, &c. See BURIAL.

FERG, FRANCIS PAUL, in *Biography*, a landſcape painter, born at Vienna in 1689, where he ſtudied under different maſters. In 1718 he left Vienna, and went to Dreſden and Bamberg in company with Alexander Thiele, in whoſe landſcapes he inſerted the figures and animals. He afterwards viſited England, where, not meeting with the encouragement he had found elſewhere, he became involved in his circumſtances, and, according to report, was found dead at the door of his lodgings, exhauſted by cold, want, and miſery.

The ſtyle of Ferg was in imitation of Wouvermans, but has neither the richneſs nor truth of the latter; his finiſhing is remarkably neat, and his ſcenes pleaſing, but his colour is generally faint, and often mealy; ſtill, his pictures will always pleaſe thoſe who are gratified with prettineſs, and have taſte to admire neatneſs and delicacy in execution. His pictures are uſually ſmall. He etched well in aquafortis, and his prints are eagerly ſought for by the curious. He died in 1740 aged 51.

FERGA, ST. in *Geography*, a town of Arabia, in the province of Hedjas; 75 miles S.S.E. of Medina.

FERGANA, a province of Great Bucharia, ſituated on the river Seir or Sihon. It is mountainous, and abounds in mines of gold, ſilver, copper, iron, and coal. Andegan is the capital. N. lat. about 40° to 42°. E. long. 65° to 70°.

FERGUS, a river of the county of Clare, Ireland, which forms a large eſtuary full of iſlands at its junction with the Shannon. This river dips under ground in ſome part of its courſe. Ennis, the county town, is on this river, and has a ſmall port at Clare, which is ſituated a few miles lower on it. This river is navigable from the Shannon river up to Clare, near Ennis.

FERGUSON, JAMES, in *Biography*, a practical philoſopher and aſtronomer of diſtinguiſhed reputation, was born in a humble ſtation at Keith, a ſmall village in Scotland, in the year 1710. At a very early age he gave evidence of extraordinary genius; for he learned to read by merely liſtening to the inſtructions which his father communicated to an elder brother, and by him he was alſo taught to write. He was afterwards ſent for about three months to the grammar ſchool at Keith. His taſte for mechanics appeared when he was only about 7 or 8 years of age, and by means of a turning lathe and a knife, he conſtructed machines that ſerved to illuſtrate the properties and uſes of the lever and of the wheel and axle. Of theſe machines, and the mode of their application, he made rough drawings with a pen, and wrote a brief deſcription of them. At this time his knowledge was ſo imperfect, that he conceived himſelf to have made ſome original diſcovery. Unable to ſubſiſt without ſome employment, he was placed with a neighbouring farmer, and occupied for ſome years in the care of his ſheep. In this ſituation he commenced the ſtudy of aſtronomy, devoting a great part of the night to the contemplation of the ſtars, while he amuſed himſelf in the day-time with making models of ſpinning wheels, mills, and other machines which he had an opportunity of obſerving. By another farmer, in whoſe ſervice he was engaged, he was much encouraged in his aſtronomical ſtudies, and enabled, by the aſſiſtance that was afforded him in his neceſſary labour, to reſerve a part of the day for making fair copies of the obſervations which he roughly ſketched out in the night. In making theſe obſervations he lay down on his back, with a blanket about him, and by means of a thread ſtrung with ſmall beads, and ſtretched at arm's length between his eye and the ſtars, he marked their poſitions and diſtances. This
kind

kind maſter recommended him to ſome neighbouring gentlemen, one of whom took him into his houſe, where he was inſtructed by his butler in decimal arithmetic, algebra, and the elements of geometry. Deprived of the aſſiſtance of his preceptor, he returned to his father's houſe; and availing himſelf of the information derived from "Gordon's Geographical Grammar," he conſtructed a globe of wood, covered it with paper, and delineated upon it a map of the world; he alſo added the meridian ring and horizon, which he graduated; and by means of this inſtrument, which was the firſt he had ever ſeen, he could ſolve the problems in that treatiſe. His father's contracted circumſtances obliged him again to ſeek employment; but the ſervice into which he entered was ſo laborious as to affect his health, and injure his conſtitution. For his amuſement in this enfeebled ſtate he made a wooden clock, and alſo a watch, after having once ſeen the inſide of ſuch a piece of mechaniſm. His ingenuity obtained for him new friends, and employment ſuited to his taſte, which was that of cleaning clocks, and of drawing patterns for ladies' needle work; and he was thus enabled not only to ſupply his own wants, but to aſſiſt his father. Having improved in the art of drawing, he was induced to draw portraits from the life, with Indian ink, on vellum. This art, which he practiſed with facility, afforded him a comfortable ſubſiſtence for ſeveral years, and allowed him leiſure for purſuing his favourite ſtudies. From Scotland he removed to London in 1743; and being recommended to ſeveral ſcientific perſons, he was treated with kindneſs and friendſhip; and encouraged to publiſh ſome curious aſtronomical tables and calculations, and to commence a courſe of lectures in experimental philoſophy, which he repeated in various parts of the country. In the year 1754 he publiſhed "A Brief Deſcription of the Solar Syſtem, to which is ſubjoined an Aſtronomical Account of the year of our Saviour's crucifixion," 8vo.; and alſo "An Idea of the Material Univerſe, deduced from a ſurvey of the Solar Syſtem," 8vo. In 1756 he publiſhed, in one volume, 4to. a larger work, entitled "Aſtronomy explained upon ſir Iſaac Newton's principles, and made eaſy to thoſe who have not ſtudied Mathematics."

About this time he was alſo introduced to his preſent majeſty, then prince of Wales, and had the honour of delivering lectures to him, for which he received ſeveral preſents; and after his acceſſion to the throne Mr. Ferguſon obtained a penſion of 50*l.* a-year. In 1760 he publiſhed his "Lectures on Subjects in Mechanics, Hydroſtatics, Pneumatics, and Optics, with the uſe of the Globes, the art of Dialling, and the calculation of the mean times of New and Full Moons and Eclipſes," 8vo.; this work, and alſo his "Aſtronomy," have paſſed through ſeveral editions both in 4to. and 8vo.; and of the former, a new edition, with ſeveral valuable additions, has been lately publiſhed by Dr. Brewſter of Edinburgh. His "Plain Method of determining the Parallax of Venus by her Tranſit over the Sun, and thence, by Analogy, the Parallax and Diſtance of the Sun, and of all the reſt of the Planets," firſt publiſhed in 1761, was annexed to the 4th edition of his "Aſtronomy," 1770, 8vo. In 1763 Mr. Ferguſon was elected a fellow of the Royal Society, and excuſed the payment of the uſual fees and contributions. During the ſame year he publiſhed, in 8vo. "Aſtronomical Tables and Precepts for calculating the true times of New and Full Moons, and ſhewing the method of projecting Eclipſes, from the creation of the World to A.D. 7800; to which is prefixed a Short Theory of the Solar and Lunar Motions." In 1767 he publiſhed "Tables and Tracts relative to ſeveral Arts and Sciences," 8vo.; and a "Supplement to the Lectures on Mechanics, Hydroſtatics, &c.;" which is annexed to the ſecond edition of that work. His "Young Gentleman and Lady's Aſtronomy, familiarly explained in ten Dialogues," was publiſhed in 1768, and re-printed in the following year, under the title of "An Eaſy Introduction to Aſtronomy, for Young Gentlemen and Ladies." His "Introduction to Electricity," 8vo. appeared in 1770; and in 1773 "Select Mechanical Exerciſes, ſhewing how to conſtruct different Clocks, Orreries, and Sun-dials, on plain and eaſy Principles, &c." 8vo. with an account of his life prefixed, written by himſelf. In 1775 he publiſhed "Two Letters to the Rev. John Kennedy, containing an Account of many Miſtakes in the Aſtronomical part of his Scripture Chronology, and his abuſive treatment of Aſtronomical Authors," 8vo. which were followed by a "Third Letter" on the ſame ſubject. In that year appeared his laſt work, entitled "The Art of Drawing in Perſpective, made eaſy to thoſe who have no previous knowledge of the Mathematics," 8vo. Mr. Ferguſon alſo communicated ſeveral papers to the Royal Society, which were printed in the Philoſophical Tranſactions. He died, after long labouring under the infirmities of a feeble conſtitution, in the year 1776. From the above detail it muſt appear that he was a man of extraordinary genius, particularly in mechanical inventions and contrivances. He was diſtinguiſhed alſo by an unaffected and perſpicuous mode of communicating his ideas both in his lectures and his printed works. His knowledge of pure mathematics, however, was very limited and ſuperficial; and our readers may be ſurpriſed when they are informed, upon the authority of Dr. Hutton, that he could never demonſtrate one propoſition in Euclid's elements. His judgment was clear, his application indefatigable; his diſpoſition was humble, meek, and benevolent, and his manners were diſtinguiſhed by a ſimplicity and courteouſneſs, which engaged the eſteem of all who knew him. The compiler of this article can teſtify, from perſonal knowledge, that he poſſeſſed theſe ſeveral qualities in an eminent degree. His whole life, as it has been juſtly ſaid, exemplified reſignation and Chriſtian piety; and "philoſophy ſeemed to produce in him only diffidence and urbanity, a love for mankind, and for his maker." Account of his Life, &c. above referred to. Nichols's Anecdotes of Mr. Bowyer. Hutton's Math. Dict. Gen. Biog.

FERHAD, in *Geography*, a town of Perſia, in the province of Khoraſan; 40 miles S.E. of Neſſapour.

FERIA, a town of Spain, in the province of Eſtremadura, ſituated on a mountain near the Guadiana; eight miles N. of Badajos.

FERIÆ, among the Romans, were holy-days, or days wherein they abſtained from work. The word feriæ is uſually derived *a ferendis victimis*, on account of the victims killed on theſe days. Martinius ſays, that feriæ were ſo called *velut* ἱεραὶ ἡμέραι, *dies ſacri*, *holy days*. Others obſerve, that all days in general, though they were not feaſt-days, were anciently called *feſtæ*, or, as Voſſius reads it, *feſiæ*; whence, according to that author, was formed the word *feriæ*.

The feriæ, or *dies ferati*, were obſerved and diſtinguiſhed chiefly by reſt; whereas the feaſts, or *dies feſti*, beſide a ceſſation from labour, were celebrated with ſacrifices and games; ſo that there were feriæ, which were not feaſt-days; though authors frequently confound the *feriæ* and *feſti*. Others confound the *feriæ* with the *dies nefaſti*, or *non-court-days*.

The Latin *feria* amounts to the ſabbath of the Hebrews. The Romans had divers kinds of feriæ, public and private, ſtated and occaſional; their names, at leaſt thoſe of the principal, are *æſtivales*, or ſummer *feriæ*; *anniverſariæ*, yearly *feriæ*; *compitalitiæ feriæ*, of the ſtreets and croſs-ways; *conceptivæ*, votive *feriæ*, which the magiſtrates promiſed every year; *denicales*, for the expiation of a family polluted by the death of any one; *imperativæ*, or *indictivæ*, thoſe occaſionally decreed by the magiſtrate; *Latinæ*, the Latin *feriæ*, inſtituted by Tarquin the Proud, for all the Latin people, amounting annually, ſays Dion. Hal. to forty-ſeven nations, being celebrated on mount Alba, in memory of the peace concluded by Tarquin with the people of Latium. Theſe *feriæ Latinæ* were either ordinary or extraordinary. They continued at firſt only for a day; but after the expulſion of Tarquin a ſecond day was added, and a third after the reconciliation between the plebeians and patricians; and in proceſs of time they were prolonged to four days. At theſe feaſts a bull was ſacrificed, and each town contributed a certain quantity of meat, wine, and fruits. *Meſſis feriæ* were thoſe of harveſt; there were alſo *paganales feriæ*, or *paganalia præcidaneæ*, which were what we properly call the vigils, or eves of the feaſts; *privatæ*, or *propriæ*, thoſe peculiar to the ſeveral families; as the *familiæ Claudiæ*, *Emiliæ*, *Juliæ*, &c.; *publicæ*, thoſe obſerved by all in general, or for the public weal; *ſementinæ*, thoſe held in ſeed-time; *ſtativæ*, thoſe kept conſtantly on the ſame day of the year; *Saturnales*, whereof we ſhall ſpeak in their place; *ſtultorum feriæ*, or *quirinaliæ*, the *feriæ* of fools, held on the ſeventeenth of February; *victoriæ feriæ*, thoſe of victory, in the month of Auguſt; *vindemiales*, thoſe of the vintage, from the twentieth of Auguſt to the fifteenth of October; *Vulcani feriæ*, thoſe of Vulcan, which fell on the twenty-ſecond of May. See FEAST.

FERIÆ was alſo uſed among the Romans for fair-days; becauſe it was their cuſtom to hold their fairs on the *dies feriati*, or holidays. Struv. Synt. Antiq. Rom. cap. ix. p. 425, 443, &c.

FERIA is ſtill retained in the Romiſh breviary, though in a ſenſe ſomewhat different from the feriæ of the ancients; being applied to the ſeveral days of the week, beginning with Sunday; provided none of thoſe days be a feaſt or faſt-day. Thus, Monday is the ſecond feria; Tueſday the third, &c.

The word feria, in this ſenſe, is doubtleſs borrowed from the ancient feria, a day of reſt. Accordingly, Sunday is the firſt feria; for anciently all the days of Eaſter-week were accounted feſtival days, by a decree of Conſtantine; whence thoſe ſeven days were called feriæ; Sunday being the firſt, Monday the ſecond, &c. And this week being then accounted the firſt of the eccleſiaſtical year, they afterwards accuſtomed themſelves to call the days of the other weeks after the ſame manner, *firſt*, *ſecond*, *third*, &c. feriæ. Though others will have it, that the days of the week were not called *feriæ* from the people's reſting, that is, on account of being obliged to abſtain from ſervile works; but to advertiſe the faithful, that they ought to abſtain from ſin. See Durand, De Off. Div. lib. viii. cap. 1.

Theſe are the *ordinary feriæ*; but beſides theſe, they have *extraordinary*, or *greater feriæ*; *viz.* the three laſt days of Paſſion-week; the two days following Eaſter day, and Whitſunday; and the ſecond feriæ of Rogation.

FERIAL DAYS, *dies* FERIALES, or FERIÆ, among the *Ancients*, ſignify holidays, or days vacant for labour, and pleading.

But in the ſtat. 27 Hen. VI. cap. 5. and in Forteſcue, De Laudibus LL. Angliæ, ferial days are taken for working days. S. Sylveſter ordained—"Sabbati & dominici diei nomine retento, reliquos hebdomadæ dies feriarum nomine diſtinctos, ut jam ante in eccleſia voraci cæperant appellari." So that ferial days are properly all the days of the week, except Sunday.

FERIJEE, in the dreſs of the Egyptians, is a ſort of ſkirt worn over another garment, and made either of black woollen, or of other coloured cloth furred; this by the more genteel people is left open before. It ſomewhat reſembles a night-gown.

FERING, in *Geography*, a town in the duchy of Stiria; 14 miles N. of Rackelſburg.

FERINO, ST. a town of Italy, in the department of the Adda and Oglio; 5 miles W. of Breno.

FERIO, in Latin treatiſes on muſic, implies, I beat, I ſtrike, in marking the meaſure; it is at the down part, or beginning of a bar, when the hand or foot comes down, as the ſignal for the commencement of a meaſure, though in the middle of a note. See SYNCOPATION.

FERISON, in *Logic*, a mood of the third figure of ſyllogiſms. In this mood the firſt propoſition is an univerſal negative, denoted by the vowel *e*; the ſecond a particular affirmative; and the third a particular negative, ſignified by *i* and *o*.

FERLING, in our *Old Statutes*, is uſed for the fourth part of a penny. Aſſiſ. panis & cereviſ. 51 Hen. III.

FERLINGATA TERRÆ, in our *Old Writers*, according to Blount, is the ſame as *ferlingus terræ*, which lord Coke on Lyttelton ſays, was a quarentine, or thirty-two acres of land. But according to the authorities quoted by Du Cange, Gloſſ. Lat. voc. Quarentena, it contained but forty perches.

FERM, FIRMA, in *Law*. See FARM.

FERMACO, in *Geography*, a ſmall iſland in the Grecian Archipelago, about 10 miles from the coaſt of Natolia. N. lat. 37° 17′. E. long. 27° 1′.

FERMANAGH, a townſhip of America, in the county of Pennſylvania, having 1505 inhabitants.

FERMANAGH, a county of Ireland, in the province of Ulſter, formerly ſubject to the old Iriſh family of Maguire, and called *Maguire's territory*. It was forfeited at the time of Tyrone's intended rebellion in the reign of James I. and was one of thoſe counties diſtributed to undertakers, on the plantation of Ulſter, for a particular account of which important meaſure, the reader is referred to the general article IRELAND. Fermanagh is bounded on the north by the county of Donegal; by Tyrone and Monaghan on the eaſt; by Cavan on the ſouth and ſouth-weſt; and by Leitrim on the weſt. The boundaries are not marked by nature, excepting the lakes, which partly ſeparate it from Leitrim, and ſome hills on the borders of Tyrone and Cavan. It extends 34 Iriſh (43 Engliſh) miles in length, and 26 Iriſh (33 Engliſh) miles in breadth. Its area is 283,400 acres, or 448 ſquare miles, (455,298 Engliſh acres, or 719 ſquare miles;) a very conſiderable portion however of this area is occupied by lough Erne, which extends from north to ſouth of various breadth, and completely ſevers the county into nearly equal parts. The number of houſes, according to the laſt official return publiſhed, was 11,983, which, at 6 to a houſe, would give a population of 71,900. The number of pariſhes is only 18, fifteen of which, containing 23 churches, are in the dioceſe of Clogher, and three pariſhes, with as many churches, are under the ſee of Kilmore. This county is in general hilly, but it is only on the confines of Tyrone, and in the weſtern diviſion adjoining Leitrim that it can be called mountainous. There is indeed no part of it which is not capable of cultivation; but at preſent many of theſe riſing grounds are rough and boggy, and merely afford a coarſe paſturage to herds of young cattle, from rearing which the farmers derive a principal ſource of profit. Indications of coal have been diſcovered in many parts of the weſtern diſtrict of this county, and in one place in particular, within a mile of lough Erne, there is ſuppoſed to be a very valuable colliery, but the time has not yet arrived for turning to account theſe mineral treaſures. Amongſt the other ſubſtances already diſcovered in it, manganeſe and fuller's earth are mentioned. Theſe, however, are not ſo valuable as the limeſtone, and different kinds of marles which are found in it, and are uſed as manure. On lord Enniſkillen's eſtate, weſt of lough Erne, are quarries of a grey, or brown and white marble, beautifully veined, and of a very fine grain. The farms are in many parts ſmall, to accommodate the linen-weavers, and the ſame ſpirit of induſtry is found here, as in the adjoining counties. Mr. Young, nearly 30 years ago, found them improving in their circumſtances, and living more comfortably than in moſt other parts of the iſland; and the neighbourhood of Enniſkillen, on the eaſtern ſide, is in particular a well-inhabited, and well-cultivated county. Lough Erne, which is ſuppoſed to occupy 45,000 acres, and the river Erne, by which its ſuperfluous waters are conveyed to the ſea, have been already deſcribed in former articles of this work. (See Erne.) There are two other lakes comparatively ſmall, but by no means of inconſiderable length; one called Melvin, and the other Macnean. Lough Macnean lies between the counties of Fermanagh, Cavan, and Leitrim, and communicates with lough Erne; lough Melvin is in the northern part, and a ſmall ſtream flows from it to the ſea. The only town deſerving notice is Enniſkillen, already mentioned. (See Enniskillen.) Fermanagh returns three members to parliament, two for the county, and one for the town of Enniſkillen. Young's Tour. Beaufort's Memoir, &c.

FERMAT, Peter De, in *Biography*, was born in the year 1590, and became, by his talents and acquirements, counſel of the parliament of Toulouſe, in France. He was one of the ableſt lawyers of the age in which he flouriſhed: was a good poet, and well grounded in claſſical and modern learning, intimately converſant in antiquities, and a profound mathematician. His works were collected and publiſhed at Toulouſe, in 1679, in 2 vols. folio, under the title of "Opera varia Mathematica." Theſe contain Diophantus's Treatiſe on Algebra; a method for the quadrature of all ſorts of parabolas; a treatiſe on the maxima and minima; with many ſmaller pieces, and his correſpondence with the moſt celebrated geometricians of his time. Fermat was as much diſtinguiſhed by his integrity and impartiality in the character of a magiſtrate, as by his great learning and knowledge. Moreri.

Fermat, in *Geography*, a town of Aſiatic Turkey, in Caramania; 12 miles S. W. of Akſhehr.

FERME *a Ferme*, in the *Manege*, ſignifies to exerciſe in the ſame place without ſtirring or parting.

FERMENT, of *fervere, to boil*, in *Phyſics*, any body, which being applied to another, produces a fermentation therein; or, any thing capable of exciting an inteſtine motion in the parts of another; and of ſwelling or dilating the ſame.

Thus, the acid in leaven is a ferment which makes bread riſe or ſwell. And the moiſture in hay is a ferment which heats, and makes it ſmoke. Thus alſo, rennet is a ferment which curdles and breaks milk; and barm, or yeaſt, is the ferment that ſets wort a working, &c.

Thoſe things are called ferments in an illuſive ſenſe, which, when added to the liquor, only correct ſome fault therein, and by removing ſome obſtacle to the fermentation, forward it by ſecondary means; as alſo ſuch as being added in time of fermentation, make the liquor yield a large proportion of ſpirit, and give it a finer flavour; all theſe additions have the name of ferments among our diſtillers, but improperly. The primary uſe of ferments is, to ſave time, and make diſpatch of buſineſs, while they only occaſionally and accidentally give a flavour, or add to the quantity of the ſpirit; and accordingly all fermentable liquors may, without the leaſt addition, only by a due application of heat, be brought to ferment more perfectly, though it will be more ſlowly than with the addition of any ferment. The general ferments uſed on theſe occaſions are the flowers and fæces of fermentable liquors generated, thrown up, or depoſited, during the time of the fermentation in that liquor, or after the end of it. There are two of theſe ferments, procurable in large quantities, and at a ſmall price; theſe are beer-yeaſt, and wine-lees. A prudent and artificial management of theſe, might render the buſineſs of the brewery for diſtillation, as in the buſineſs of the malt diſtiller, &c. much more eaſy and advantageous. It has always been found a great difficulty to procure theſe ferments in proper quantities, and preſerve them always ready for uſe; and this has been a great diſcouragement to the buſineſs, and hence ſome have been obliged to contrive artificial ferments, or to form mixtures or compounds of particular fermentable ingredients; but this has been attempted without any great ſucceſs, all theſe mixtures falling ſhort even of the common bakers' leaven in their uſe.

When the proper ſort of ferment is pitched upon, the operator is next to conſider its quantity, quality, and manner of application. The quantity muſt be proportioned to that of the liquor, to its tenacity, and the degree of flavour it is intended to give, and to the diſpatch required in the operation. From theſe conſiderations he will be able to form a rule to himſelf; but till ſuch a rule is formed, or, in order to the forming of it, proper trial will ſhew how much ſuffices for the purpoſe. The way is to begin with a little, and to add more occaſionally, the weight of the whole being noted beforehand; ſo that on weighing the remainder, after the proper quantity is taken away, it will be found how much exactly has been uſed out of it for the buſineſs.

Among the ſeveral ingredients of which fermentable liquors are made for the ſervice of the diſtillery, treacle requires more ferment than almoſt any other. This is not wonderful on a juſt conſideration of the nature of the ſubject, ſince the manner in which that concrete juice is made, muſt render it greatly unfit for fermentation afterwards, though the original product of a vegetable juice very much diſpoſed to it in its own nature. The ſtrength of the fire uſed in the ſugar-making, and its long continuance and almoſt immediate contact, and the lime and other alkalies uſed in refining the ſugar, that is, in making the treacle, do ſo condenſe, indurate, and ſcorch the body of this juice, and abſorb its acid, that it is ſcarcely to be expected that it ſhould ferment at all, even with the addition of jalap, or other powerful ſaline and acid or acrid ſtimulators, which tend to break the viſcous and aduſt connections of the particles.

The greateſt circumſpection and care are neceſſary in regard to the quality of the ferment, if a pure and well-flavoured ſpirit be required. It muſt be choſen perfectly ſweet and freſh, for all ferments are liable to grow muſty and corrupt; and if in this ſtate they are mixed with the fermentable liquor, they will communicate their nauſeous and filthy flavour to the ſpirit, which will ſcarcely ever be got off by any ſubſequent refining. If the ferment be ſour, it muſt by no means be uſed with any liquor, for it will communicate its flavour to the whole, and even prevent its riſing to a head, and give it an acetous, inſtead of a vinous tendency. When the proper quantity of a ſuitable and well-conditioned ferment is got ready, it muſt be put to the fermentable liquor in a ſtate barely tepid, or ſcarcely lukewarm. The beſt manner of putting them together, ſo as to make the fermentation ſtrong and quick, is this. When the ferment is ſolid, it muſt be broke to pieces, and gently thinned with ſome of the warm liquor; but a complete or uniform ſolution of it is not to be expected or deſired, as this would weaken its efficacy for the future buſineſs. The whole intended quantity being thus looſely mixed in ſome of the lukewarm liquor, and kept near the fire, or elſewhere in a tepid ſtate, free from too rude commerce of the external air, more of the inſenſibly warm liquor ought at proper intervals to be brought in, till thus by degrees the whole quantity is ſet at work together.

When the whole is thus ſet at work, and ſecured in a proper degree of warmth, and kept from a too free intercourſe with the external air, it becomes as it were the ſole buſineſs of nature to finiſh the operation, and render the liquor fit for the ſtill. In this eaſy manner the whole end of fermentation would be anſwered. But during the whole courſe of the operation, there are ſeveral other things that may be added with ſome particular view, as either to increaſe the quantity of ſpirit, or give it ſome agreeable flavour. Theſe additions may ſometimes require ſome alteration in the general method laid down above, though upon the whole it is right. Shaw's Eſſay on Diſtilling. See ADDITIONS.

FERMENTS *in the Earth*. It is very probable, that the natural ferments in the earth may be of more conſequence than is generally ſuppoſed, and tend to elucidate many things, which at preſent appear very myſterious. The different fruitfulneſs of different ſpots of the ſame ſort of land may be owing to this, as alſo the different temperature of air at the ſame time in places very little diſtant from one another. The effluvia ſent up by ſome of theſe, not only diſſolve ſnow that falls on them, but even melt it in the air as it approaches, and cauſe it to fall in rain, not in ſnow. And often in two places within a mile or two of each other, there ſhall be a diſparity of heat and cold no way elſe to be accounted for, ſince there is often no difference of ſhade or ſhelter.

In Scotland there are large tracts of land, where the ferment is ſo ſtrong, that the earth lets a perſon up to the ankles as he walks; and generally, at about a foot depth under this, there is found a ſtratum of pebbles, ſo cloſe rammed together, that they ſeem an artificial cauſeway. This land, though of no greater depth than a foot, is found very rich for garden plants, and even for fruit-trees. Phil. Tranſ. N° 110.

FERMENTARII, or FERMENTACEI, a denomination which thoſe of the Latin church have given to the Greeks, on account of their conſecrating and uſing leavened or fermented bread in the euchariſt.

As the Greeks call the Latins *azymites*, the Latins, in return, call them *fermentarii*.

FERMENTATION. The important proceſs by which ſaccharine ſolutions are converted into intoxicating liquors, is one of the moſt complicated in chemiſtry, and the preciſe cauſe of this change is as yet very imperfectly known. In the preſent article we ſhall notice the conditions requiſite to fermentation, the appearances that occur during the proceſs, and the eſſential product of it, reſerving for the articles SPIRITS, *Diſtilled*, and WINE, ſome further particulars. The only two ſubſtances indiſpenſably requiſite to the formation of a fermentable liquor are water and ſugar.

No vegetable juice will ferment that is not ſenſibly ſweet, and from which a portion of ſugar may not be extracted by chemical means. The ſtrength of vinous liquors (other circumſtances being the ſame) is in direct proportion to the quantity of ſugar contained in them before fermentation. The addition of ſugar to the weakly fermentable juices will enable them to produce a ſtrong full-bodied liquor, and the very eſſence of this proceſs is the diſappearance of the ſugar, and the conſequent production of alcohol.

With regard to the water, it does not appear how far this is an active ingredient in vinous fermentation, though it is fully aſcertained that a particular degree of dilution is neceſſary to this proceſs: this conſiſtence exiſts naturally in the juice of grapes, in the ſaccharine ſap of many trees, and of other ſpontaneouſly fermentable liquors; and if theſe very liquors be deprived by gentle evaporation of a conſiderable portion of their water, the reſidue will not ferment till the requiſite conſiſtence is reſtored by the addition of a freſh portion of water. On the other hand, if a ſaccharine mucilage is too dilute, the fermentation is very languid and imperfect.

But pure ſugar and water alone will not ferment, and therefore ſome other ſubſtance is alſo requiſite. To this point the attention of chemiſts has been often directed, but hitherto with but little ſucceſs; indeed, the general reſult of the experiments that have been made is, that ſeveral ſubſtances, very different in their other properties, will anſwer almoſt equally well as a ferment. Muſt, or the recent juice of the grape, contains, beſide ſugar and water, a quantity of vegetable acid, chiefly the tartareous, and one or more ſubſtances obſcurely deſcribed under the names of mucilage and extract. Each of theſe is requiſite to the fermentation of muſt; for if any one is abſtracted the proceſs will not take place. A warm temperature is alſo requiſite to fermentation. This varies according to the natural fermentability of the materials, and their bulk. Thus, grape-juice will readily begin to ferment at the temperature of about 60°, and the proceſs is ſtrong and vehement at 70° or 80°. The expreſſed juice of the ſugar-cane is ſo exceſſively prone to fermentation, that in the climate of the Weſt Indies the proceſs would begin in ten minutes, or a quarter of an hour; and hence, as fermentation is the deſtruction of the ſugar, it is neceſſary, in making ſugar, to counteract this tendency in the expreſſed juice as ſpeedily as poſſible, which is effected merely by bringing it to a ſcalding heat. A low temperature, as that of freezing water, is equally efficacious in preventing or arreſting the progreſs of fermentation, ſo that all domeſtic proceſſes of this kind are performed within doors, or near a fire, and in the large way chilling muſt be particularly avoided; but as the act of fermentation produces a conſiderable heat, the liquor within the veſſel being ſeveral degrees warmer than the ſurrounding air, large maſſes are of courſe leſs affected by the external cold, and will ferment at a lower temperature.

The firſt ſigns of fermentation are, a gentle inteſtine motion, the riſing of ſmall bubbles to the top of the liquor, and a whitiſh turbid appearance. This is ſoon followed by the collection of a froth, or head, conſiſting of a multitude of air-bubbles entangled in the liquor, which, as the proceſs advances, riſe ſlowly to a conſiderable height, forming a white denſe permanent froth. A very large portion of the gas alſo eſcapes, which has a ſtrong, penetrating, agreeable, vinous odour. The temperature of the liquor at the ſame time increaſes to ſeveral degrees above that of the external air, and continues ſo during the whole of the proceſs.

Sooner or later theſe appearances gradually ſubſide; the head of the foam ſettles into a denſe froth, and on turning it aſide, the liquor beneath appears much clearer and nearly at reſt, having depoſited a copious ſediment, and from being viſcid and ſaccharine is now become vinous, intoxicating, thinner, and of leſs ſpecific gravity.

The proceſs of fermentation, however, does not terminate ſuddenly, but goes off very gradually, the liquor continuing to work or throw up foam, to clarify, to attenuate, and more completely to loſe its ſugar, which at laſt can no longer be diſcerned by the taſte, or detected by chemical analyſis. The vinous liquor, when complete, if of ſufficient ſtrength and well fermented, will now keep for a great length of time in veſſels ſecured from the air, and undergoes comparatively little farther alteration, except in becoming more perfectly limpid by the depoſition of an additional quantity of ſediment.

The gas of fermenting liquors has been long known to conſiſt for the moſt part of carbonic acid; it will, therefore, extinguiſh a candle, deſtroy animal life, convert cauſtic alkalies into alkaline carbonats, and the like. But, beſide the carbonic acid, it has been proved by Scheele to hold in ſolution a ſenſible quantity of alcohol, and Prouſt has detected in it a portion of azot. Mr. Collier (Mancheſt. Tranſ.) has further ſhewn that in this gas are contained all the requiſites for vinous fermentation. He paſſed the whole of the gas from a ninety gallon fermenting tun into a caſk of water, and divided the liquor thus impregnated into three parts, of which one being immediately diſtilled, afforded a ſmall quantity of alcohol; to the ſecond was added ſome yeaſt, by which a new fermentation was excited, and the ſubſequent product of diſtilled ſpirit was nearly doubled, and the third being ſuffered to ferment a longer time, produced ſome vinegar.

The attenuation of liquors, or the diminution of their ſpecific gravity by fermentation, is very ſtriking. This is ſhewn by the hydrometer, which ſwims much deeper in fermented liquor than in the ſame materials before fermentation. Much of this attenuation is, doubtleſs, owing to the deſtruction of the ſugar, which, diſſolved in water, adds to its denſity, and to the conſequent production of alcohol, which, on the contrary, by mixture with water, diminiſhes the denſity of the compound. The extract, or mucilage, alſo appears to be in ſome degree deſtroyed by fermentation, for the gelatinous conſiſtence of thick liquors is much leſſened by this proceſs: the deſtruction of this principle, however, is by no means ſo complete as of the ſugar, many of the full-bodied ales, for example, retaining much of their original clammineſs and gelatinous denſity even after having undergone a very perfect fermentation.

It has been doubted whether the alcohol of vinous liquors exiſts in them ready formed, or in ſome intermediate ſtate, requiring the boiling heat of diſtillation for its complete developement. It is not eaſy to fix upon an unexceptionable mode of deciding this queſtion. It has been argued by Fabbroni, in favour of alcohol being a product, and not an educt from wine, that wine cannot be again formed by adding the diſtilled alcohol to the reſidue left behind in the retort: he alſo affirms, that if a ſmall portion of alcohol is added to wine, it may be ſeparated again almoſt entirely by carbonat of potaſh, but that this ſalt will not ſeparate any alcohol from wine in its natural ſtate. This laſt fact, however, only ſhews that the union of the alcoholic with the other parts of the wine, is too ſtrong to be broken by ſimple affinity, without the aſſiſtance of heat; and, as to the former, it is highly probable that the boiling heat operates ſome change on the other conſtituents of wine, the effect of which cannot be done away by the mere return of the ſpirit that has been driven off. This opinion, therefore, though by no means improbable, requires further confirmation.

The production of alcohol ſeems to be one of the laſt effects, or the completion of the proceſs of fermentation; for if the liquor is diſtilled while yet in a ſtate of high fermentation, it will not yield a drop of alcohol.

The atmoſpheric air ſeems to have no ſhare whatever in vinous fermentation, for it will take place full as well incloſed as in open veſſels, provided ſpace is allowed for the great expanſion of the materials, and the copious production of gas. Indeed Mr. Collier found, by direct experiment, that more ſpirit is procured by cloſe than by open fermentation. In three ſeparate experiments, in each of which an equal quantity of wort and yeaſt were fermented, under circumſtances preciſely ſimilar, with the ſingle exception, that in one the veſſel was open, and in the other cloſed, (the gas having no exit but through a tube dipping in water,) he found, on diſtilling each fermented liquor, and drawing off the ſame bulk of ſpirit from each, that that from the cloſe veſſel was conſtantly of leſs ſpecific gravity, and, therefore, richer in alcohol than the other. Where the ſpirit from the open veſſel was 74 degrees below proof, that from the cloſe veſſel was 56 degrees; where the former was 83, the latter was 65; and where it was 103, the other was 93.

The theory of vinous fermentation is ſtill involved in great difficulty, on account of the very compound nature of the ſubſtances employed, and their great tendency to decompoſition in various ways and proportions.

The reſults of Lavoiſier's experiments ſhould not paſs unnoticed, though it is obvious that much too great ſimplicity is attempted in the explanation of a proceſs which every circumſtance ſhews to be very complicated. The ſimple point to which the experiments of this able inquirer tend, is (ſetting aſide all other agents) to explain how ſugar becomes converted into carbonic acid and alcohol, which, after all, is the characteriſtic phenomenon of vinous fermentation.

The entire products of ſugar, yeaſt, and water, fermented in cloſe veſſels, are ſtated to be carbonic acid, alcohol, and water, together with a ſmall portion of acetous acid, and from theſe facts the following theory is deduced. Sugar is compoſed of eight parts hydrogen, 64 oxygen, and 28 carbon, and the proceſs of fermentation effects a change merely in the arrangement of the conſtituent parts of the ſugar, converting one portion into carbonic acid, and the other into alcohol; and hence (as carbonic acid contains only carbon, with a large proportion of oxygen) the portion which is left muſt contain all the hydrogen, part of the carbon, and a very ſmall proportion of oxygen: or, in other words, by this new arrangement of the ingredients of the ſugar, one portion, namely, the carbonic acid, is totally deprived of hydrogen, and overloaded with oxygen, while the other portion, namely, the alcohol, abounds in hydrogen, and is deficient in oxygen; the carbon being divided between the new products in nearly an equal proportion with regard to their reſpective quantities.

No theory more plauſible than the above has, perhaps, hitherto been offered to the general phenomenon of vinous fermentation, though it is very defective in many eſſential parts, and even does not correſpond with the alleged compoſition of alcohol, given by the ſame chemiſt in another part of his enquiries.

The great queſtion remaining for future enquirers to determine is, what the ſubſtance or circumſtance is, which diſpoſes ſugar to ferment; for it has been proved that ſugar will not of itſelf begin this ſpontaneous change into carbonic acid and alcohol; though, when once begun, the proceſs will probably go on without further aſſiſtance.

It has been already mentioned, that both extractive matter and an acid are preſent in every known inſtance of vinous fermentation; and, for any thing that appears to the contrary, both of them are neceſſary, though the requiſite quantity of each is very ſmall compared to the ſugar: therefore the ſtrength or body of the fermented liquor is in direct proportion to the quantity of ſugar alone, and there is good reaſon to ſuppoſe that the extractive matter and the acid are only acceſſary ingredients, though ſtill eſſential, as being thoſe without which the vinous decompoſition of ſugar cannot be effected.

It has been ſuppoſed that it is the *vegeto-animal* extract, as it has been called, which exiſts in the fermentable juices of vegetables, that cauſes the firſt change in the ſugar. The preciſe nature of this vegeto-animal matter is not very well known: it may be ſuppoſed to be ſimilar to the gluten of wheat, but intimately combined with the ſaccharine mucilage, and hence extremely ſuſceptible of ſpontaneous change. The chief, if not the only, proof of its exiſtence in many of theſe combinations, is the production of a quantity of ammonia during its decompoſition by heat, which alkali is almoſt always *formed* by the action of fire, and indicates in the ſubſtance which yields it the preſence of azot.

Some of the commoneſt fermenting ingredients, as the ſweet infuſion of malt, technically called wort, it is well known, will hardly enter into fermentation without the addition of *yeaſt*; and hence chemiſts have ſought in this ſubſtance for the principle which gives the firſt impulſe to the fermentation of ſugar.

The analyſis of yeaſt preſents a vaſt variety of ingredients, the chief of which are the carbonic, acetic, and malic acids, mucilage, ſugar, and gluten. Of theſe the latter is in the largeſt proportion, which would ſeem to give much weight to the opinion of the great ſhare which the azotic ingredient has in inducing fermentation.

Yet Mr. Henry found by a ſeries of very intereſting experiments, that malt infuſion might be made to enter into compleat fermentation by impregnating it with carbonic acid prepared from chalk and ſulphuric acid, and the liquor thus fermented gave a yeaſt which made perfect bread, gave alcohol by diſtillation, and vinegar by further keeping. The wort itſelf undoubtedly contained all the ingredients of yeaſt, ſince this ſubſtance was produced during the fermentation, but the experiment is deciſive to prove that no addition of azotic extract is required to begin fermentation in materials naturally fermentable, though, when once begun, the yeaſt, as faſt as it was produced, muſt have aſſiſted in the fermentation then going on. The evidence for the neceſſity of an acid to begin fermentation is therefore more deciſive, but it is ſtill doubtful whether any particular one is required, or whether there are not ſeveral which will anſwer the purpoſe. In Mr. Henry's experiments the acid employed was the carbonic, and, from the arrangement of the apparatus, probably a ſmall portion of ſulphuric was alſo carried in along with it. But in grape juice there is no proof of the exiſtence of carbonic acid ready formed, though the tartaric, malic, and other vegetable acids contain within themſelves the ingredients of carbonic acid, and are chiefly and ultimately reſolvable into this acid. Yeaſt will even induce fermentation after it is preſſed and dried into ſolid cakes, (a practice not uncommon, as it will keep for a great length of time in this form,) but after this operation it can hardly contain any carbonic acid ready formed, though with abundant tendency to produce it by the firſt mutual action of its conſtituent parts. Many intereſting enquiries therefore remain to be carried on before we can have a full and ſatisfactory theory of the important proceſs of vinous fermentation.

Fermentation, *Acetous*. See Acetous *Acid*, and Vinegar.

Fermentation, *Putrid*. See Putrefaction.

Fermentation, *Bituminous*, in *Geology*, denotes a particular change, which, according to the opinion of Mr. James Parkinſon, (Organic Remains, vol. i. p. 184.) "is peculiar to vegetable matter placed in ſuch ſituations, as not only exclude the external air, and ſecure the preſence of moiſture, but prevent the eſcape of the more volatile principles, and which terminates in the formation of thoſe ſubſtances called bitumens." This author, after giving a conciſe, but luminous account of the *ſaccharine*, the *vinous*, the *acetic*, and the *putrid* fermentation, to which moſt vegetable ſubſtances are progreſſively liable, by the modified admiſſion of atmoſpheric air, thus proceeds: "But if, inſtead of being thus expoſed to the influence of the air, a maſs of dead vegetable matter be accumulated in ſuch ſituations as allow of the admiſſion of water, but in which the compactneſs of the ſuperincumbent ſtratum of earth, not only excludes the external air, but the diſengaged gaſeous matters are prevented from eſcaping, the bituminous fermentation takes place, and bituminous matters are formed in various degrees of maturity and pureneſs, according to the ſtage at which the proceſs may have arrived, or the extraneous matters which may have been admitted." Our author, however, admits, that a complete hiſtory of all the phenomena which occur during the whole of the operation cannot poſſibly be expected to be made out, but the proofs of its exiſtence muſt be obtained by inference, and from analogy on comparing it with the other ſpecies of fermentation; and he thus continues: "the ſubſtance, then, which I conceive to be entirely dependent on, and actually the product of, this proceſs, is bitumen; a ſubſtance which manifeſts, upon examination, all thoſe properties which might, *a priori*, be expected to be found in a body conſtituted under the particular circumſtances which I have preſumed to have directed its formation.

"In the firſt ſtage of the vinous fermentation, we perceive that a conſiderable portion of the more volatile parts of the mixture is diſſipated, and that it is only by the careful preſervation of the remainder that the accompliſhment of this proceſs is effected. In the acetous fermentation this eſcape of the volatile parts is continued through the whole of the proceſs, and occaſions the great difference which exiſts between the two products. In the firſt of theſe ſpecies of fermentation, carbon, that principle which always ſeems to affect that mode of combuſtion, obſervable in ignited charcoal, where flame is not preſent, is, we have remarked, diſſipated in very large quantities, by which its doſe in the mixture muſt be conſiderably diminiſhed; whilſt, ſhould hydrogen even be ſuppoſed to eſcape in a ſimilar proportion, ſtill, from the decompoſition of the water, ſufficient of this principle (which I will call the principle of inflammability) will be yielded, to give the ſpirituous and very inflammable product which we find to be the reſult of this proceſs. In the latter of theſe ſpecies of fermentations, in which the diſſipation of the volatile matters is carried to the utmoſt extent which the degree of temperature will admit, the mixture ſeems to be deprived of almoſt the whole of its hydrogen; except, perhaps, juſt ſo much as is left in combination with the colouring principle, and the water, whilſt the oxygen is attracted, nearly in the ſame proportion, by the carbon from the atmoſphere, and from the very conſiderable doſe of this acidifying principle; and, from ſome peculiar modification of their union, the product, *vinegar*, reſults, poſſeſſing a high degree of acidity, but not the leaſt degree of inflammability.

“ We will now examine the changes which may be expected to reſult from the decompoſition of vegetable matters placed in ſubterranean ſituations, and conſidering theſe, with the properties which are poſſeſſed by the ſuppoſed product of the bituminous fermentation, we ſhall be enabled, eſpecially by recollecting what has been juſt ſaid of the other ſpecies of fermentation, to determine whether it is right to admit of the exiſtence of ſuch a ſpecies of fermentation or not.

“ Secured on every ſide by the ſurrounding earth, the maſs of vegetable matter is preſerved, at it were, in a well-cloſed veſſel; hardly any eſcape being permitted to any of its more volatile particles, nor any admiſſion of extraneous matters allowed, except of ſuch as are introduced with the water which may inſinuate itſelf by ſoaking through the interſtices of the earthy particles, compoſing the ſeveral ſtrata which incloſe it.

“ It is decreed, that a ſtrong diſpoſition to ſeparate, and to unite in another order, ſhall ſecure the neceſſary decompoſition of dead organized matter, which, according to the economy of nature, is but to poſſeſs a ſhort and tranſient coheſion. Agreeable to this law, this maſs of vegetable matter, now deprived of the energy of vegetable life, muſt undergo ſome change; but from the cloſeneſs of its preſervation, it cannot admit that eſcape of the gaſeous matters on which the commencement of the vinous, acetous, or putrid fermentations depend: another proceſs is therefore inſtituted. The hydrogen, carbon, and oxygen are diſengaged from their former attachments, but being prevented from flying off in a gaſeous ſtate, are obliged again to unite, and to enter into new combinations.

“ Under theſe particular circumſtances a ſubſtance may be expected to be formed, containing a conſiderable portion of theſe principles ſo abundant in vegetable matter. In this reſpect, there undoubtedly may be diſcovered a remarkable agreement between the ſuppoſed product of this fermentation, and the hypotheſis by which its formation is attempted to be explained; ſince, in all bituminous ſubſtances the abundant exiſtence of theſe three principles has been ſufficiently proved by analyſis.

“ In this, as in every other ſpecies of fermentation, a conſiderable difference may exiſt, as to the degree of perfection to which the proceſs may proceed, and of courſe, as to the degree of perfection which the product may poſſeſs.

“ Thus I expect to ſhew, that, according to length of time, excluſion from the air, and the exiſtence of other favourable circumſtances, will theſe bituminous ſubſtances be found in their ſeveral approaches to that ſtate, to which the law of nature ſeems to have particularly deſtined them.

“ Peat, that combuſtible and inflammable ſubſtance, generally found in conſiderable maſſes at a little depth beneath the ſurface of the earth, poſſeſſing chemical properties eſſentially different from every other ſubſtance which has not derived its exiſtence from the ſame origin, appears to be the firſt product of this kind of fermentation, and to have been formed in ſituations not favourable to the rapid completion of this proceſs. The celerity with which this proceſs is accompliſhed muſt depend on the cloſeneſs with which the gaſeous principles are ſecured; but it ſhould be conſidered, that ſuch peat-bogs as are, comparatively, but of modern formation, are covered by a coat of vegetable mould, in an humid ſtate, of no conſiderable degree of thickneſs, and therefore the eſcape of the more volatile principles, and the admiſſion of atmoſpheric air, are only partially prevented; the proceſs muſt therefore be carried on with much leſs effect, than in thoſe caſes which will be hereafter mentioned, where vaſt maſſes of vegetable matters have been ſuddenly buried under a conſiderable thickneſs of earthy depoſition.

“ The abundance of hydrogen, carbon, and oxygen, in peat, is demonſtrated by its analyſis. By the early analyſis of Schoockius we learn, that it yields an oil much reſembling the oil of amber, with an acid liquor. Monſ. Fourcroy relates, that, on expoſing peat to the action of heat in a diſtillatory apparatus, a yellow or reddiſh fœtid water is obtained, an oil of a moſt diſagreeable odour, with carbonate of ammonia, and carbonated hydrogen gas, alſo ſmelling moſt diſagreeably; a coal being left, which is frequently pyrophoric, and which yields, after incineration, muriate and ſulphate of ſoda and of pot-aſh, mixed with the phoſphate and ſulphate of lime, and with the oxyds of iron and of manganeſe.

“ The prevalence of hydrogen in this ſubſtance is fully diſplayed by the foregoing analyſis, ſince not only enough exiſts for the formation of this peculiar oil, but a conſiderable quantity of this principle is alſo diſengaged in a gaſeous form; the agreement, therefore, between this ſubſtance, and what might, *a priori*, have been ſuppoſed, would be the product of a vegetable matter placed under theſe particular circumſtances, appears to be evident. The original mode of exiſtence which belonged to this ſubſtance is ſufficiently marked by the great quantities of vegetable ſubſtances which are found in it, which have not ſuffered ſuch an alteration, as to hinder the immediately tracing them to their true origin. That this ſubſtance has been ſubjected to the influence of the two circumſtances, which ſeem eſſential to this peculiar fermentation, the preſence of moiſture and ſubterranean ſituation, muſt appear ſo plain from the ſtate in which the peat moſſes are found, that, on this point, not a word need be added. Peat, therefore, I preſume, we may regard as a vegetable ſecondary foſſil; having been formed from vegetable matter, changed in its nature and properties by a certain fermentation, which had been carried on in the mineral regions.”

The further proſecution of this theory by our author, in order to account for the formation of amber, and jet, &c. are too long for our purpoſe, but are well worthy the peruſal of thoſe who wiſh to become acquainted fully with this ſubject.

FERMENTED LIQUORS are eſteemed great antidotes to putrefaction; accordingly the abſtinence from them is aſſigned as one cauſe why the Turks are more ſubject than other people to the plague, and other contagious diſtempers. It is likewiſe obſerved, that beer, wine, and ſpirituous liquors, coming more into general uſe, has been one great means of ſuppreſſing putrid diſeaſes. See Pringle's Obſerv. on the Diſeaſes of the Army, p. 286. 294. and Macbride's Eſſ. eſſ. 3. See ANTISEPTIC, CHOWDER, and SPRUCE *beer*, and WORT.

FERMO, *Ital.* as canto fermo, or plain-chant, in *Eccleſiaſtical Singing*, is uſed in oppoſition to canto figurato, or figurative ſong. Rouſſeau was of opinion that the Roman, or Gregorian chant, is a precious relic, though much diſfigured, of the ancient Greek muſic, which, after having paſſed through the hands of the barbarians, has not loſt all its firſt beauties. Enough remains ſtill to make it far preferable for the uſe to which it is deſtined, to that effeminate and theatrical, or flat and mawkiſh muſic, which has been ſubſtituted to it in ſome churches, without gravity, without taſte, propriety, or reſpect for the place which they dare thus profane.

Canto fermo is written only on four lines in the Roman miſſals, and only two clefs are uſed, the baſe clef of F, and the clef of C, which are moveable, and only one flat upon B, and two kinds of notes, the long and ſquare note, to which a tail is ſometimes added, and the breve in the lozenge form, but all black. Theſe are called Gregorian notes, ſuppoſed to have been invented or adopted by St. Gregory, the firſt pope of that name. St. Ambroſe, archbiſhop of Milan, is ſaid to have invented the Ambroſian chant, or at leaſt to have brought it from Antioch, and to have eſtabliſhed it in his church at Milan, a conſiderable time before the pontifical reign of Gregory, who perfected it, and gave it the form which it ſtill preſerves at Rome, and in other churches where the Roman chant is ſtill practiſed. See PLAIN *Chant*, AMBROSIAN *Chant*, and GREGORIAN *Notes*.

FERMO, in *Geography*, a city of Italy, in the marquiſate of Ancona, ſituated near the coaſt of the Adriatic; the ſee of an archbiſhop, erected in the year 1589, by pope Sixtus V. It contains 10 churches and 16 convents; 26 miles S. S. E. of Ancona. N. lat. 43° 6′. E. long. 13° 44′.

FERMOR, WILLIAM, in *Biography*, count Von, a celebrated Ruſſian general, was born at Pleſkow, on the 28th of September, 1704. He was educated for the military profeſſion, and entered the army as a common bombardier in the year 1720, and was ſo rapidly promoted, that, in the year 1729, he became adjutant-general to count Von Munnich. At Dantzic he formed an acquaintance with Frederic William, king of Pruſſia, who conferred upon him the order of la Generoſitè. He greatly diſtinguiſhed himſelf in the Turkiſh war of 1736, and was promoted to the rank of general, and commandant of Zolberg. In 1746, he was appointed inſpector of building; and the imperial palace, a maſter-piece of art, was built under his direction. In 1755, he was made commander-in-chief, and ſhortly after, for his conduct in Pruſſia, he was raiſed to the dignity of a count of the empire by Francis I. In the following year he fought the celebrated battle of Zorndorf, with Frederic II. king of Pruſſia. Being ſatisfied with the reputation he had gained, he requeſted leave to retire, and though this was granted him, he was called again into active ſervice, and was finally made governor-general of Smolenſko, and member of the ſupreme ſenate. After this he rebuilt ſome towns; when he again retired, reſigning all his employments, and died in 1771, on his eſtate of Nicutau, where he had erected an elegant church. Gen. Biog.

FERMOSELLE, in *Geography*, a town of Spain, in the province of Leon; 30 miles W. S. W. of Zamora.

FERMOY, a very handſome and flouriſhing market and poſt-town of the county of Cork, Ireland, which affords a ſtriking inſtance of what may be effected by the exertions of an individual. Leſs than twenty years ago Fermoy was a miſerable village, with a long narrow bridge over the fine river Blackwater, and one of the laſt places at which a traveller would think of ſtopping for refreſhments of any kind. At preſent it is a regularly built town, with a large barrack for two regiments of infantry, and another for cavalry adjoining to it on the oppoſite ſide of the river. The bridge has been widened; a church of elegant conſtruction, and well ſituated, a large ſchool-houſe, a market-houſe, and a ſeſſions-houſe, which alſo ſerves occaſionally for an aſſembly room, and theatre, have been built, and there are two good inns, with ſome of the beſt poſt-carriages to be met with in Ireland. There are alſo an extenſive porter brewery, a flour-mill, a woollen manufactory, a bank, and ſeveral reſpectable ſhops. This change has been effected by the exertions of John Anderſon, eſq. who purchaſed the greater part of the old village, and has made Fermoy an object of admiration and aſtoniſhment to thoſe who remember what it *was*, and who know what Iriſh towns in general *are*. To the ſame individual the ſouth of Ireland is indebted for mail coaches and the improvement of the roads. Fermoy is on the road from Dublin to Cork, being 107 Iriſh miles from the former, and 17 from the latter of theſe cities.

FERN, in *Agriculture*, the name of a moſt troubleſome weed, which it is very difficult to deſtroy where it has a deep ſoil to root in. The beſt method of killing it in graſs lands is, probably, by cutting it often while it is in its green and moſt ſucculent ſtate, as in the ſpring or the beginning of ſummer. The fern thus cut, when full of ſap, and left to rot upon the ground, tends greatly to improve the ſoil, by rendering it more mellow, or if it be burnt when ſo cut, it will yield a much greater quantity of ſaline matter than any other ſort of vegetable.

This is, however, a waſteful practice, and by no means ſo good as that of collecting it and ſtacking it up, for the purpoſe of littering the fold-yards during the time that cattle are kept in them, as by ſuch a method, a large ſtock of valuable manure may be accumulated, the fern retaining the moiſture and liquid animalized matters better than ſtraw, by which means it becomes in a ſtate fit for manure much ſooner than is commonly ſuppoſed. Beſides, it forms an excellent warm litter for the live-ſtock in ſuch ſituations.

In tillage lands the beſt method of eradicating this plant is by repeated deep ploughing, ſo as to effectually break the deep matted roots of it, which, often in the more mellow loamy ſoils, ſtrike to the depth of ſeveral feet. When they are once well broken, they readily decay in the ground, and add to its fertility.

Fern is commonly met with in breaking up waſte lands where the ſoil is of the friable, hazel, loamy quality.

The aſhes of this plant become an excellent manure for all the lighter ſorts of ſoil when employed as a top-dreſſing. See MANURE.

FERN *Web*, in *Rural Economy*, is a term applied to a kind of ſmall inſect of the chaffer ſort, which is highly injurious to the early bloſſom of the apple-tree.

FERNS. See FILICES.

FERN, *Common Male and Female*, in *Botany*. See POLYPODIUM.

The common female fern is a very miſchievous and troubleſome weed to the farmers, being very difficult to deſtroy, where it has any depth of ground to root in. Its roots will often penetrate to eight feet deep, and ſpreading a great way, they will riſe again to the ſurface, and ſend up new plants at a conſiderable diſtance. In graſs land, the beſt way of deſtroying them is mowing the graſs three times a year, in ſpring, in May, and in Auguſt. Dung and aſhes are very good manure for lands which abound with them; but the beſt of all things for deſtroying them is urine. Fern cut up when the ſap is in it, and laid to rot upon the ground, is a very good manure for land, and will mellow it ſo as to prevent its binding. Trees planted where fern grows, are obſerved to thrive very much, even though it be upon a hot gravel; the reaſon of this is, that the fern ſhades the roots, and keeps them moiſt and cool. Mortimer's Huſbandry, p. 316.

Scotch ſheep put into land where there is much fern growing among the graſs generally deſtroy it in a little time, partly by their dung and urine, and partly by treading it down.

The root of the male fern is greatly recommended by medical writers, as a cure for rickets in children. Some alſo give it in powder, againſt worms; and it has the ſame virtues againſt the ſtone and gravel, with the reſt of the genus of capillary plants, aſcribed to it. It was frequently preſcribed by the ancients in diet drinks, for removing obſtructions, and in chronic caſes of all kinds, but is much diſuſed at preſent. Lemery, Dict. des Drog.

All the ſpecies of fern, and other vegetables, which carry their ſeed on the back of their leaves, as moonwort, and the like plants, poſſeſs the ſame general virtues of drying and ſtrengthening the viſcera, eſpecially the ſpleen.

Fern, *Flowering.* See Osmunda.

Fern, *Common or True Males.* See Asplenium.

Fern, *Mules.* See Hemionitis.

Fern, *Sweet.* See Scandix.

Fern-*aſhes.* The poor people in many parts of the north of England uſe aſhes of fern inſtead of ſoap for waſhing their cloaths; they cut the plant green, and then burn it to aſhes, and make them up into balls with water; they dry theſe in the ſun, and keep them ready for uſe.

The aſhes of the common female fern produce a very ſingular phenomenon in the common way of treating them and their ſalt. If a large quantity of theſe aſhes be procured, and the ſalt to the quantity of ſeveral pounds extracted from them in the common way, it will ſucceed better than in ſmaller quantities. The greater part of this ſalt being dried, if the remainder, which is more moiſt, be expoſed to the air to receive ſome of the vapours of it, this will ſoon become fluid, or an oil, as it is more improperly called, per deliquium. The reſt of the lixivium, which will be very heavy, and of a deep blood-red, or claret-colour, being ſet by in a glaſs-veſſel unſtopped for five or ſix months, there will be found at the bottom of the liquor a very large quantity of ſalt precipitated to the thickneſs of about two inches on the bottom of the veſſel. The lower part of this will have all the foulneſs, and appear diſcoloured; but the upper part will be extremely pure and white. From the ſurface of this part there will grow up a number of plants, in appearance ſtanding erect, and at ſmall diſtances from one another. Theſe are only the laſt cryſtallizations of the ſubſiding or ſeparating ſalt, but they have a regularity that is very ſurpriſing; they vary conſiderably in ſize and weight, but are all of the ſame ſhape, exactly reſembling ſo many plants of the common unbranched fern, ſending out a great number of regular leaves on each ſide the ſtem. Theſe ramifications of the ſalt will remain many weeks in this perfection, if the veſſel be not ſtirred: but they are ſo tender, that the leaſt motion deſtroys them, and they after this never form themſelves again. Phil. Tranſ. N° 105.

Fern-*oil,* in *Pottery,* a name given by our merchants who have been in China to a ſort of varniſh, which the Chineſe uſe in their porcelain manufactories. It is alſo called lime-oil, and is a thing ſo eaſily made, that it would be worth attempting what might be done with it, in our imitations of the porcelain. They make it in this manner: they take a large quantity of fern well dried, and ſpreading a covering of it over a piece of ground ſufficient for the quantity of oil they intend to make, they lay upon this a coat of large lime-ſtones, newly calcined into lime; on theſe they ſprinkle with the hand a ſmall quantity of water juſt to ſlake them. They cover this bed of lime with another of fern; and ſo on, till they have raiſed it to eight or ten feet high; they then ſet fire to the fern, this burns away in a little time, and leaves a mixture of the lime and its own aſhes. This mixture is laid in the ſame manner between beds of more fern, and burnt again. This operation is repeated five or ſix times. Obſerv. ſur les Coutom. de l'Aſie.

When the laſt calcination is finiſhed, the mixture of lime and aſhes is carefully gathered up, and thrown into large veſſels of water, and with every hundred weight of it they put in one pound weight of kekio: they ſtir the whole together; and when the coarſer part has ſubſided to the bottom, they take off the finer, which ſwims at the top in form of a fine cream, and putting it into another veſſel of water, they let it ſubſide to the bottom by long ſtanding: they then pour off the water, and ſave the reſiduum in form of a thick oil.

This they mix with the oil of ſtone, prepared by powdering and waſhing in the ſame manner a particular ſort of ſtones, and with this they cover all the veſſels that they intend to varniſh. The fern aſhes have a very great ſhare in the advantage that this oil has over our common varniſhes; and the Chineſe tell us, that they once inſtead of fern uſed the wood of a tree, called ſe-tki, and they ſuppoſe that the ſuperiority of the old porcelain over the preſent, is owing to the uſe of this tree inſtead of the fern: but it is now too ſcarce among them. The new manufacture which was eſtabliſhed at Briſtol excels every thing, that has been done of the like kind, in the beauty of the varniſhing; and it is ſaid, they have founded their advantage on an imitation of this and the Chineſe oil of ſtone. Theſe two oils, as they are called, are always mixed together; and they muſt be carefully preſerved of the ſame degree of thickneſs, or elſe all the varniſhing will not be even.

Ferns, *Petrified,* in *Natural Hiſtory,* are a kind of foſſil plants found in the ſtrata accompanying coal, and bearing ſome reſemblance to ferns. Mr. William Martin, in his "Petrificata Derbienſia," deſcribes and figures three kinds of theſe, as found in the Derbyſhire coal ſtrata, and in iron-ſtone nodules; theſe he denominates phytolithi, filicites ſtriates, filicites auriformis, and oſmundæ regales, the latter in compliance with the practice of former writers, but ſeems himſelf to doubt the identity of any of the three with recent plants of any kind. In Parkinſon's Organic Remains, letter 45, &c. of vol. i., a recital of much which has been written on this ſubject will be found, accompanied alſo with doubts of ſuch pretended identity: alſo, in W. Martin's "Outlines of the knowledge of Extraneous Foſſils," pages 63, 64. 84, &c.

Fern, in *Geography,* a town of Scotland, in the county of Angus or Forfar; 6 miles W. of Brechin.

FERNAMBUC. See Brazil *Wood.*

FERNAMBUCO, in *Geography,* alſo called *Olinda,* a captaincy or province of Brazil, lying along the coaſt of the Atlantic, and abounding in ſugar, cotton, Brazil wood, cattle, and hides.

Fernambuco, or *Olinda,* as it was called by the Dutch, the chief town of the fore-mentioned province, the ſee of a biſhop, ſuffragan of St. Salvador; and having a ſmall inconvenient harbour on the coaſt of the Atlantic. By the Portugueſe this town is called Pernambuco. S. lat. 8° 13'. W. long. 36° 16'.

FERNANDEZ, Anthony, in *Biography,* was born at Coimbra in 1558, admitted in early life a member of the order of Jeſus, and having completed his ſtudies to the ſatisfaction of his ſuperiors, had the degree of doctor of divinity conferred upon him by the univerſity of Evora, where he delivered lectures on the ſcriptures of the Old and New Teſtament with conſiderable reputation. His talents rendered him an object fit to be ſent out on a miſſion to the Portugueſe ſettlements; he went to Goa, where he obtained much reſpect as ſuperior of his order in that city. On his return to Europe he devoted his time to the duties of the pulpit, and to write commentaries on the Bible. His principal publications are "Commentaries on the Viſions of the Old Teſtament," in folio : and "A Commentary on Iſaiah." Moreri.

FERNANDEZ, ALPHONSO, was born at Palencia, in Leon, in the year 1572 ; and appointed preacher-general to the Dominican order of monks in 1618. As an author he wrote "An Eccleſiaſtical Hiſtory of his own Time ;" "A Treatiſe on the Benefits conferred by his Order on the kingdom of Spain by the inſtitution of the Inquiſition :" "Annals of the Town and Church of Palencia ;" theſe with a "Hiſtory of the Devotion of the Roſary," were publiſhed in the Spaniſh language. He publiſhed other works in the Latin tongue, and was employed in compiling eccleſiaſtical annals of Spain, which with other works have been publiſhed ſince his death. Moreri.

FERNANDEZ, *Juan*, in *Geography*, an iſland in the ſouthern Pacific ocean, firſt ſeen in 1563, and ſo called from its diſcoverer, is of an irregular ſhape, about five miles long, and between one and two broad. It is diſtant from Chili about 110 leagues. This iſland has been frequently deſcribed by the navigators of the Pacific, and particularly in the account of Anſon's voyage: it was a place of reſort for refreſhments, eſpecially antiſcorbutic vegetables, with which it abounds; and the freebooters of former times made it a place of reſort for the rendezvous of their forces, or the diviſion of their ſpoil. At a convenient diſtance from the coaſt of Peru, unſettled and unfortified, abounding in almoſt every requiſite for re-fitting, re-victualling, wooding, and watering, it became not only a deſirable ſtation, but was long an unſuſpected or deſpiſed retreat. The Spaniards, however, at length directed their attention to it, and in 1766, or 1767, made a ſettlement upon it. In the latter year captain Carteret on his voyage round the world, upon opening Cumberland bay, was ſurpriſed to find the iſland in poſſeſſion of the Spaniards, who had built a fort, on which the Spaniſh colours were flying, and ſome cannon mounted. Many cattle were ſeen on the hills, and about 20 houſes in different parts of the iſland. Carteret had no communication with the ſhore, but ſailed immediately for Maſafuero. In the year 1792, it was viſited by lieutenant John Moſs of the royal navy, who then commanded a ſhip in the ſouthern whale and ſeal fiſhery. He approached it on the weſt ſide, and came abreaſt of the north point ; but, unapprized of its having been ſettled by the Spaniards, he propoſed to catch fiſh, and to examine if it afforded ſafe anchorage. But hauling his boat round the N. W. point, he found the place fortified, and ſaw a ſmall village in the valley. His requeſt, preſented to the governor for leave to anchor and to fiſh, was not formally granted; however, keeping his boat out of the way of the guns, he caught as many fiſh as ſerved the whole ſhip's company. From him we learn, that in making the iſland from the weſtward, it appears elevated at the N. end, and ſlopes away towards the ſouth, with a remarkable iſlet, or large rock, detached about half a mile off the S. point. At a diſtance the whole iſland appears like an entire rock ; but on nearer acceſs the interſecting vallies diſcover themſelves, and diſplay a fine ſcene of verdure, being covered with wood. The weſt ſide affords no anchorage, nor any landing place, the cliffs riſing almoſt perpendicularly from the ſea. When abreaſt of the N. W. point, the firſt valley or landing-place opens, where there is anchorage in 14 fathom water, but in an expoſed ſituation. Here the Spaniards have a guard-houſe and one gun. About half a mile to the E. N. E. is the great bay, (Cumberland bay of the Buccaneers,) which is land-locked from E. to N. W. by W. ; but there is no anchorage in leſs than 40 fathoms, till within half a cable's length of the ſhore. The town or village is very pleaſantly ſituated in a fine valley, between two high hills. A battery of five guns is placed juſt round the W. point of the harbour, and commands the road ; though it is poſſible to land clear of the reach of any gun. This battery is built of looſe ſtones, piled up breaſt-high, and forming embraſures, without mortar, or any kind of cement. On the left of the valley, on a little eminence, another battery was then conſtructing of maſonry, with two faces, having 14 embraſures in each, one face pointing to the anchorage, and the other flanking the village ; five guns were mounted on that ſide which faces the road, and one in the other. According to the report of the commandant, the whole force on the iſland in January, 1792, conſiſted of ſix ſoldiers, and 40 of the ſettlers armed and trained. Captain Moſs, though not allowed to refreſh his crew, ſaw great numbers of goats on the ſides of every hill, and regretted that he could not relieve his crew, who were diſordered with the ſcurvy, and which would have been ſpeedily corrected by the freſh veniſon, fiſh, and vegetables to be found there. Towards the cloſe of the year he touched again on the iſland, and was politely accommodated by the governor with a plentiful ſupply of ſheep, vegetables, milk, and craw-fiſh, and two bullocks. In the town there are about 40 houſes, and ſeveral in different parts of the iſland. Every houſe has a garden, with arbours of grape-vines, forming a delightful ſhade. Figs, cherries, plums, and almonds appeared all green, and abundance of potatoes, cabbages, onions, thyme, and other vegetables and herbs ; but none of them in perfection, as a ſort of grub is ſaid in a great meaſure to deſtroy the kitchen gardens. From other accounts it appears, that the ſouthern part of the iſland is precipitous and barren ; but there are ſome hills of a red-earth, approaching to vermilion. The ſoil of the northern part is looſe and ſhallow, ſo that very large trees ſoon periſh for want of root, and are eaſily overturned. The dreſs of the women in this iſland is very ſingular : they wear a petticoat which reaches only a little below the knee, and which is ſpread out by a hoop at the bottom to a great diſtance round them, leaving the legs entirely expoſed ; they wear their hair long, plaited into 40 or 50 ſmall braids, which hang ſtraight down the back. This dreſs is alſo that of the ladies of Peru and Chili. In every houſe captain Moſs was preſented by the women with *maté*, the infuſion of the herb of Paraguay, which they ſuck up through a pipe or tube, that ſerves more than one perſon, and is handed about from one to another. The women are in general handſome, and every houſe ſwarmed with children. As Juan Fernandez and Maſafuero may be miſtaken one for the other, by ſtrangers, both lying in the ſame latitude, we may obſerve, that the N. end of Juan Fernandez is higheſt, while Maſafuero is loweſt to the north. Beſides, a ſmall iſland lies off the S. end of Juan Fernandez. Theſe two iſlands lie 80 miles from each other. Juan Fernandez, according to the obſervations of captain Moſs, lies in S. lat. 33° 40′, W. long. 80° 30′.

FERNANDO DE VORONHA, an iſland of the Atlantic, diſtant between 60 and 80 leagues from the coaſt of Brazil. Its ſurface is mountainous and unequal, but moſtly covered with wood and herbage. The high part of one mountain, nearly in the middle of the iſland, is diſtinguiſhable from the reſt ; it is called "Campanario," or the Belfry, from its reſemblance to a church tower, and it very much leans, or overhangs, to the eaſt. The iſland no where exceeds two leagues in extent.

According to Don Ulloa, to whoſe deſcription of it captain Cook refers in the ſecond volume of his ſecond voyage, (p. 278.),

(p. 278.), this iſland has two harbours, capable of receiving ſhips of the greateſt burden; one on the N. ſide, and the other on the N. W. The former is, in every reſpect, the principal, both for ſhelter and capacity, and the goodneſs of its bottom, but both are expoſed to the N. and W. winds, though theſe winds, particularly the north, are periodical, and of no long continuance. He farther ſays, that you anchor in the north harbour, (called by Cook a road,) in 13 fathoms water, one-third of a league from ſhore, on a bottom of fine ſand; the ſea and hill above-mentioned bearing S. W. 3° ſoutherly. This road ſeems to be well ſheltered from the S. and E. winds. The water in this iſland is brackiſh, and very ſcarce; and ſometimes no rain falls for two or three years. In conſequence of this deficiency of moiſture, more than from the nature of the ſoil, which produces every ſpecies of grain, and fruits common in hot climates, the plants wither and die, and the moſt fertile parts of the iſland, unleſs when they are ſoftened by the humidity of the clouds, become as arid and barren as rocks. The Portugueſe, however, ſay, that in the interior parts of the iſland there is no want of water, that is clear and wholeſome. In the inland part of the iſland there is a Portugueſe town, in which the pariſh prieſt and governor reſide; and it has ſeveral forts conſtructed of ſtone, which are ſpacious and well provided with artillery, and garriſoned by ſoldiers, who are partly regulars, ſent fron Fernambeau, relieved every ſix months, and partly tranſports ſent from that mart of Brazil, which ſupplies them with proviſions and other neceſſaries. The harbour or roads abound with various kinds of fiſh, and from December to April the ſhores of the whole iſland are covered with the eggs of turtles. S. lat. 3° 53′. W. long. 32° 34′.

FERNANDO-*Po*, or FERNAND *Pao*, an iſland of Africa, in the Atlantic, near the coaſt of Benin, about 20 leagues in circumference; the land lies high, and the ſoil is fertile in manioc, ſugar-canes, rice, fruit, and tobacco: the inhabitants are rude and uncivilized. This iſland ſeems deſtitute of any good harbour, and very much abandoned to the goats and ſeals: but the Spaniards retain the nominal poſſeſſion. N. lat. 3° 20′. E. long. 10° 45′.

FERNANDO, *St.* a town of South America, in the province of Tucuman; 150 miles W. of St. Jago d'Eſteros. S. lat. 28°. W. long. 68° 16′.—Alſo, a town of South America, in the province of Cumana.—Alſo, a town of Spain, in Galicia, near the W. coaſt; 37 miles W. of Orenſe.

FERNAO, or FERNANDO VELOSO, a river of Africa, which runs into the Indian ſea. S. lat. 14° 10′.

FERNEBO, a town of Sweden, in the province of Gaſtricia; 25 miles S. of Gaffle.

FERNEL, JOHN, in *Biography*, a phyſician of the ſixteenth century, and a member of the faculty of Paris, greatly diſtinguiſhed by his learning and talents. According to the beſt authority, for there is ſome contradiction among his biographers, Fernel was born at Clermont, in the year 1497. He received the greater part of his education at a grammar-ſchool of that place, under the eye of his parents; for it was not until the nineteenth year of his age that his ardent thirſt after knowledge led him to procure the permiſſion of his father to proſecute his ſtudies in Paris. He diſtinguiſhed himſelf ſo greatly among his fellow-ſtudents in philoſophy, that, after having taken the degreee of maſter of arts, he was requeſted to undertake the profeſſorſhip of Dialectics in his college (St. Barbe's.) This led him to a ſerious and profound courſe of ſtudy, in order to the proſecution of which he renounced all ſociety and recreation; and his labours were only arreſted by a quartan ague, with which he was ſeized, and which compelled him to fly to his native province for the reſtoration of his health. On his return to Paris, when he had determined to chooſe medicine for his profeſſion, the narrowneſs of his father's finances compelled him to take ſome meaſures for ſubſiſtence during his ſtudy of that ſcience; and he taught philoſophy in the chair of the college of St. Barbe, and was admitted to the degree of bachelor in medicine (the duties of the profeſſorſhip not impeding his ſtudies) in 1528. In the year 1530, at the age of 33, he arrived at the doctorate, and ſettled in Paris. His paſſion for the mathematics, even after he married in 1732, had nearly proved ruinqus to his family; when he liſtened to the advice of his father-in-law, and reſumed the ſtudy and practice of medicine, becoming at the ſame time a teacher of that ſcience in the College de Cornouailles in 1536. He ſoon obtained a moſt extenſive fame, and a laborious practice, in which he was unuſually ſucceſsful, inſomuch that he had ſcarcely time for his ordinary repaſts, and often took his meals without ſitting. He was diſtinguiſhed among his brethren by his boldneſs in preſuming to queſtion the dogmas of Galen, in which the moſt implicit and bigotted confidence was univerſally placed. In 1542 he was put upon the eſtabliſhment of the Dauphin, Henry, and was made perſonal phyſician to that prince ſoon after he came to the throne. He had hoped by this change of life to obtain leiſure for the proſecution of his favourite ſtudies; but the wars which Henry II. carried on with the Engliſh and Spaniards compelled him to march at the head of his army, and Fernel followed him. But even amid the agitations of a military and reſtleſs life, at the age of ſixty, Fernel ſeldom paſſed a day without writing. It was in one of theſe marches that he commenced his treatiſe on Fevers, which was indeed almoſt completed, when the king retook Calais from the Engliſh on the 1ſt of January, 1558. On his return from this expedition, Fernel followed the court to Fontainebleau, taking with him his wife, who, being hitherto accuſtomed to a quiet and ſtationary life, and chagrined at this ſeparation from her family and connections, fell into a fever, in the courſe of a few days, which terminated fatally, on the 20th day of the diſeaſe. The ſhock which this blow gave to Fernel was ſo great, that in twelve days afterwards, he was himſelf ſeized with a ſimilar fever, which carried him off on the 26th of April, 1558, in the ſixty-ſecond year of his age, to the univerſal regret of the metropolis.

The titles of the works of Fernelius, as he is called in his Latin treatiſe, are, 1. "Monaloſphærium partibus conſtans quatuor, &c." Paris, 1526. 2. "De Proportionibus, libri duo," ibid. 1528. 3. "Coſmo-theoria Libros duos complexa," ibid. 1528. 4. "De naturali parte Medicinæ, libri ſeptem," ibid. 1532. 5. "De vacuandi ratione, liber," ibid. 1545. 6. "De abditis rerum cauſis, libri duo," ibid. 1548. This work underwent nearly thirty ſubſequent editions. 7. "Medicina, ad Henricum II. &c." 1554. This collection has been ſtill more frequently reprinted, with ſome changes of the title. 8. "Therapeutices univerſalis, ſeu medendi rationis libri ſeptem," Lugduni, 1659. 6. "Conſiliorum Medicinalium liber," Paris, 1582. Many times reprinted. 10. "Febrium curandarum methodus generalis," Francfort, 1577. A poſthumous work. 11. "De Luis venereæ curatione perfectiſſima liber," Antwerp, 1579. Edited by Giſſelin, a phyſician of Bruges. Some other parts of his works have been tranſlated, or edited ſeparately ſince his death. Eloy remarks, that as many things taken from the Arabian writers are found in the works of Fernel, and as the elegant Latinity in which he has repeated them is generally admired, the following bon mot has been applied to him: "Fæces Arabum melle Latinitatis condidit."

FERNELIA, in *Botany*, ſo named by Commerſon, probably in honour of ſome one of his countrymen or acquaintances, but it does not appear from whom. Juſſ. 199. Lamarck t. 67. f. 1. Claſs and order, *Tetrandria Monogynia*. Nat. Ord. *Rubiaceæ*.

Gen. Ch. *Cal.* Perianth ſuperior, of four equal teeth. *Cor.* of one petal, funnel-ſhaped; tube the length of the calyx; limb ſpreading, in four equal broad ſegments. *Stam.* Filaments four, very ſhort, inſerted into the top of the tube; anthers erect, oblong, furrowed, half as long as the limb, at length recurved. *Piſt.* Germen inferior, globular; ſtyle thread-ſhaped, the length of the ſtamens; ſtigma obtuſe. *Peric.* Berry crowned with the calyx, of two cells, the partitions not reaching quite acroſs, but their central part is (according to Juſſieu) ſupplied by a receptacle bearing the ſeeds. *Seeds* numerous.

Eſſ. Ch. Corolla of one petal, funnel-ſhaped, ſuperior. Anthers nearly ſeſſile, in the mouth of the corolla. Berry of two cells, with many ſeeds.

Obſ. This genus differs from *Cateſbia* in its ſhort filaments and the place of their inſertion. How far it is diſtinct from *Randia*, (now made a *Gardenia*,) except in number, which is of ſmall or no importance, may admit of much doubt. Juſſieu allows their fruit to be ſimilarly conſtructed. We merely notice it here for future conſideration.

Two ſpecies are deſcribed.

1. F. *buxifolia*, Lamarck, Encycl. v. 2. 432. Illuſt. 287. "Segments of the corolla obtuſe. Berry globoſe." A much-branched ſhrub or tree, found in the iſland of Mauritius, where it is called *Bois de Buis*, or *Faux Buis*, Falſe Box, from the reſemblance of its leaves to common Box. It has no thorns. The flowers are whitiſh, axillary, two or three together, on ſhort, ſimple, ſilky ſtalks, with a bell-ſhaped, toothed bractea, like a ſecond calyx to each. Corolla ſcarcely half an inch long. Berry the ſize of a black currant. Lamarck reckons two varieties; but theſe appear to us merely the ſame plant, gathered at two different ſeaſons of the year, that in fruit having larger leaves.

2. F. *obovata*. Lamarck, Illuſt. 287. t. 67. f. 1. "Segments of the corolla acute. Berry oval." Native of the ſame country, according to Lamarck, from whom alone we have any knowledge of this ſpecies. What he has aſſociated with it in his plate, is an altered copy of *Peteſia Lygiſtum* from Brown's Jamaica, t. 3.; but has ſet this right in his letter-preſs.

FERNERA, in *Geography*, a town of Germany, in the principality of Culmbach; 12 miles W.S.W. of Culmbach.

FERNESS, a cape, and alſo a bay on the W. coaſt of Eda, one of the Orkney iſlands. N. lat. 59° 2′. W. long. 2° 43′.

FERNEY, a ſmall, regular, well-built town, pleaſantly ſituated near the lake of Geneva, with a handſome ſeat, celebrated for being the reſidence of Voltaire, at the interſection of two high-ways, the one leading from Switzerland to Lyons, and the other from the Franche-Comte to Geneva.

FERNITE, a town of the duchy of Stiria; eight miles S.E. of Gratz.

FERNS, a ſmall poſt town in the county of Wexford, Ireland, which is a biſhop's ſee, united to Leighlin. For an account of the united biſhopricks, ſee LEIGHLIN. The biſhop's reſidence is at a handſome and convenient palace lately erected in Ferns. This town is 54 miles ſouth from Dublin. Beaufort's Memoir.

FEROE, or FAROER, *Iſlands*, are ſituated in the North ſea, between N. lat. 61° 15′ and 62° 21′; and with regard to longitude, the town of Thorſhern lies 19° 15′ 15″ W. from Copenhagen, and 9° 47′ 45″ E. from Teneriffe. They are eighty-four miles diſtant from the coaſt of Norway on the eaſtern ſide, and forty-five miles from the Shetland iſles towards the ſouth-weſt. It is not improbable, that the free-booters, who at one time infeſted moſt of the northern ſeas, firſt diſcovered the way to theſe iſlands, where they introduced ſheep, in order to ſupply them with proviſions in their frequent cruizes. In the time of Harald Harfager, king of Norway, that is, in the ninth century, theſe iſlands were inhabited by ſome diſcontented Norwegians, who for a long time ſupported themſelves by piracy and occaſional incurſions into their original country, Norway. Theſe people, it is reaſonably ſuppoſed, were firſt ſubjected to the Norwegian dominion by king Hagen Adelſtein, but they ſoon threw off the yoke, and maintained their freedom, till they were again reduced to obedience by king Magnus the Good; after which period theſe iſlands belonged to Norway, till they became a part of Denmark by the union of the two crowns. Chriſtianity was introduced into theſe iſlands ſoon after its eſtabliſhment in Denmark, A. D. 1000; and they were thought worthy of a particular biſhop, who was appointed to reſide in the iſland of Stromoe. The Norwegians are ſuppoſed to have given them the name of Feroe, from the number of ſheep which they found in them; *faar*, in Daniſh, ſignifying ſheep, and *oe* an iſland; others, however, conceive, that the name is derived from *fier*, feathers, an article with which they have always abounded; or from *fiær*, or *fiæm*, far diſtant. Theſe iſlands are in number twenty-two, ſeventeen of which are inhabited. They occupy in a direction from N. to S. fifteen miles; extend in breadth from E. to W. ten miles; and contain altogether nearly 23½ ſquare miles. They conſiſt of a group of ſteep rocks or hills, riſing from the ſea, chiefly of a conical form, and placed for the moſt part cloſe to each other, ſome of which proceed with an even declivity to the ſhore; but the greater part of theſe declivities has two, or three, or more ſloping terraces, formed by projecting rocks, and covered with a thin ſtratum of earth, which produces graſs. Cloſe to the ſea, however, the land in general conſiſts of perpendicular rocks, from two to three hundred fathoms in height. The higheſt of theſe hills is Shællins, in the ſouthern part of Nordſtromoe, being two thouſand two hundred and forty Engliſh feet high. The hills lie ſo cloſe to each other, that they are ſeparated merely by a brook or rivulet; and between them there are no vallies of any extent. In the higher ground, however, between their ſummits, are a few dales, covered with wretched graſs. The rocks in general conſiſt of trap, much intermixed with feld-ſpar, glimmer and ſmall grains of zeolites. No certain traces of any crater or ſigns of volcanic eruptions are found here; nor does there ſeem to be any pumice-ſtone or lava, unleſs baſaltes, of which there are ſeveral columns, belongs to that kind of production. The Feroe iſlands contain a great many ſtreams and rivulets, which are generally fordable and furniſh trout. Trout is alſo caught in ſome freſh water lakes between the hills. After rain theſe hills preſent a number of water-falls, the moſt remarkable of which is Foſaa, between Qualvig and Halderſvig, in Nordſtromoe. Theſe iſlands abound alſo in ſprings, which are of two kinds, cold and warm; of the latter, the moſt remarkable is Vermakielde in Oſtarve. The Feroe iſlands which are inhabited are ſeventeen, and form ſeven pariſhes: their names are

Fugloe, Swinoe, Videroe, Bordoe, Konoe, Kalſoe, Oſtarve, Stromoe, Kolder, Haſtoe, Nolſoe, Vaagoe, Myggenæs, Sandoe, Skuve, the greater Dimon, and Suderoe. Bordoe is ſeparated by a narrow channel from Videroe, and is little more than 2¾ miles long, and at its greateſt breadth 1¾ mile. It has ſeven villages. For the other iſlands, ſee their reſpective articles. In theſe iſlands there is no want of good harbours and anchoring places; but there is ſome difficulty in obtaining pilots. The currents round and between the iſlands are rapid and ſtrong, eſpecially three days before and three days after new and full moons. There are ſeveral whirlpools at ſome diſtance from the ſhores. The ſurf which prevails round theſe iſlands is very remarkable, and in winter and the early part of ſpring it exhibits a wonderful and awful ſpectacle. As the Feroe iſlands lie in the latitude of 62° north, the ſun, during the three ſummer months, is ſcarcely four hours beneath the horizon, ſo at that time there is no night; at leaſt there is light ſufficient for enabling a perſon to read and write. But in winter the days are ſo much ſhorter, and would be exceedingly dark, if the deficiency of light were not in ſome meaſure ſupplied by the morning and evening twilight. The heat, notwithſtanding the high latitude, is more temperate in ſummer, and the cold leſs ſevere in winter than in the more ſouthern provinces of Denmark; the ſea round the coaſt never freezes; and the cauſe of this mildneſs of the winter is the vicinity of the ſea. The weather in Feroe is never uniform, and the barometer is exceedingly variable. Theſe iſlands have lain under the imputation of being foggy and unhealthy; but though the firſt charge may be true, the ſecond is not ſo well founded. The winds and hurricanes in the Feroe iſlands are ſo violent among the hills and rocks, as to inſpire the traveller with terror. Thunder is not ſo common as in Denmark; but the northern lights are often ſeen, particularly in the winter. Theſe iſlands are at preſent almoſt entirely deſtitute of wood, but this does not appear to have been formerly the caſe. Attempts have been made at different times to introduce wood, by planting buſhes and trees of various kinds, but they have been for the moſt part attended with little ſucceſs. The black cattle here are ſmall, and little or no trade is carried on in this article. The cows are much neglected and ill fed; and of courſe yield little milk. The Feroe heifers are ſmall, with thick drooping heads; they are generally of a fox colour, and ſome few are almoſt black. Little attention is paid to them. Sheep, of which one peaſant will ſometimes poſſeſs two or three hundred, are the principal riches of theſe iſlanders; their fleſh affords them food: their wool clothing: and of the remainder, after their own wants are ſupplied, they manufacture articles of commerce. The ſheep remain out ſummer and winter, without ever being houſed; and on this account many of them are loſt. Domeſtic cats are common, ſome of which become wild; and dogs are very uſeful to the peaſants, as they aſſiſt them in the care of their ſheep. It would extend this detail too much to enumerate the variety of their fowl and fiſh. Geeſe were formerly more abundant than they are now; but theſe iſlands have various kinds of ducks, the moſt remarkable of which, on account of its valuable production is the eider duck. See Eider-*down*.

One great ſource of ſubſiſtence to theſe iſlanders is the ſea fowl which abound on the coaſt, and which are caught either by dragging them out of their holes, or by another method, for which a bird-pole, with a peculiar apparatus, is employed. The operation is ſingularly adventurous, and attended with danger, among the high and ſteep rocks, which the bird-takers climb, or from which they are ſuſpended by ropes. The catching of ſeals is alſo of great importance to the inhabitants of theſe iſlands. The fiſhery at Feroe, however, is much declined; at one time fiſh was an important article of food and of commerce; but theſe have now almoſt entirely deſerted the coaſt. The kinds of fiſh caught in ſalt water are the torſk, halibut, and cod. The whale fiſhery is periodical, and does not now take place ſo often as formerly; but where it is carried on it produces great advantage to theſe iſlands. Small whales come to Feroe in ſhoals of from one hundred to one thouſand; and when it is conſidered that each fiſh in general yields one caſk of train oil, which ſells for nine rix-dollars, the value of one fiſhing will amount to from nine hundred to one thouſand rix dollars, beſides the benefit which the natives derive from the fiſh itſelf, which, if not employed for making oil, affords agreeable and wholeſome food. See Whale-fishery.

In Feroe there are no frogs, toads, lizards, ſnakes, or ſerpents, and no amphibious animal of any kind.

The natives of Feroe are, in general, handſome and well-made. In the colour of their hair there is conſiderable variety. Their complexion exhibits a healthful mixture of red and white, acquiring a browniſh caſt in hot ſummers, whilſt they are employed in procuring turf. Their features are never disfigured by the ſmall-pox, for this diſeaſe has not yet become endemial in theſe iſlands. The natives of the Southern iſlands, though their whole extent be only 15 miles, are of leſs ſtature, have round faces, ſpeak precipitately, and appear to be much livelier in their actions; whereas the natives of the Northern iſlands are in general taller, have more lengthened countenances, ſpeak ſlower, and are much graver in their whole deportment. The women are, for the moſt part, exceedingly pretty and well-proportioned; many of the people are inclined to be phlegmatic; but they poſſeſs great ſenſibility. They are of a religious diſpoſition; and when, on a Sunday, they cannot have the benefit of a clergyman's ſervices, they meet in church, ſing pſalms, hear the ſervice read by one among themſelves, and alſo a ſermon. They are peaceable among themſelves; affable and friendly in their diſpoſition; and alſo, according to their means, hoſpitable, kind and benevolent. They are alſo honeſt in all their dealings with one another, and humane and compaſſionate towards ſtrangers. The language of Feroe conſiſts, in great part, of old Daniſh, or rather Norwegian words; which, by a corrupted pronunciation, has aſſumed a foreign appearance. However moſt of the inhabitants of theſe iſlands underſtand the Daniſh language, in which the Chriſtian religion is taught. This account of the Feroe iſlands we have extracted, in an abridged ſtate, from the Athenæum; in which periodical publication an anonymous writer has made copious extracts from the communications of a Daniſh clergyman who reſided in them ſeveral years, and who had the beſt opportunity of acquainting himſelf with their ſituation, nature, and extent, as well as with their productions, and the manners and cuſtoms of the inhabitants.

FEROENSIS Marga, in *Natural Hiſtory*, a name given by ſome authors, to a marley earth, found principally in the fiſſures and cavities of ſtone, and called by the generality of later naturaliſts, agaricus mineralis, and lac lunæ; and by the ancients, terra, or creta ſeleneuſiaca. See Lac-*lunæ*.

FEROKABAD, in *Geography*, a town of Hindooſtan, on the coaſt of Malabar; 10 miles S. of Calicut.

FEROL, a ſea-port and good harbour of Peru, on the coaſt of the Pacific ocean, in the archbiſhopric of Lima, 70 miles S.S.E. of Truxillo. S. lat. 9°. W. long. 78° 26'.

FEROLIA, in *Botany*, Aubl. Guian. Suppl. 7. t. 372. Juſſ. 342, *ſub Parinario*. A tree of Guiana, of which the flowers are unknown to botaniſts. The fruit is a compreſſed, roundiſh, rugged, bordered *drupa*, not very fleſhy, with a compreſſed nut of two cells, with one ſeed in each, but it often happens that only one cell perfects its ſeed. The *trunk* is 40 or 50 feet high, bearing numerous branches at the top, the ultimate ones very ſlender. *Leaves* two inches long, alternate, on ſhort ſtalks, elliptic-lanceolate, pointed, entire. *Fruit* in terminal bunches. The bark of the tree is ſmooth and aſh-coloured, milky when wounded. The heart of the wood is a kind of ſattin wood, hard and heavy, red variegated with yellow, taking a fine poliſh. It is ſometimes called *bois de Ferole*, from a name of a former governor of Cayenne, who firſt introduced it as an article of commerce.

Juſſieu ſuſpects this tree may be generically allied to the *Parinari* of Aublet, *t.* 204—206. *Petrocarya* of Schreber. They agree in the drupa of two cells, and are not diſſimilar in habit.

FEROLLI, in *Geography*, *cape* or *point*, a cape on the W. coaſt of Newfoundland, N. of St. John's bay. N. lat. 51° 2′ W. lon. 74° 52′.

FERONIA, in *Mythology*, derived from *fero*, to bring relief, or from the town Feronia, near mount Soracte, was, according to Servius, the patroneſs of the enfranchiſed ſlaves, to whom were preſented many offerings; this goddeſs being in high veneration through all Italy. Servius ſuppoſes her to be the ſame with the virgin Juno, and this ſuppoſition is countenanced by an ancient inſcription quoted by Fabretti, and expreſſed in theſe terms, "Junoni Feron." The Romans appropriated to this goddeſs the care of the woods and orchards. She had a temple at the foot of mount Soracte, where an annual ſacrifice was offered to her; and it has been ſaid that thoſe who were fully inſpired by this goddeſs walked bare-footed upon coals without being burnt, or ſuffering any harm. Horace in one of his ſatires (l. i. ſat 5.) mentions the homage that was paid to this divinity, in waſhing the face and hands, according to cuſtom, in the ſacred fountain which flowed near her temple.

FERONIA, in *Botany*, after a goddeſs to whom the ancients dedicated foreſts. Correa Tr. of L. Soc. v. 5. 224. Claſs and Order, *Decandria Monogynia*. Nat. Ord. *Aurantia* Juſſ.

Gen. Ch *Cal.* Perianth inferior, of one leaf, ſmall, flat, in five deep ſegments, deciduous. *Cor.* Petals five, oblong, acute, ſpreading, much longer than the calyx. *Stam.* Filaments ten, inſerted into the receptacle, awl-ſhaped, erect, ſhorter than the petals, broad and compreſſed, as well as very hairy, at the baſe: anthers erect, ovate. *Piſt.* Germen ſuperior, nearly ovate; ſtyle ſhort, conical; ſtigma bluntiſh, notched. *Peric.* Berry of five cells, globular, with a tough roughiſh coat. *Seeds* very numerous, in ſimple rows, attached to the central receptacle.

Eſſ. Ch. Calyx in five deep ſegments. Petals five. Berry ſuperior, of five cells. Seeds numerous. Stigma notched.

The only known ſpecies is

F. *elephantum*. Roxb. Coromand. v. 2. 21. t. 141. Elephant apple. A native of moſt woods and mountainous parts of India, flowering, according to Dr. Roxburgh, during both the hot and cold ſeaſons, and ripening fruit in hot and rainy weather. It forms a large tree, with a deeply cracked bark, from which, when wounded, iſſues a beautiful tranſparent gum, excellent for water-colours. The wood is white, hard and durable, but ſplits in the ſun. Pulpy part of the fruit univerſally eaten by the inhabitants of the coaſt of Coromandel. The *branches* are thorny. *Leaves* pinnate, of about ſeven obovate, entire, ſmooth, oppoſite leaflets. *Flowers* in terminal and axillary cluſters, white tinged with purple. *Fruit* the ſize of an orange, greeniſh. Some flowers have an abortive piſtil.

FEROSEPOUR, in *Geography*, a town of Hindooſtan, in Moultan, on the Setledge; 48 miles S. of Lahore. N. lat. 31° 5′. E. long. 73° 59′.

FERRACINO, BARTHOLOMEW, in *Biography*, was born at Baſſano in Vicentin, in 1692, of parents ſo humble, that in early life he was engaged in ſawing wood as the means of a livelihood. Having a natural genius for mechanics, he ſoon invented a ſaw that was worked by the wind, and which he rendered ſo perfect, as to perform his work with expedition and accuracy, without much manual exertion. Succeſs in one invention ſoon led him to make experiments in other branches of buſineſs, in which he likewiſe ſucceeded; he made clocks in iron; and invented ſome uſeful hydraulic machines; of theſe, one was formed on the principle of Archimedes's ſcrew, which raiſes water to a conſiderable height. His chief work was the noble bridge over the river Brenta, at Baſſano, which is greatly admired for boldneſs of conception, and ſolidity of conſtruction. Ferracino died ſoon after he had completed this undertaking. His life was publiſhed in 1764, by M. F. Memo, in quarto, who has entered pretty largely into his labours and inventions Nouv. Dict. Hiſt.

FERRAND, LEWIS, was born at Toulon in 1645, where he received the elements of a learned education, but he finiſhed his ſtudies at Lyons. He was originally intended for the law, but he gave early proofs of attachment to biblical literature and theology, by publiſhing, when he was but nineteen years of age, "A paraphraſe on the ſeven penitentiary Pſalms." In the following year he went to Mentz, with a view of employing all his powers in a new tranſlation of the bible from the Hebrew. His zeal being now checked by the want of encouragement, he returned to France, applied himſelf to the law, took his degrees at Orleans, and was admitted an advocate of the parliament of Paris. In 1670 he publiſhed a work, conſiſting of a plan of annals of the kings of France and the Ottoman emperors: in 1679 he publiſhed "Reflections on the Chriſtian Religion, containing Explanations of the Prophecies of Jacob and Daniel relating to the advent of the Meſſiah," in two vols. abounding in much curious chronological and hiſtorical matter. For this work, on account of its high merit, he obtained a penſion of 800 livres. M. Ferrand died in 1699, having publiſhed many other works beſides thoſe which have been referred to, almoſt entirely on theology. The laſt labour in which he was engaged was entitled "A collection of Diſſertations, &c. on the Bible, in the Latin language," only one volume of which was publiſhed during his life. He left behind him a great maſs of MSS. on various topics; of theſe, one was committed to the preſs, entitled "Of the knowledge of God." He was eſteemed by his contemporaries a very able, and very learned man; and he was unqueſtionably moſt indefatigable in whatever he undertook. Moreri.

FERRANDUS, ſurnamed *Fulgentius*, who flouriſhed in the ſixth century, was an African by birth, and a diſciple of St. Fulgentius. When that prelate was baniſhed by the Arians to Sardinia, Ferrandus accompanied him; but on his return he was choſen deacon of the church of Carthage, when he entered with much zeal into the queſtion which was the ſubject of warm diſcuſſion at that day, "whether it could be ſaid that one of the perſons of the Trinity ſuffered on the croſs." Ferrandus died about the year 530, leaving behind him many works that were highly thought of by his contemporaries. The moſt conſiderable was "A Collection of Eccleſiaſtical Canons," for reſtoring diſcipline in the churches of Africa. This is one of the moſt ancient collections of canons among the Latins. It conſiſts of between two and three hundred abridged from the councils of Africa, Ancyra, Laodicea, Nice, Antioch, &c. A life of Fulgentius has alſo been aſcribed to Ferrandus, but by ſome authors it has been aſcribed to another of the prelate's pupils. Moreri.

FERRAR, Robert, was an eminent divine, born at Halifax, in the county of York, at which place he received the rudiments of his education; for its completion he was ſent to Cambridge, and afterwards was admitted ad eundem into the univerſity of Oxford. Having early embraced the doctrines of the Reformers, and in their defence diſplayed a conſiderable portion both of learning and zeal; he was patronized by archbiſhop Cranmer, who appointed him one of his chaplains, and ſubſequently procured for him the biſhopric of St. David's. During the regency of Edward VI. he fell into diſgrace at court, on ſuſpicion of his entertaining heretical opinions, and was put in confinement on charges falſely preferred againſt him, as was ſubſequently proved; for in the reign of Mary he ſo far diſtinguiſhed himſelf in the Proteſtant cauſe, as to excite the vengeance of the inſatiate perſecutor of truth, biſhop Gardiner; by whom Ferrar was ſummoned to recant his errors, and, perſiſting in his refuſal to comply, was condemned as an heretic, and burnt at the ſtake in the town of Caermarthen, South Wales; where an inſcribed monument ſtill records the ſanguinary tranſaction, and deſignates the ſpot on which the pious prelate ſuffered martyrdom in the year 1555. Fox's Arts and Monuments.

FERRARA, in *Geography*, a city of Italy, and capital of the exarchate of the Lower Po, ſituated on a branch of the Po, on the frontiers of the Venetian ſtates. Fortified by Smaragdus, exarch of Ravenna in 585, it was erected into a biſhopric by pope Vitalian in the year 657, and in 735 it was made an archbiſhopric. It was afterwards enlarged, and became celebrated under the princes of the houſe of Eſte; but having loſt its dukes it declined in magnificence and wealth. It is about four miles in circumference, and defended by a citadel, ſtrong walls, and baſtions. The ſtreets are handſome, and it has many magnificent palaces and churches. They reckon, beſides the cathedral, which is ancient, 100 churches, 38 convents, and about 14,000 inhabitants. The air in its environs is unwholeſome on account of the marſhes that encompaſs it: Arioſto lies buried in the Benedictine convent, and in the hoſpital of St. Ann Taſſo was confined as an idiot. Its univerſity was founded in 1390 by Albert, marquis of Ferrara; 40 miles S.E. of Mantua. N. lat. 44° 51′. E. long. 11° 35′.

FERRARESE, late a province of Italy, in the ſtate of the church, is bounded on the N. by the Poleſino, on the E. by the gulf of Venice, on the S. by the Romagna and Bologneſe, and on the W. by the Mantuan and Modeneſe. The whole country is fertile, but low and marſhy, being often overflowed by the waters of the Po. After paſſing from the houſe of Eſte, to which it was granted by the emperor Frederic II. to the ſtate of the church, it now conſtitutes the department of the Lower Po, being ceded by the pope in 1797. It has few towns, being badly cultivated, and thinly inhabited. The chief places are Ferrara and Comachio.

FERRARI, John Matthew, in *Biography*, known by the ſurname of *De Gradibus*, or *De Grado*, from the villa in which he was born, in the Milaneſe, was one of the moſt expert phyſicians of his time. He practiſed medicine at Milan, whence he was invited to Pavia, to occupy the medical chair in that univerſity, an appointment which he fulfilled with great applauſe. He was alſo phyſician to Maria Bianchi Viſconti, ducheſs of Milan. He died in 1480. He has left three large works, which have been frequently reprinted. The firſt is "A Commentary on Rhaſes;" the ſecond is entitled "Expoſitiones ſuper vigeſimam ſecundam Fen 3tiæ. Canonis Avicennæ;" and the third alſo "A Collection of the Opinions of Avicenna, and Rabbi Moyſes."

Ferrari, Ottaviano, was born at Milan in 1518, and having purſued a regular courſe of ſtudies, he was made profeſſor of moral philoſophy and politics in the Canobian college, a poſt which he occupied eighteen years. He was afterwards profeſſor at Padua, or Pavia, but returned to Milan, where he died in 1586. He was intimate with the moſt eminent ſcholars of his time; and publiſhed an introduction to the Ariſtotelian philoſophy, entitled "De diſciplina Encyclica;" and another work, "De ſermonibus Exotericis," which treats on the exoteric books of Ariſtotle. But his moſt valuable work is "De Origine Romanorum," devoted to the detection of the forgeries of Annius of Viterbo. He tranſlated Athenæus into Latin, and wrote notes upon Ariſtotle. Moreri.

Ferrari, Lewis, inventor of the firſt method of reſolving biquadratic equations, was born at Bologna about the year 1520. He ſtudied mathematics under the celebrated Cardan, who, having had a problem given him for ſolution, gave it his pupil as an exerciſe of his ingenuity. This led to the diſcovery of a new method of analyſis, which is preciſely that of biquadratics. Cardan publiſhed this method, and aſſigned the invention to its real author, and, but for this liberal conduct of the maſter, the pupil, for want of publiſhing any thing himſelf, would have been unknown to poſterity. At the age of eighteen he was appointed a tutor in arithmetic, and was equal to the taſk of diſputing with the moſt diſtinguiſhed mathematicians of his own age. He was afterwards appointed profeſſor of mathematics at Bologna, where he died in 1565. Ferrari was an excellent claſſical ſcholar, a good geographer, and well verſed in the principles of architecture. He was, however, addicted to aſtrology. Hutton's Math. Dict. Moreri.

Ferrari, Francis Bernardin, was born at Milan in 1577. He was educated in his native city, attracted the notice, and acquired the patronage of archbiſhop Borromeo, who, having projected a grand library at Milan, appointed Ferrari to travel through different parts of Europe to purchaſe the beſt books and MSS. that could be obtained. With this view he viſited Spain and Italy, and procured a vaſt number of valuable works, which laid the foundation of the Ambroſian library. To this inſtitution he was appointed the librarian, and created doctor. In 1638 he was nominated director of the college of Nobles, then recently erected at Padua, but the ſtate of his health obliged him to reſign that ſituation in leſs than two years. He returned to Milan, where he died in 1699, having attained to the ninety-ſecond year of his age. He left behind him numerous works in eccleſiaſtical and profane antiquities in an unfiniſhed ſtate. His chief publications are, "De Antiquo Eccleſiaſticarum Epiſtolarum genere," lib. iii. Milan, 1613. 4to. "De Ritu Sacrarum Eccl. Cathol. Concionum," lib. iii. Milan, 1620. 4to. which was afterwards reprinted by Grævius; and "De Ritu Veterum Acclamationibus et Plauſu," lib. vii.; this alſo is reprinted in the ſixth volume of Grævius's Rom. Antiq. Ferrari was author likewiſe of "A Treatiſe on the Funerals of Chriſtians."

Ferrari, Ottavio, was born at Milan in 1607, and ſo quickly did he eſtabliſh his literary reputation, that at twenty years of age he was choſen profeſſor of eloquence in the Ambroſian college. In 1684 he occupied the ſame poſt in the univerſity of Padua, where he was alſo appointed profeſſor of the Greek language, and by his means that ſeminary was reſtored to its ancient ſplendour. On account of his extraordinary ſervices he received a ſtipend of two thouſand florins; for a panegyric in praiſe of queen Chriſtina he was rewarded with a golden collar, value one thouſand ducats, and another, publiſhed in honour of Lewis XIV., obtained him a penſion of 500 crowns for five years. He was appointed hiſtoriographer to the city of Milan, and compoſed eight books of its hiſtory, but either the want of neceſſary documents, or the fear of offending the houſe of Auſtria, or his benefactor the king of France, cauſed him to leave his papers unfiniſhed. He was well known as an antiquary, and publiſhed ſeveral learned works on that ſubject, theſe are "De re veſtiaria," to which he added "Analecta," and diſſertations "De Lucernis Sepulchralibus Veterum," "De Pantomimis et Mimis," "De Balneis et Gladiatoribus." He died in 1684. Moreri.

FERRARI, JOHN BAPTIST, a native of Sienna, deeply learned in the Oriental languages, publiſhed, in 1622, a Syriac dictionary, with a view of furniſhing biblical ſcholars with ſuch Syriac words as occur in the ſcriptures. It is well and highly ſpoken of by Simon and Labbe. He was author of "Flora, ſeu de florum cultura;" alſo of "Heſperides, ſive de Malorum Aureorum cultura et uſu." He died in 1655. Moreri. See FERRARIA.

FERRARI, PHILIP, was an Italian monk, who flouriſhed in the 17th century, and taught mathematics in the univerſity of Pavia. He recommended himſelf to the eſteem of ſeveral popes, as Clement VIII., Paul V., and Urban VIII., and was twice general, and twice vice general of his order. He was author of "Typographia in Martyrologium Romanorum," "Epitome Geograp. lib. iv.," but his principal production was his "Lexicon Geographicum," which has been frequently reprinted. Moreri.

FERRARI, BENEDETTO, of Reggio in the Modeneſe ſtate, ſpent the chief part of his life at Venice, where, though the inhabitants of that city cultivated and encouraged the drama with more diligence and zeal than any other city in Europe, during the latter part of the 17th century, and the beginning of the laſt, yet they were not very early in its eſtabliſhment; as the firſt regular opera or drama ſet to muſic which was performed at Venice after the invention of recitative was "Andromeda," written by Benedetto Ferrari, and ſet to muſic by Franceſco Minelli of Tivoli, in 1637. Ferrari was himſelf a celebrated performer on the lute, an able poet, and a good muſician; who, collecting together a company of the beſt ſingers in Italy, brought this opera on the ſtage in the theatre of S. Caſſiano, at his own expence, in a very ſumptuous manner. An extraordinary inſtance of ſpirit and enterpriſe in a private individual of moderate fortune, to vie with princes in an exhibition of which they only could ſupport the ſplendour. (Le Glorie della Poeſ. et della Muſ.) Ferrari was not only qualified in an eminent degree for directing ſuch enterpriſes, but for ſupplying the principal materials; from his excellent performance on the lute, he was very early ſtyled Ferrari della Tiorba. He was a poet, a compoſer, and a ſinger in his own dramas. For five ſucceeding years, he annually produced an opera, which being collected into volumes in 1651, the printer informs the reader, that Benedetto had ſtill twelve more muſical operas to give to the public. In 1638, "La Maga Fulminata," by the ſame poet and muſician, was exhibited at the expence and riſk of Ferrari and of five or ſix of the performers, in a very ſumptuous and magnificent manner, though the expence did not amount to more than 2000 crowns. A ſum which, at preſent, (ſays the author of "The Glory of Poetry and Muſic," 1730) is hardly ſufficient to ſatiſfy the demands of an ordinary ſinger. But at this time the performers either ſhared in the profits, or were content with a moderate ſalary; public ſingers being then but ſeldom wanted, and that only in the capital cities of Italy; whereas, at preſent, dramatic repreſentations abound in villages. Ferrari was author of both words and muſic of two operas, "Armida," in 1639, and "Il Paſtor Reggio" in 1640; it was, however, much eaſier to ſet theſe dramas then than ſince, as theſe operas preceded the invention of airs, the dialogue being only carried on in recitative, till about the year 1649, when, in the opera of "Giaſone," written by Cicognini, and ſet by Cavalli, it is ſaid that the grave recitative began firſt to be interrupted by that anacreontic kind of ſtanza which has ſince been called aria. Storia Criti. de Teatri del Dottor Napoli Signorelli.

FERRARIA, in *Botany*, ſo named by Burmann, in the Ephemerides of the Imperial Academy *Naturæ Curioſorum* for 1761, in honour of John Baptiſt Ferrari, a Jeſuit, who publiſhed at Rome, in 1633, a quarto volume on the culture of flowers, the pompous plates of which are ſaid to have been drawn by Guido Reni and Pietro da Cortona. He publiſhed alſo at Rome, in 1646, a ſtill more ſplendid work, in folio, on the culture of orange-trees. Linn. Gen. 465. Schreb. 451. Willd. Sp. Pl. v. 3. 580. Juſſ. 57. Gawl. in Ann. of Bot. v. 1. 241. Mart. Mill. Dict. v. 2. Claſs and order, *Monadelphia Triandria*. Nat. Ord. *Enſatæ*, Linn. and Gawler. *Irides*, Juſſ.

Gen. Ch. *Cal.* Spatha of ſeveral inflated leaves. Perianth none. *Cor.* of ſix petals, regular, cohering by their claws, reflexed, pointed, criſped, with involute points; the three alternate ones rather the ſmalleſt. *Stam.* Filaments three, united into a tube in their lower part, equal, ſpreading above; anthers didymous, two-celled. *Piſt.* Germen inferior, obovate, obtuſe, ſomewhat triangular; ſtyle thread-ſhaped, the length of the ſtamens; ſtigmas three, dilated, petal like, cloven, deeply fringed, converging. *Peric.* Capſule oblong, triangular, of three cells and three valves; partitions contrary to the valves. *Seeds* numerous, roundiſh, in two rows.

Eſſ. Ch. Spatha inflated. Petals ſix, regular, criſped and fringed. Stigmas three, petal-like, fringed. Capſule of three cells. Seeds roundiſh. This genus is very properly reduced by Mr. Gawler to the original ſpecies, and another which he has deſcribed, excluding *F. Pavonia* of Linnæus, and *ixioides* of Willdenow.

1. F. *undulata*. Linn. Sp. Pl. 1353. Mill. Ic. t. 280. Jacq. Hort. Vind. t. 63. Curt. Mag. t. 144. (Flos indicus, e violaceo fuſcus, radice tuberoſa; Ferrar. de Fl. Cultura 168. t. 171.) "Border of the corolla thrice as long as the claws. Lobes of the anthers cloſe." Native of the Cape of Good Hope, cultivated by Miller at Chelſea in 1759. *Ait. Hort. Kew. v.* 3. 305. It flowers with us early in the ſpring, being kept in a greenhouſe, like other Cape bulbs. The *leaves* are equitant, ſomewhat glaucous, inflated at the baſe, and the floral leaves and ſpathas reſemble them, only being ſhorter. The *ſtem* is branched above, bearing numerous, very tranſient *flowers*, of a ſingular curled appearance, variegated with purple and white, and bordered with brown.

2. F. *antheroſa*. Gawl. in Curt. Mag. t. 751. (F. viridiflora; Andr. Repoſ. t. 285. F. Ferrariola; Willd. Sp. Pl. v. 3. 581. Moræa Ferrariola; Jacq. Coll. v. 4. 141.) "Claws of the corolla equal to the border. Lobes of the anthers divaricated." Native of the Cape of Good Hope, introduced by Mr. G. Hibbert in 1802. It much reſembles the former, but differs eſſentially in the greater length of the claws of the *petals*, the ſhape and greater ſize of the

anthers, and the *ſtigmas* being more toothed at their baſe. *Gawler.*

FERRARS, George, in *Biography*, was born at St. Albans about the year 1510. He ſtudied at Oxford, and from thence he removed to Lincoln's-inn, and became a diſtinguiſhed pleader in Weſtminſter-hall. He was patronized by lord Cromwell, and obtained the favour of Henry VIII. whom he attended in a military and civil capacity. In 1535 a conſiderable grant was made to him out of the royal demeſnes in Hertfordſhire, but, notwithſtanding his ample income, want of economy brought his affairs into ſuch a ſituation, that, in 1542, while repreſentative for Plymouth, he was arreſted for debt, and thrown into the compter. He was, however, ſet at liberty by virtue of privilege of parliament, and the officers concerned in his arreſt were impriſoned for contempt of the powers and privileges of a repreſentative of the people. In the reign of Edward he accompanied the protector, Somerſet, to Scotland, as commiſſioner of the army. He was afterwards maſter of the ſports, at a feſtivity held at Greenwich for twelve days, in order to amuſe the king. This appointment is ſuppoſed to have been occaſioned by ſome metrical ſtories of his compoſition, inſerted in the "Mirror of Magiſtrates," the firſt edition of which appeared in 1559. Ferrars is ſaid to have been the author of "The Hiſtory of the Reign of Queen Mary," in the Chronicles publiſhed under the name of Richard Grafton. He publiſhed a tranſlation of Magna Charta, from the French, into the Latin and Engliſh, and other laws enacted in the time of Henry III. and Edward I. Mr. Ferrars died in 1579. Biog. Brit.

FERRATO Saſſo, an hiſtorical painter known under that name, but whoſe real name was Giovanni Battiſta Salvi. He derived the former appellation from being born at an ancient caſtle ſo called, on the borders of the territory of Urbino, in 1504. He went to Rome to ſtudy the works of Raffaelle, then, as ſince, the admiration of the world. Franciſco Penni aſſiſted Salvi in his ſtudies, who had obtained great ſkill in copying: but his original works do not exhibit much comprehenſion of mind. He died in 1590, at 86 years of age.

Ferrato, *Cape*, in *Geography*, a cape on the eaſt coaſt of Sardinia. N. lat. 39° 31′. E. long. 9° 34′.

FERRATT, Cape, or *Cape Meſaff*, a cape on the coaſt of Algiers. N. lat. 36° 9′.

FERRE, Cape, a cape on the S.E. coaſt of Martinico. N. lat. 14° 30′. W. long. 60° 40′.

FERRE-ANAH, a town of Africa, in the kingdom of Tunis, was formerly, according to Dr. Shaw, the largeſt city of Bizacium, though its ancient grandeur is exhibited only in a few granite and other pillars, which the Arabs have ſuffered to remain. It was well watered by a ſtream which ran under the walls, and by wells within the city, encompaſſed by a corridor, and vaulted over with cupolas. The circumjacent country, however, is dry, barren, and inhoſpitable, for want of water. Several circumſtances lead us to conclude that it was the ancient Thala, mentioned by Tacitus, or Telepte; and that Thala and Telepte were the ſame; 130 miles S.W. of Tunis.

FERREIN *on the Vocal Organ*, in *Muſic*. See Voice.

FERREIRA, in *Geography*, a town of Spain, in Granada; ſix miles S.E. of Guadix.—Alſo, a town of Portugal, in the province of Alentejo; 13 miles W. of Beja.

Ferreira *des Aves*, a town of Portugal, in the province of Beira; 15 miles N.E. of Viſeu.

FERREOLA, in *Botany*, from *ferrum*, *iron*, alluding to the hardneſs of the wood. Roxb. Corom. v. 1. 35. Mart. Mill. Dict. v. 2. Claſs and order, *Diœcia Hexandria.* Nat. Ord. *Guaiacanæ*, Juſſ.

Gen. Ch. Male *Cal.* Perianth inferior, bell-ſhaped, three-cleft, permanent. *Cor.* of one petal, tubular, cut half way down into three erect ſegments, externally hairy. *Stam.* Filaments ſix, inſerted into the receptacle, awl-ſhaped, equal, erect, the length of the corolla; anthers erect, oblong. Rudiment of a germen roundiſh, abortive. Female *Cal.* and *Cor.* like the male. *Stam.* none. *Piſt.* Germen ſuperior, ovate; ſtyle ſhort, columnar; ſtigma three-cleft. *Peric.* Berry round, of two cells. *Seeds* ſolitary, convex on one ſide, flat on the other.

Eſſ. Ch. Male, Calyx three-cleft. Corolla tubular, three-cleft. Female, Cal. and Cor as in the male. Berry ſuperior, of two cells. Seeds ſolitary.

Obſ. Sometimes, according to Koenig, there are but five ſtamens.

1. F. *buxifolia*. Roxb. Corom. v. 1. 35. t. 45. (Ehretia ferrea; Willd. Phytogr. faſc. 1. t. 2. f. 2.) Native of Coromandel, growing to the ſize of a tree on the mountains, but in the Low Countries it is but a ſhrub. The wood is dark, hard, and durable, very uſeful where its ſmall ſize does not preclude its uſe. *Branches* numerous, rigid, and divaricated. *Leaves* not an inch long, on ſhort ſtalks, alternate, obovate, entire, obtuſe, emarginate, ſmooth. *Flowers* ſmall, yellow, axillary, ſolitary, nearly ſeſſile. *Berry* the ſize of a large pea, red, eatable, and very good. *Roxburgh.*

FERRER's Bay, in *Geography*, a bay on the N. coaſt of Egmont iſland, or New Guernſey, with a town or village; five miles E. of Carteret point.

FERRERAS, Don, John de, in *Biography*, a noble Spaniard, born in the province of Aſtorga in 1652, was brought up with the monks, and became diſtinguiſhed for pulpit eloquence. He twice refuſed the honour of a biſhopric, chooſing rather the life of a literary man in the metropolis, than the emoluments attached to the moſt elevated ſituation in the church. He was elected a member of the Spaniſh academy in 1713, and ſoon after was made royal librarian. He took a conſiderable part in the compilation of a dictionary, and contributed the articles under the letter G, and a diſcourſe on the origin of the Caſtilian tongue. He died at Madrid in 1735. He was author of many pieces in theology and general literature, but he is beſt known for a "General Hiſtory of Spain," in 16 vols. 4to. It has been tranſlated into French by M. de Hermilly. Moreri.

FERRET Island, in *Geography*, a ſmall iſland near the E. coaſt of Labrador. N. lat. 53° 40′. W. long. 55° 40′.

Ferret, *Viverra*, in *Zoology*, an animal of the *muſtela* or *weazel* kind, called by ſome alſo *muſtela ſylveſtris*, *furo*, and *furunculus*. See Mustela *Furo*.

Ferret, *Indian*, *viverra Indica*, a name by which ſome have called the animal known in America by the name of *quirpele* and *quil*. See Viverra *Mungo*.

Ferrets, in *Glaſs-making*, the irons with which the workman tries the melted metal to ſee if it be fit to work.

It is alſo uſed for thoſe irons which make the ring at the neck of bottles.

FERRETES d'Espagne, in *Natural Hiſtory*, a name given by authors to certain ſtones of a regular figure, found on the ſides of a rock in Spain; which have been ſince diſcovered very plentifully on the bottom and ſides of the Fontaine de Salut, near Bagneres in France, and in other places in the country thereabout.

Every one of theſe ſtones, ſo long as it remains in the rock, is always found between two bundles or cluſters of tranſparent fibres, of which generally one is placed on the one, and the other on the oppoſite ſide; theſe cluſters of fibres are largeſt in the largeſt ſtones; however, they are always found even about the ſmalleſt in ſome quantity. Philoſ. Tranſ. N° 472. p. 30.

FERRETI, Emilio, in *Biography*, born at Caſtel-Franco, in Tuſcany, in 1489, ſtudied at Piſa and Sienna, and became ſecretary to cardinal Salviati at Rome. He was admitted an advocate at the age of nineteen; after which he was made profeſſor of law, and ſecretary to Leo X. This office he filled with much reputation for ſeveral years, and then retired to his own country. On his return he accompanied Montferrat, the commander of the French army, to Rome and Naples. On his return he was taken priſoner by the Spaniards, and obliged to pay a high ranſom for his liberty. He next went to France, and taught the law at Valence with great reputation. He was then employed in various diplomatic ſtations, and as counſellor of the parliament at Paris. At length, after various negociations, he finally became profeſſor of the law at Avignon, where his ſtipend was raiſed to a thouſand crowns. He died in 1552, and when his ſucceſſor Craveta began his lectures by ſtrictures upon Ferreti, the ſcholars ſhewed their attachment to their old maſter by hiſſing and driving him from the place. Ferreti was a man of general learning, and well acquainted with claſſical literature. He gave an edition of the principal orations of Cicero. Bayle. Moreri.

FERRETO, an hiſtorian and poet of Vicenza, was born about 1296, and took a conſiderable part in the reſtoration of polite literature in Italy. He wrote, in Latin, a hiſtory of Italian affairs, from 1250 to the year 1318. This is one of the beſt compoſitions of the age, and was firſt printed in Muratori's Collection of Italian writers. Moreri.

FERRETTE, in *Geography*, a town of France, in the department of the Upper Rhine, and chief place of a canton in the diſtrict of Altkirch. The place contains 608, and the canton 11,470 inhabitants, on a territory of 225 kiliometres, in 31 communes.

FERRETTO, in the *Glaſs Trade*, a ſubſtance which ſerves to colour glaſs. This is made by a ſimple calcination of copper, but it ſerves for ſeveral colours. There are two ways of making this; the firſt is as follows: take thin plates of copper, and lay them on a layer of powdered brimſtone, in the bottom of a crucible; over theſe lay more brimſtone, and over that another layer of the plates, and ſo on alternately till the pot is full. Cover the pot, lute it well, place it in a wind-furnace, and make a ſtrong fire about it for two hours. When it is taken out and cooled, the copper will be found ſo calcined that it may be crumbled to pieces between the fingers like a friable earth; it will be of a reddiſh, and in ſome parts a blackiſh colour. This muſt be powdered and ſifted fine for uſe. Neri's Art of Glaſs, p. 30.

The other way is leſs eaſy, but it makes a more valuable ferretto. It is this: make a number of ſtratifications of plates of copper and powdered vitriol alternately in a crucible, which place on the floor of the glaſs-furnace near the eye, and let it ſtand there three days; then take it out, and make a new ſtratification with more freſh vitriol, and calcine it again as before; repeat this operation ſix times, and a moſt valuable ferretto is produced.

FERRI, Paul, in *Biography*, who flouriſhed in the 17th century, was born at Metz in the year 1591. He purſued his theological ſtudies with ſo much zeal that he was introduced to the miniſterial office when he was but 19 years old, and even then he had appeared as an author by a volume of poems written in the moments of relaxation. He poſſeſſed very extraordinary pulpit talents, and was the moſt popular preacher among the reformed in his province. He died of the ſtone in 1669, in his 79th year. The works publiſhed during his life were chiefly theological, but he left behind him collections for a hiſtory of Metz, in three or four volumes folio, which are referred to by Calmet as abounding in curious reſearches. In the height of his popularity he was charged with having received an annual penſion of five hundred crowns from cardinal Richlieu, as a bribe for his ſervices in attempting to promote an union between the Catholic and Proteſtant religions. This charge has been fully inveſtigated, and proved to be without the ſmalleſt foundation. Bayle. Moreri.

Ferri, Il Cavalier Baltazar, of Perugia, in the 17th century, is inſtanced by Rouſſeau, in his "Muſ. Dict." as the moſt extraordinary vocal performer that ever exiſted. "This ſingular and prodigious ſinger," ſays he, "who had ſuch talents as all the ſovereigns in Europe courted and ſeized by turns, was loaded with gifts and honours during his whole life, and his powers and glory all the muſes vied with each other in celebrating after his death. Every panegyric that was written upon this muſician, breathes rapture and enthuſiaſm; and his contemporaries all unite in affirming, that a talent ſo perfect and ſo rare, was above all competition, and had even ſilenced Envy herſelf. It is impoſſible, ſay they, to expreſs the brilliancy of his voice, or the graces of his ſtyle. He had all the characteriſtics of different ſtyles in the higheſt perfection; he was lively, dignified, grave, and tender, at his pleaſure, and all hearts were melted by his pathos. Among the infinite paſſages of the extremeſt difficulty which he performed with his voice I ſhall only repeat one. He aſcended and deſcended in one breath two full octaves in a running ſhake, in chromatic degrees of half notes with ſuch accuracy, though without accompaniment, that, if ſuddenly the baſe was ſtruck to any one of theſe intervals, whether flat or ſharp, the exact intonation was inſtantly felt in an aſtoniſhing degree by the audience." Bontempi Iſtoria Muſ.

We uſed to wonder whence Rouſſeau took this ſplendid account, as we found nothing ſo marvellous elſewhere; in Quadrio's ample liſt of opera ſingers, from the year 1634 to 1744, amounting to 273, no ſuch name as that of Ferri occurs. We find him not in Padre Martini, Algarotti, Planelli, Napoli Signorelli, Arteaga, or Eximeno, and it ſeems as if Bontempi, in imitation of Apelles the painter, who compoſed the face of his Venus of the beſt features of all the beauties of Greece, had rather told us what was to be wiſhed in a perfect ſinger than what really ever did exiſt in any one mortal; and we cannot help thinking that Bontempi has coloured his piece the higher from Ferri having been his countryman. One great ſinger may have poſſeſſed two or three of his excellencies at moſt. But exaggeration is the conſtant companion of panegyric and ſatire. If a ſinger of the name of Baltazar Ferri ever ſaw the light, and had tranſcendent powers, they are certainly magnified à la Herſchel: but his name not occurring in any other muſical work, or dramatis perſonæ of the innumerable operas that we have collated and examined, obliges us to doubt the authenticity of the account given us from Bontempi by the ingenious and enthuſiaſtic citizen of Geneva.

Monſ. Laborde has abridged the tale from Rouſſeau, and placed the name of Ferri in Quadrio's liſt, between Cavalli and Paita, among ſingers who flouriſhed between 1690, and 1700; but *non eſt inventus* either there or elſewhere.

Ferri, Ciro, an hiſtorical painter, born at Rome in 1634. He was a favourite diſciple of Pietro da Cortona, whom he aſſiſted in finiſhing ſeveral of his works at Florence, and at Rome; and whoſe ſtyle he ſo nearly adopted that their pictures may ſometimes be miſtaken for each other. Generally, Ferri has leſs grace of deſign, leſs eaſe in his actions and draperies, and leſs compaſs of mind; but he has more ſolidity and carefulneſs of finiſh than his maſter. His St. Ambroſio in the church of that ſaint at Rome offers the faireſt compariſon between them and Romanelli, a fellow ſcholar with Ciro Ferri. His principal works in freſco are in the Palace Pitti, at Florence, and at St. Maria Maggiori of Bergamo.

FERRIER, Jeremiah, a Proteſtant miniſter, and profeſſor of divinity at Niſmes in Languedoc, in the beginning of the 17th century, maintained in public debate that pope Clement VIII. was properly and truly Antichriſt. For this liberty of ſpeech he was arreſted and thrown into priſon at Toulouſe; from the effects of which he eſcaped, in conſequence of an arrêt from Henry IV. forbidding perſons to moleſt him on account of that buſineſs. Notwithſtanding Ferrier's zeal in the inſtance referred to, he was one of the firſt who, in the political aſſemblies of the proteſtants, oppoſed their proceedings in ſupport of their civil and religious privileges and immunities. He began now to be ſuſpected of having been induced by a bribe to deſert his cauſe, and was forbidden to appear in their aſſemblies again. His conduct in other reſpects was equally reprehenſible, and he was prohibited from exerciſing his miniſtry within the province of Languedoc. He now turned his attention to the law, but the populace, who are ever indignant at the treachery of public characters, attacked him publicly in the ſtreets, with ſtones, and other miſſile weapons, ſo that his life was in imminent danger. Not contented with the injury inflicted on his perſon, they proceeded to ranſack his houſe, burning and deſtroying his goods and books, and treating with much brutality his wife and children, whom the prudence of the magiſtrates preſerved from greater miſchief. Hence he became an avowed convert to the Catholic faith, ſettled at Paris, and took ſome pains to advance his fortune. His zeal was now equally great in defence of his new opinions, at leaſt of what were conſidered his new opinions, and he publiſhed a treatiſe, entitled "De l'Antichriſt, et de ſes Marques, contre les ennemis de l'egliſe Catholique," 4to. He was likewiſe ſuppoſed to be the author of "Catholique d'etat, ou diſcours des Alliances du roi tres Chretien contre les calomnies des ennemis de ſon etat." M. Ferrier was employed by the king in many affairs of great national importance, and was, in 1626, appointed privy counſellor. He ſtood alſo high in eſtimation with cardinal Richlieu. He died in 1626, and on his death-bed dictated an epitaph, in which he declared his ſteady attachment to the Catholic faith: he went much farther, and even extorted from his children a promiſe that they would live and die in the communion of Rome. Bayle. Moreri.

FERRIE'RES, in *Geography*, a town of France, in the department of the Ourte, and chief place of a canton, in the diſtrict of Huy; the place contains 689 and the canton 4,981 inhabitants, on a territory of 145 kiliometres, in 16 communes.—Alſo, a town of France, in the department of Loiret, and chief place of a canton, in the diſtrict of Montargis; the place contains 1610, and the canton 9,025 inhabitants, on a territory of 270 kiliometres, in 7 communes.

FERRILITE, in *Mineralogy*, a name given by Mr. Kirwan to rocks found at, and in the neighbourhood of, Rowley Regis, Staffordſhire, and known by the term Rowley rag. It has been conſidered by many as baſalt, by others as Floetz greenſtone, and by ſome called whin, an indefinite term uſed in the north of England, and applied to various hard ſtones.

Its colour is greyiſh-black, inclining to greeniſh-black, and, when expoſed to the weather, browniſh. It occurs maſſive in great beds, or ſtrata, in the vicinity of Rowley, Dudley, Walſall, and the ſouth-weſt part of Staffordſhire; and in ſome inſtances in columnar diſtinct concretions, particularly at Powk Hill, near Walſall, where it is quarried for mending the roads.

Internally it is glimmering, from minute cryſtals of hornblende and felſpar, particularly the fractured ſurface of the latter, which is foliated.

The fracture is generally fine-grained, uneven, but often flat, conchoidal, and fine ſplintery. The fragments rather ſharp edged.

When diſintegration has taken place to a conſiderable extent, it occurs in large globular concretions, which appear to be compoſed of concentric laminæ.

It is generally opaque, but ſometimes faintly tranſlucent at the edges, gives a whitiſh grey ſtreak, hardiſh, ſcratches glaſs, brittle, and difficultly frangible, but leſs ſo than baſalt of Werner; ſpecific gravity 2.7 to 2.9.

It melts eaſily, without addition, before the blow-pipe, into a black glaſs.

It conſiſts of felſpar and hornblende in a confuſedly cryſtallized ſtate: it has been analyſed by Dr. Withering, with the following reſult:

Silica . . .	47.5
Alumina . .	32.5
Oxyd of Iron .	20.0
	100.0

It is probable, as ſo great a portion of it conſiſts of felſpar, that it contains pot-aſh, but which, at the ſame time when this analyſis was made, was not ſuſpected to occur in the mineral kingdom.

It is alſo probable that the iron it contains is in a low degree of oxydation, as it exerts ſo much influence on the magnetic needle. This effect has been long known, as Dr. Plott, in his "Hiſtory of Staffordſhire," mentions, that it drew the compaſs needle 6° out of its proper direction.

The lower ſtratum of the Derbyſhire toad-ſtone, which very accurately reſembles ferrilite in its external characters, is alſo very magnetic.

Mr. Keir has, in Shaw's "Hiſtory of Staffordſhire," given an intereſting account of this ferrilite, and lately Mr. G. Watt (in Philoſ. Tranſ. 1804,) has given a ſtill more intereſting detail of experiments made on this ſubſtance, by melting, and cooling it with different degrees of rapidity.

When cooled ſuddenly from the fluid ſtate, it aſſumed the appearance of an opaque black glaſs, but when the heat was ſo ſlowly withdrawn that it was ſeveral days in cooling, its appearance was as ſtony, and texture as cryſtalline, as the original rock.

For obſervations on the phenomena, and concluſions illuſtrative of the igneous formation of baſaltic, and other rocks; ſee Philoſ. Tranſ. 1804.

FERRITER's Island, in *Geography*. See Blaskets.

FERRO, or Hiero, the moſt weſterly of the Canary iſlands, about 15 miles in breadth, and 45 in circumference. The aſcent from the ſea is difficult, as it is on all ſides high and craggy: but on the ſummit it is tolerably level and fruitful; abounding with many kinds of trees and ſhrubs. It produces better graſs, herbs and flowers than any of the other iſlands; ſo that bees thrive and multiply here exceedingly, and yield excellent honey. The greater part of the wine of Ferro, which is bad, is diſtilled into brandy; and there are only three fountains of water on the iſland. On account of the ſcarcity of water, ſheep, goats, and ſwine do not drink in ſummer; but they are accuſtomed to dig up the roots of fern, and chew them in order to quench their thirſt. The larger cattle are watered at thoſe fountains, and at a place where water diſtils from the leaves of a tree. The Engliſh and French geographers formerly reckoned their longitude from Ferro; but Engliſhmen now count their longitude from Greenwich, and the Frenchmen reckon their's from Paris. N. lat. 27° 45′. W. long. 17° 46′.

FERROGAN, or Farragon, a mountain of Scotland, in Perthſhire; 18 miles S. of Blair Athol. Its height is eſtimated at 2548 feet above the level of the ſea.

FERROL, a handſome ſea-port town of Spain, and harbour for the royal navy, in the province of Galicia, the entrance of which is formed by Cape Prior. It is ſituated N.N.E. of Corunna, and ten Spaniſh leagues from Cabo Ortegal, and has been, ſince the middle of the eighteenth century, one of the moſt famous maritime places in Europe, and one of the beſt in Spain. Before the year 1752, Ferrol was merely a kind of hamlet, inhabited by the ſailors of coaſting veſſels, and fiſhermen: but a town has ſince been raiſed with an increaſing population. The harbour is very ſafe, being on every ſide protected from the winds; it is ſurrounded by redoubts, mounting five cannon on each front, and four on each ſide: the whole is connected by an intrenchment and a parapet, which maſk the interior works. It has one pariſh, containing about 8000 ſettled inhabitants, and occaſionally many more, who are attached to the navy and the harbour, and it has two hoſpitals, one for the inhabitants, and the other for ſoldiers and ſailors. It has alſo a ſchool for midſhipmen, magnificently built; the handſomeſt arſenal in the kingdom; a machine for hammering copper to ſheath veſſels; and an extenſive rope-walk. The naval barracks are large and commodious, and capable of containing 6000 men. Here is alſo a good dock-yard. This place is at preſent the firſt arſenal of the royal navy of Spain: it was erected by order of Ferdinand VI., the father of Charles III. Art and nature have conſpired to render the poſition of the harbour impregnable. The baſon for the fleet is immenſe; each ſhip having a ſeparate warehouſe, where the tackle, rigging, and ſpare ſtores are marked, and placed in the greateſt order. The "preſidiario" is compoſed of 600 galley ſlaves, who are employed in the moſt laborious works of the harbour. Two caſtles, that of St. Philip, and that of the Palma, defend the approach of the coaſt between Corunna and Ferrol, and the road paſſes between them. Ferrol being more a military than a civil place, has only an alcalde mayor, and ſome alcaldes of diſtricts, to attend to the police of the town; but it has a military commandant, a governor, an intendant, a complete and numerous ſtaff, who ſerve for the fortifications, the harbour, and the garriſon, which is always very ſtrong. As Ferrol is altogether intended for the royal navy, general commerce and all foreign merchant-ſhips are excluded, except ſuch coaſting veſſels, &c. as ſupply articles of neceſſity. The environs of the town have many fountains of excellent water, and the town has abundance of river and ſea fiſh. It has only one manufactory, which furniſhes ſail-cloth. N. lat. 43° 28′. W. long. 8° 11′.

Ferrol, a ſmall iſland in the Pacific ocean, near the coaſt of Peru. S. lat. 9° 15′.

FERRUGINOUS, denotes a thing to partake of the nature of iron, or to contain particles of that metal.

It is particularly applied to certain mineral ſprings, whoſe water, in their paſſage along the ſtrata of the earth, meets with the ore of this metal, or with pyritæ containing it, part of which they waſh off, and carry with them, and thus become impregnated with the principles thereof. Such are what we call *chalybeate waters*.

The waters of Tunbridge, thoſe of Forges, and of the iron ſpring at Bourges, and many others, are ferruginous.

FERRUGO, the ruſt of iron, or a kind of calx found on the ſurface thereof.

The ruſt of iron is a reſtringent; applied by way of peſſary, it repreſſes the fluor uterinus; and drank, prevents conception; it cures the eryſipelas, and exanthematous eruptions. It is of good uſe in a paronychia, roughneſs of the eye-lids, and a condyloma. It alſo ſtrengthens the gums, relieves under the gout, being rubbed on the part affected, and makes the hair grow after an alopecia. Wine or water, in which red hot iron has been quenched, being drank, is good for the cœliac paſſion, dyſentery, diſorders of the ſpleen, cholera morbus, and relaxations of the ſtomach. See Iron.

FERRULE, in a *Ship*, a ſmall iron hoop, fixed on the extremities of the yards, booms, &c.

FERRUM. See Iron.

Ferrum *Equinum*, in *Botany*, Horſe-ſhoe Vetch. See Hippocrepis.

FERRY, a liberty by preſcription, or the king's grant to have a boat for paſſage upon a river, for the carriage of horſes and men for a reaſonable toll: it is uſually to croſs a large river. Termes de Ley.

A ferry is no more than a common highway; and no action will lie for one's being diſturbed in his paſſage, unleſs he allege ſome particular damage, &c. (3 Mod. Rep. 294.) The not keeping up of a ferry has been held to be indictable. If a ferry be granted at this day, he that accepts ſuch grant is bound to keep a boat for the public good. Holt, Ch. J. Shaw. 257.

FERRYLAND Harbour, in *Geography*, a bay on the eaſt coaſt of Newfoundland. N. lat. 47° 8′. W. long. 52° 51′.

FERSIN, a town of Perſia, in the province of Irak; 22 miles S. of Sava.

FERSINA, a river of Tyrol, which riſes in a lake near St. Boldo, and runs into the Adige, 2 miles N. of Trent.

FERTE'-ALLAIS, La, a town of France, in the department of the Seine and Oiſe, and chief place of a canton in the diſtrict of Etampes. The place contains 780, and the canton 8,583 inhabitants, on a territory of 167½ kiliometres, in 18 communes.

Ferté-*Bernard*, *La*, a town of France, in the department of the Sarthe, and chief place of a canton in the diſtrict of Mamers, ſurrounded with walls, and containing three fauxbourgs, 21 miles N. E. of Le Mans. N. lat. 48° 11′. E. long. 0° 44′. The place contains 2314, and the canton 11,720 inhabitants, on a territory of 181½ kiliometres, in 14 communes. This is the birth-place of Robert Garnier, a poet.

Ferté-*Chaudron*, *La*, a town of France, in the department of the Nievre; 10 miles N.W. of Moulins.

Ferté-*Freſnel*, *La*, a town of France, in the department

ment of the Orne, and chief place of a canton in the diſtrict of Argentan, 21 miles E.N.E. of Argentan. The place contains 376, and the canton 8,697 inhabitants, on a territory of 200 kiliometres, in 20 communes.

Ferté-*Gaucher*, *La*, a town of France, in the department of the Seine and Marne, and chief place of a canton in the diſtrict of Coulommiers; 9 miles E.S.E. of Coulommiers. N. lat. 48° 47′. E. long. 3° 22′. The place contains 1,800, and the canton 10,241 inhabitants, on a territory of 277½ kiliometres, in 19 communes.

Ferté-*Macé*, *La*, a town of France, in the department of the Orne, and chief place of a canton in the diſtrict of Domfront; 12 miles E. of Domfront. The place contains 3849, and the canton 13,470 inhabitants, on a territory of 135 kiliometres, in 11 communes.

Ferté-*St. Aubin*, *La*, a town of France, in the department of the Loiret, and chief place of a canton in the diſtrict of Orleans. The place contains 1,558, and the canton 5,330 inhabitants, on a territory of 450 kiliometres, in 8 communes.

Ferté-*ſous-Jouarte*, *La*, a town of France, in the department of the Seine and Marne, and chief place of a canton in the diſtrict of Meaux; 10 miles E. of Meaux. The place contains 3,703, and the canton 15,206 inhabitants, on a territory of 210 kiliometres, in 19 communes.

Ferté-*ſur-Amance*, *La*, a town of France, in the department of the Upper Marne, and chief place of a canton in the diſtrict of Langres. The place contains 493, and the canton 5,972 inhabitants, on a territory of 120 kiliometres, in 13 communes.

Ferté-*Vidame*, *La*, a town of France, in the department of the Eure and Loire, and chief place of a canton in the diſtrict of Dreux; 13 miles W. of Chateauneuf. The place contains 1,271, and the canton 10,744 inhabitants, on a territory of 272½ kiliometres, in 29 communes.

FERTIE'RE, a town of France, in the department of the Po, on the Dora; 8 miles N. of Suſa.

FERTILE, in *Agriculture*, a term ſignifying fruitful or abundant.

Fertile *Soil*, is that ſort of ſoil which, from the nature of its conſtituent principles, is capable of producing full crops. See Soil.

Fertile *Flowers*, in *Botany*, and *Vegetable Phyſiology*, are the *flores fœminei*, female flowers, of Linnæus. Being furniſhed with only one kind of ſexual organs, the piſtils, they cannot indeed of themſelves bring the rudiments of the fruit to perfection, but with the aſſiſtance of the male ones, termed in contradiſtinction barren flowers, as having no rudiments of ſeed, they at length become prolific. (See Fecundation *of Plants*.) Examples are ſeen in the Oak, Hazel, and Walnut, where the fertile flowers, diſtinguiſhed by very conſpicuous ſtigmas, are of a quite different form and ſize from the barren ones. In ſeveral plants the fertile flowers are accompanied by rudiments of ſtamens, moſtly inefficient, though liable to become perfect, according to circumſtances, as in *Rhodiola*.

Fertile *Florets*, in compound, and umbellate, flowers, are not only ſuch as anſwer to the above deſcription, as in the radius of the Daiſy, Aſter, &c., but the term is applied to all florets, (whether furniſhed with ſtamens or not, as well as with a piſtil,) that bring their ſeed to perfection; which many, though formed with the rudiments of a germen and ſtyle, do not. In ſome compound flowers fertility reſides more towards the circumference than the centre, as in the Marigold, *Calendula*, whoſe diſk is altogether male. In the Sunflower and Knapweed it is otherwiſe, yet rather by abortion than original conformation See Flower and Floret.

FERTILITY, Fruitfulneſs, that quality which denominates a thing fertile or prolific.

FERULA, a little wooden pallet or ſlice, reputed the ſchoolmaſter's ſceptre wherewith he chaſtiſes the boys by ſtriking them on the palm of the hand.

The word is Latin, and has alſo been uſed to denote the prelate's crozier and ſtaff. It is ſuppoſed to be formed of the Latin, *ferire, to ſtrike*; or, perhaps, ferula in this ſenſe may be derived from the name of a plant, called, in Latin, *ferula*; in Engliſh, *fennel-giant*; the ſtem whereof was anciently uſed to correct children with.

Under the eaſtern empire the ferula was the emperor's ſceptre, as is ſeen on divers medals; it conſiſts of a long ſtem or ſhank, and a flat ſquare head. The uſe of the ferula is very ancient among the Greeks, who uſed to call their princes *ναρθηκοφοροι*, q. d. *ferula-bearers*.

In the ancient eaſtern church, ferula or narthex ſignified a place ſeparated from the church; wherein the penitents or the catechumens of the ſecond order, called *auſcultantes*, *ακροαματικοι*, were kept, as not being allowed to enter the church; whence the name of the place, the perſons therein being under penance or diſcipline: *ſub ferula erant eccleſiæ*.

Ferula, in *Botany*, a name in Pliny, derived by ſome from *fero*, to carry, becauſe its light hollow ſtalks were carried in the hand, as walking-ſticks; by others from *ferio*, to ſtrike, becauſe they were uſed to chaſtiſe ſchool-boys. Fennel-giant. Linn. Gen. 136. Schreb. 186. Willd. Sp. Pl. v. 1. 1411. Juſſ. 222. Tournef. t. 170. Gærtn. t. 85. Mart. Mill. Dict. v. 2. Claſs and order, *Pentandria Digynia*. Nat. Ord. *Umbelliferæ*.

Gen. Ch. *General umbel* of numerous rays, globoſe; *partial* ſimilar to it. *General involucrum* deciduous; *partial* of numerous, ſmall, linear leaves. *Perianth* ſcarcely diſcernible. *Cor. Univerſal* uniform; flowers all fertile; *partial* of five oblong, ſtraightiſh, nearly equal petals. *Stam.* Filaments five, the length of the corolla; anthers ſimple. *Piſt.* Germen inferior, turbinate; ſtyles two, reflexed; ſtigmas obtuſe. *Peric.* Fruit oval, ſomewhat compreſſed, marked with three elevated lines on each ſide, ſeparable into two parts. *Seeds* two, very large, elliptical, flat on each ſide, marked with three diſtinct ribs.

Eſſ. Ch. Fruit oval, compreſſed, with three ribs on each ſide. Calyx obſolete. General involucrum deciduous. Flowers uniform, all fertile.

Obſ. The ſtalk of the principal umbel ſometimes throws out lateral oppoſite flower-ſtalks.

The lofticſt of umbelliferous plants, whoſe ſtems, though annual, and conſequently properly herbaceous, have, when dry, a woody hardneſs; hence a quibbling ancient is reported to have called *Ferula* wood and no wood. The ſpecies in Willdenow are 12, but the ſynonyms are not free from confuſion. The *leaves* of all are extremely compound, with narrow, nearly linear, leaflets or ſegments, often ſhining. The *flowers* are generally copious, yellow, diſpoſed in a corymboſe manner on a round, upright, tall, hollow ſtem. The plants when wounded exude an acrid or fœtid reſin.—They generally grow in the ſouth and eaſt of Europe.—The chief ſpecies are,

F. *communis*. Linn. Sp. Pl. 355. Dod. Pempt. 321. f. 1. Ναρθηξ of Dioſcorides. "Leaflets linear, very long and ſimple." This was formerly ſuppoſed to yield the gum called *Sagapenum*, but modern naturaliſts have thought otherwiſe. It is ſcarcely cultivated but in curious botanic gardens, on account of its cumberſome ſize and weed-like aſpect. It is common in fields about Rome, flowering about Midſummer.

F. *Ferulago.* Linn. Sp. Pl. 356. Sm. Prod. Fl. Græc. v. 1. 191. (F. nodiflora; Jacq. Auſtr. append. t. 5. Willd. Sp. Pl. v. 1. 1413). "Leaflets linear-oblong, flat, three-cleft. Flowering branches moſtly ternate. Bracteas reflexed, obtuſe."—Native of Auſtria, and various more ſouthern countries. This is a much more humble plant, with numerous ſmall yellow *flowers*. Its flavour is acrid and nauſeous.

F. *Aſſa-fœtida.* Linn. Mat. Med. 40. (Aſſa fœtida; Kœmpf. Am. Exot. 535. t. 536). "Leaflets alternately ſinuated, obtuſe."—Native of Perſia, from whence the drug is brought to us. (See Assa-foetida.) We know nothing of this plant but from Kœmpfer's account and figure, from whence the above character is taken.

F. *perſica.* Willd. 1413. (Aſa fœtida; Hope Tr. of R. Soc. for 1785. 36. t. 3, 4). "Leaflets many-cleft, acute, decurrent. Primary umbel ſeſſile."—The ſeeds of this plant were ſent from the mountains of Ghilan in Perſia to the Peterſburgh Academy, and two roots were communicated to Dr. Hope at Edinburgh, from whence Chelſea and other gardens have obtained living ſpecimens. The leaves do not accord with Kœmpfer's figure above quoted, and therefore this is ſuppoſed a diſtinct ſpecies from the laſt, yielding, nevertheleſs, genuine Aſſa-fœtida, with the flavour of which every part is ſtrongly impregnated, and which exudes in the form of a milky fluid wherever the herb is wounded. The *leaves* are rather glaucous. *Flowers* deep-yellow. It is perennial and hardy with us.

The ſailors in the Levant make uſe of the *ferula* to tranſport fire from one iſland to another. This cuſtom is of the earlieſt antiquity, and may ſerve to explain a paſſage in Heſiod (Op. et Die. l. i. v. 52.) who, ſpeaking of the fire ſtolen from heaven by Prometheus, ſays, that he carried it in a ferula, εν κοιλω ναρθηκι, ſince the foundation of this fable is undoubtedly owing to what Diodorus Siculus (l. 3.) tells us of Prometheus, that he was the inventor of the ſteel, το πυρειον, with which fire is ſtruck from the flint. In all probability, that prince made uſe of the pith of the ferula, inſtead of tinder, and taught men to preſerve fire in the ſtalk of that plant. Its ſtalks are ſtrong enough to ſerve for a ſupport, but too ſlight to wound thoſe who are beat with them. Hence we are told by Diodorus Siculus (*ubi ſupra*) that Bacchus, one of the greateſt legiſlators of antiquity, enjoined primitive mortals, when they drank wine, to uſe theſe ferula canes, becauſe they frequently broke one another's heads with thoſe they uſed to wear of another kind.

Ferula, in *Gardening*, compriſes plants of the herbaceous, perennial, flowery kind. The ſpecies chiefly cultivated being the common fennel giant (F. communis); the glaucous fennel giant (F. glauca); the Tangier fennel giant (F. Tingitana); and the broad-leaved fennel giant (F. ferulago).

They are all plants which riſe to a great height in ſuch ſoils as ſuit them.

Method of Culture.—All theſe plants are capable of being readily propagated by ſowing the ſeeds either in the autumnal or ſpring ſeaſon, in drills on beds of light earth, at one foot apart, and three inches diſtant. As the plants advance in growth they muſt be kept properly clean from weeds, and be well thinned out in order to afford full room for their ſpreading out.

They ſhould continue in theſe beds for about two years, when they may be carefully taken up in the beginning of the autumn, and be planted out where they are to remain. They moſtly ſucceed in the beſt manner in the rather moiſt mellow loamy ſoils.

They are rather hardy, and well ſuited for being planted for ornament, in the more extenſive borders and clumps of pleaſure grounds, where they often continue for ſeveral years without requiring any other attention than that of being kept clean from weeds.

Ferula, in the *Materia Medica*. See Assa-foetida.

Ferulæ, a word uſed by the ancients to expreſs the horns growing on the deer or ſtag at the age of two years.

Ferulæ, among *Surgeons*, called alſo ſplinters, are little chips of different matter; as of wood, bark, leather, paper, &c. applied to bones that have been disjointed when they are ſet again.

The bark of the herb fennel-giant, called by ſome, in Latin, ferula, was anciently much uſed on this occaſion; whence the name ferula became common to all.

FERUS, John, in *Biography*, who flouriſhed in the 16th century, was a native of Metz, where he took the habit of the Franciſcans, and became warden of the order. He preached many years with great reputation, and died in the year 1554. His great work as an author was entitled "Commentaries" on almoſt all the books of the Old and New Teſtament. Theſe are characterized by Dupin as large and eloquent diſcourſes, in which the holy ſcriptures are faithfully explained. He was a candid as well as learned expoſitor, ſo that his writings have been in high eſtimation with Proteſtants, as well as by the liberal of his own denomination. By the bigots he was fiercely attacked and charged with Lutheraniſm. Ferus did not live to write his own defence, but he met with an able apologiſt even in Spain, *viz.* Michael Medina, a learned monk, who vindicated the explications which he had given by an appeal to the ſcriptures, and the doctrines of the apoſtles. The author had nearly ſuffered for his boldneſs in defence of a friend, and the works of Ferus were inſerted in the "Index Expurgatorius." Like many good and excellent men of all perſuaſions he denied the lawfulneſs of war, holding it to be repugnant to the diſtinguiſhing principle of Chriſtianity, which is univerſal benevolence. Moreri.

FERZAA, in *Natural Hiſtory*, a name given by the Perſians to that gem which we call the turquoiſe or Turkey-ſtone, a blue, opaque, and ſoft gem. See Turcois.

FESCAMP, in *Geography*. See Fecamp.

FESCENNINE, in *Antiquity*. Feſcennine verſes were a kind of ſatirical verſes, full of wanton and obſcene expreſſions, ſung or rehearſed by the company, with many indecent geſtures and dances, at the ſolemnization of a marriage among the Romans, and alſo at the feſtival of "Harveſt-home." Hor. ep. i. lib. v. 145.

The word is borrowed, according to Macrobius, from *faſcinum, a charm*; the people taking ſuch ſongs to be proper to drive away witches, or prevent their effect; but its more probable origin is from Feſcennium, a city of Campania, where ſuch verſes were firſt uſed.

FESHN, in *Geography*, a town of Egypt; 18 miles N. of Abu-Girgé.

FESOLI, or Fiesoli, *Congregation of*. See Jeronymites.

FESSE, in *Heraldry*, one of the nine honourable ordinaries of the eſcutcheon, which it divides horizontally in the middle, and ſeparates the chief from the point. It is ſuppoſed to repreſent a broad girdle or belt of honour, ſuch as thoſe with which knights at arms were anciently girded.

It poſſeſſes the centre of the eſcutcheon, and contains in breadth one third part thereof. Thus, he beareth azure, a feſſe, or, by the name of Elliot.

When the feſſe takes up leſs than its proper breadth, it is called a bar.

Fesse-*point* is the exact centre of the eſcutcheon.

It is thus called, as being the point through which the feſſe line is drawn from the two ſides; and accordingly it divides the eſcutcheon into two equal parts when the eſcutcheon is parted per feſſe.

Fesse-*ways*, or *in Feſſe*, denotes things borne after the manner of a feſſe; *i. e.* in a line or range, acroſs the middle of the ſhield, which the French call en feſſe.

Fesse, *party per*, implies parted acroſs the middle of the ſhield, from ſide to ſide, through the feſſe point.

This the French expreſs by one word, *coupé*.

FESSELDORF, in *Geography*, a town of Germany, in the biſhopric of Bamberg; four miles S. W. of Weiſmayn.

FESSIER, in *Anatomy*, the name given by the French to the glutei muſcles, which are diſtinguiſhed as the grand, moyen, and petit. It is derived from feſſe, the buttock.

FESTA, Constantius, in *Biography*. Beſides the works of ſuch muſicians as may be claſſed under the ſeveral ſchools of Italy, there are extant many admirable productions of a much higher period than Paleſtrina, preſerved in the collections of the curious, by Italian compoſers, the particular place of whoſe birth or reſidence has not been recorded. Among theſe, there is one who for his genius and abilities well deſerves a niche in every hiſtory of muſic. This is Conſtantius Feſta, of whoſe compoſitions there are ſeveral in the Britiſh muſeum. There is likewiſe a motet of this ancient maſter in the ſame collection, printed in the fourth book of "Motetti della Corona," which was printed ſo early as 1519, ten years before Paleſtrina was born.

In the third book of Arkadelt's madrigals, printed at Venice, 1541, there are alſo ſeven compoſitions by Coſtanzo Feſta, in which more rhythm, grace, and facility appear, than in any production of his cotemporaries, that we have ſeen. Indeed, he ſeems to have been the moſt able contrapuntiſt of Italy during this early period; and if Paleſtrina and Conſtantius Porta be excepted, of any period, anterior to that of Cariſſimi. His motets, for three voices, printed in 1543, are in the church ſtyle of the times, a model of elegance, ſimplicity, and pure harmony; the ſubjects of imitation are as modern, and the parts ſing as well, as if it was a production of the preſent century. We could not reſiſt the pleaſure of ſcoring his whole firſt book of three-part madrigals, from the ſecond edition printed at Venice, 1559; for we were aſtoniſhed as well as delighted to find compoſitions ſo much more clear, regular, phraſed, and unembarraſſed than we expected.

Festa *in Cappis*, in *Middle Age Writers*, grand holidays, in which the whole choir of the cathedrals wore caps.

FESTENBERG, in *Geography*, a town of Sileſia, in the province of Oels; 10 miles N. of Oels. N. lat. 51° 21′. E. long. 17° 30′.

FESTI Dies, among the ancients, were feaſt-days or holidays.

Numa diſtinguiſhed the days of the year into *feſti*, *profeſti*, and *interciſi*. The firſt were thoſe dedicated to the gods; the ſecond were thoſe allowed to men for the management of their own affairs; the third were ſhared between the gods and men.

The feſti dies, again, were divided, according to Macrobius, Saturn. cap. 16. into *ſacrifices*; *epulæ*, or banquets; *ludi*, or games, and *feriæ*; and the *profeſti* into *faſti*, *comitiales*, *comprehendini*, *ſtati*, *prœliares*.

FESTING, Michael Christian, in *Biography*, an eminent muſician, whoſe inſtrument was the violin, and who, during many years, was the leader and principal conductor of almoſt every muſical eſtabliſhment in London.

This performer, with a feeble hand, little genius for compoſition, and not a deep contrapuntiſt, by good ſenſe, probity, prudent conduct, and a gentleman-like behaviour, acquired a weight and influence in his profeſſion, at which hardly any muſician of his claſs ever arrived. He led during many years at the opera, at Ranelagh, at the concert at Hickford's room, at the Swan and Caſtle concerts in the city, and often at Handel's oratorios. Nor was there a benefit concert for any Engliſh profeſſor at that time without a ſolo on the violin by Mr. M. C. Feſting; and yet there is not a ripieno player on the violin at the opera now, whoſe hand and abilities are not ſuperior to thoſe of Feſting upon that inſtrument. Learn hence, ye young profeſſors, that ſomething elſe is neceſſary, beſides muſical talents, to carry you reputably and comfortably through the world!

Festing-*Men*. See Fastermans.

Festing-*Penny*, in *Rural Economy*, a term provincially applied to the earneſt given to ſervants when hired at fairs, or other places.

FESTINO, in *Logic*, one of the moods of the ſecond figure of ſyllogiſms.

In a ſyllogiſm in feſtino, the firſt propoſition is an univerſal negative; the ſecond, a particular affirmative; and the third a particular negative.

FESTIVAL. See Feast and Festum.

FESTNERSGREATH, in *Geography*, a town of Germany, in the biſhopric of Bamberg; 16 miles S. S. W. of Bamberg.

FESTOON, in a *General Senſe*. See Garland.

Festoon, in *Architecture* and *Sculpture*, is a decoration in form of a garland or cluſter of flowers.

The word is French, *feſton*, which ſignifies a *garland*, formed of the Latin, *feſtum*, *feaſt*.

It conſiſts of a ſtring or collar of flowers, fruits, and leaves, tied together, ſomewhat biggeſt in the middle, and ſuſpended by the two extremes; from which, beſide the main part which falls down in an arch, two leſſer parts hang perpendicularly.

This ornament is made in imitation of the feſtoons or long cluſters of flowers, hung by the ancients on the doors of their temples, &c. on feſtival occaſions.

Feſtoons are now chiefly uſed in friezes, tablets, and other vacant places, required to be filled up and adorned. They are ſometimes uſed over or under a niche.

FESTUCA, in *Botany*, a Latin word expreſſive of the ſhoot of an herb or tree, adopted by Dillenius, in his Nov. Pl. Gen. 90. t. 3, for a genus of graſſes. The *Feſtuca* of Dillenius however, comprehended under the *Bromus* of Linnæus, is diſtinct from the genus here intended.—Feſcue-graſs.—Linn. Gen. 36. Schreb. 50. Willd. Sp. Pl. v. 1. 418. Juſſ. 32. Lamarck. Illuſtr. Gen. t. 46. Sm. Fl. Brit. 113. Leers. t. 8. Claſs and order, *Triandria Digynia*. Nat. Ord. *Gramina*.

Gen. Ch. *Cal.* Glume of two valves, erect, containing many florets, in a ſlender, roundiſh, two-ranked ſpikelet; its valves awl-ſhaped, pointed, the lower one ſmalleſt. *Cor.* of two valves; the lower one largeſt, of the form of the calyx but larger, ſomewhat cylindrical, pointed, awned. "Nectary either of two ovato-lanceolate, acute leaflets, gibbous at their baſe; or of one rather concave, horizontal, notched leaf." *Schreber. Stam.* Filaments three, capillary, ſhorter than the corolla; anthers oblong. *Piſt.* Germen turbinate; ſtyles two, ſhort, reflexed; ſtigmas downy. *Peric.* none, except the corolla cloſely enfolding, and united to, the ſeed, not burſting. *Seed* one, oblong, ſlender, very ſharp at each end, marked with a longitudinal furrow.

Eſſ. Ch. Calyx of two valves. Spikelet oblong, ſomewhat cylindrical, two-ranked, with ſharp-pointed glumes.

A rather large genus, of ſlender, narrow-leaved, rigid graſſes, of a glaucous or greyiſh-green hue, whoſe ſpecies are often very difficult to define. Some diverſity of opinion has exiſted among botaniſts reſpecting the generic diſtinction between *Feſtuca* and *Bromus*. (See Bromus.) The terminal awn of the former is generally conſtant, to which Dr. Smith has added the ſmoothneſs, or at leaſt only fine pubeſcence, of the edge of the inner valve of the corolla; conſidering the moſt important mark of *Bromus* to conſiſt in the ſtrong briſtly fringe of the ſame part. With this laſt character will always be found the proper habit, colour and proportion of the latter genus, whether the awn be accurately terminal or no.

Willdenow has 26 ſpecies of *Feſtuca*, but many more are now known. Of theſe 26, 15 have the panicle pointing to one ſide; the reſt have an equally ſpreading panicle.

The *Flora Britannica* deſcribes 12 ſpecies, to which two have ſince been added in *Engl. Bot. viz. F. cæſia*, t. 1917, a glaucous kind found on barren open heaths in Surrey and Suffolk; and *F. triflora*, t. 1918, found by Mr. Crowe at Saham, Norfolk, and ſince by the Rev. Mr. Holme, F.L.S. at Hinton, Cambridgeſhire, and by Mr. G. Don in Scotland. This is *Bromus triflorus* of Linnæus, very near *F. gigantea*, t. 1820, and like that, approaching too much to the habit of a *Bromus*, but both of them have the two moſt eſſential characters of *Feſtuca*.

F. *ovina*, Engl. Bot. t. 585, common in dry open ground, has been much celebrated by Stillingfleet as good for ſheep; but ſome late obſervations have diſcredited this opinion, it being doubtful whether thoſe animals eat it, though it grows where they feed. From this *F. vivipara*, t. 1355, was firſt ſeparated, as a ſpecies, in Fl. Brit. it having before been thought a variety, cauſed by its moiſt alpine place of growth. But its glumes are very differently ſhaped from thoſe of *ovina*. There is more doubt whether *amethyſtina* be really diſtinct from *ovina*, and alſo whether *rubra*, t. 2056, and all its acknowledged varieties, be ſpecifically different from *duriuſcula*, t. 470, and *dumetorum* of Linnæus and Willdenow. On all theſe ſubjects experiments and repeated obſervations are wanting. Soil and ſituation cauſe great differences in the extent of the creeping roots, and the downineſs, as well as ſize, of various parts. Some of our Britiſh ſpecies are trifling worthleſs annuals, as *bromoides*, Engl. Bot. t. 1411, *myurus*, t. 1412, and *uniglumis*, t. 1430, the latter remarkable for having ſcarcely more than one valve to the calyx, the other being, as it were, abortive. Others are valuable perennial meadow graſſes, as *pratenſis*, t. 1592, and *elatior*, t. 1593.

Of the foreign ſpecies, *F. pumila* of Villars and Willdenow, much better named *varia* by Jacquin, has an elegantly party-coloured panicle, and is frequent in Switzerland, and other alpine countries in the ſouthern parts of Europe. *F. ſpadicea* is famous in botanic ſtory as being the long-dubious *Anthoxanthum paniculatum* of Linnæus, or *Nardus ſpuria narbonenſis* of Bauhin, and the *Poa Gerardi* of Allioni. See Tranſ. of Linn. Soc. v. 1. 111. t. 10, and v. 2. 101. This is a tall handſome perennial graſs, with a denſe bronze-coloured panicle, and purple anthers. *F. fuſca*, a native of the Levant, has long creeping roots, with very woolly fibres, formed, like *rubra*, to bind looſe ſandy ſoils. Its browniſh panicle approaches in beauty to *Poa Eragroſtis*. *F. indica*, copied by Willdenow from Retzius, is the very ſame plant as *fuſca*.

F. ſpinoſa, Linn. Suppl. 111, a native of the Cape of Good Hope and the Canary iſlands, is a wonderfully rigid, ſpinous, widely-creeping ſpecies, no doubt formed to grow in the moſt arid ſand. This is referred by Willdenow to *Poa*, ſee his N° 41, perhaps not amiſs, but then *F. fuſca* will go near to be a *Poa* alſo, notwithſtanding its awns.

F. fluitans of Linnæus and Willdenow is removed by Scopoli and others to *Poa*. *F. decumbens* is alſo made a *Poa* in Fl. Brit. but it is more naturally perhaps, as Haller thought it, a *Melica*. Thus even the above liſt in Willdenow, imperfect as it is, becomes ſtill ſhorter.

We know of no genus of graſſes, that requires to be more ſtudied, either in a botanical or economical point of view, than *Feſtuca*.

FESTUM, in a *General Senſe*. See Feast.

Festum, in our *Law Books*, is frequently uſed for a general court or aſſembly, becauſe ſuch were anciently always kept on the great feſtivals of the year.

Thus, in our chronicles, we read, that in ſuch a year the king kept his *feſtum* at Wincheſter, &c. that is, he kept a court there at that time: "Rex apud Winton. maximum *feſtum* & convivium celebravit, tempore Natalis Domini, convocatis ibidem principibus & baronibus totius regni."

FESTUS, Pompeius, in *Biography*, a well-known grammarian, but of what particular age has never been aſcertained. He wrote an abridgment of Verrius Flaccus "De Verborum Significatione." Scaliger pronounced this as one of the moſt uſeful works connected with the Latin language. It has paſſed through many editions; the one by Dacier in uſum Delphini, 1681, is reckoned the beſt. Moreri.

To FETCH *Way*, in *Sea Language*, is to be ſhaken or agitated from one ſide to another. The terms are uſually applied to a maſt, bowſprit, &c. when it is not ſufficiently wedged, being looſe in the partners; or to any body which is moved by the rocking of the ſhip, for want of being well ſecured.

FETCHING *the Pump*, is the act of pouring water into the upper part of it, to expel the air which is contained between the lower box or piſton and the lower end of the pump that reſts on the ſhip's floor; and accordingly to make the water poured into the chamber communicate with that in the bottom of the pump-well, ſo as to be thrown out above by ſtriking with the break or handle.

FETE, *Fr.* a feaſt, an entertainment of ſinging and dancing, introduced in an act of an opera, which always interrupts or ſuſpends the action. (See Ballet.) Theſe obtruſive entertainments, ſays Rouſſeau, are only amuſing in proportion as the opera itſelf is tireſome. In an intereſting drama, well conducted, it would be impoſſible to bear them. We have ſometimes thought the ſame of the maſque, in Shakeſpeare's Tempeſt, though not in the feaſt of Romeo and Juliet, which is analogous and connected with the plot.

FETHARD, or Feathard, in *Geography*, a market and poſt town of the county of Tipperary, Ireland, which, before the union was repreſented in parliament. It is at preſent rather in a ſtate of decay. Fethard is 76 miles from Dublin, and nearly ſeven north from Clonmell.

FETI, or Fetti Domenico, in *Biography*, an hiſtorical painter, born at Rome in 1589. He was a diſciple of Ludovico Cigoli. From Rome he went to Mantua, with the cardinal Gonzaga, on whoſe acceſſion to the dukedom of of Mantua he was declared painter to that court. In the works of this painter, who hardly merited ſo high an exaltation, there is a peculiarity of feeling and expreſſion, but marked with colouring of a brown or blackened hue. He appears to have made his ſtudies among the Lazaroni, as his characters are in general of a low caſt, and even his beſt have their draperies thrown in a common and vulgar manner. Notwithſtanding this, his ſmall pictures, being executed with great freedom and firmneſs of touch, are much admired, which is not a little aſſiſted by their general harmony in the tone of colouring. His works are ſcarce, as he died when only thirty-five years old at Venice.

FETICHE, in *Modern Hiſtory*, a name given in Guinea to their divinities; one of whom is ſuppoſed to preſide over every ſeparate canton or diſtrict, one over every family, and one over each individual, which he worſhips on that day of the week when he happened to be born. On this day they are dreſſed in white, and, as an emblem of their purity, beſmear their bodies and cloaths with a kind of white loam or clay. Thoſe of the better faſhion, and eſpecially the chiefs of the people, have, beſides this birth-day, another weekly feſtival dedicated to their fetiches, on which they kill a cock or a ſheep; which ſacrifice is conſumed by the prieſts. The word fetiche, in a ſtrict ſenſe, ſignifies whatever repreſents their divinities; this may be a mountain, a tree, a large rock, a peculiar fowl or fiſh, with the head of an ape, or any ſuch thing, as their fancy ſuggeſts. They not only believe theſe material ſubſtances, or fetiches, endowed with intelligence, and the power of doing them good or evil, but alſo that the prieſt or fetichere, being of their council, is privy to all that thoſe divinities know, and thence acquainted with the moſt ſecret thoughts and actions of men. The houſhold, or family fetiche, narrowly inſpects the conduct of every individual in the houſe, and rewards or puniſhes according to the reſpective deſerts of each. Their rewards conſiſt in the multiplication of their wives and ſlaves; and their puniſhments in the want of all theſe; but the moſt terrible of all puniſhments is death. At Cape Coaſt there is a public guardian fetiche, the higheſt in power and dignity. This exalted fetiche is a rock, that projects into the ſea from the bottom of the cliff on which the caſtle is built. To this rock yearly ſacrifices are offered by the prieſts with ridiculous geſtures and ſtrange invocations, aſſuring the ſpectators that he receives verbal anſwers from Tabra, what times and ſeaſons will be propitious; and for this intelligence every fiſherman preſents him with an acknowledgment ſuited to his ability.

FETICHES alſo denotes among the negroes pieces of ſophiſticated gold, in which is a mixture of one-half or one-third part of ſilver and copper. Theſe fetiches are cut by them into ſmall bits, to the value of three farthings each, which ſerve for the current coin of the country. The fetiches of artificial and baſe gold are ſtrangely ſhaped in moulds of a black ponderous earth. The negroes have alſo fetiches of unalloyed mountain gold, which they keep for ornaments, and ſeldom paſs into trade.

FETIE, in *Geography*, a town of the Arabian Irak, on the Euphrates; 50 miles N.W. of Baſſora.

FETISLAW, or KLADOWO, a town of Servia, on the Danube; eight miles E. of Orſova.

FETLAR, FITLAR, or *Theodore's Iſle*, one of the Shetland iſlands, lying two miles E. of Yell, and nine miles in circuit, conſiſts for the moſt part of a rich black loam and ſome ſand, which yields barley, oats, and paſture. It is ſeparated from Yell by Colgrave ſound, and has ſeveral creeks, but no ſecure harbour. Fetlar and North Yell contain 227 houſes, and 1389 inhabitants. N. lat. 60° 58'. W. long. 1° 6'.

FET-LOCK, in the *Manege*, a tuft of hair growing behind the paſtern-joint of horſes.

Hence, the joint where it grows is called the fetlock-joint.

FETOVA, in *Geography*, a town of European Turkey, in Bulgaria; 25 miles S. of Ruſzak.

FETSA, in *Modern Hiſtory*, is a name which the Turks give to the written judgments or deciſions of the mufti. The word in the Turkiſh language ſignifies *ſentence*, and in Arabic, *reply*, or *judgments of a wiſe man*.

FETTEE, in *Geography*, one of the branches of the Indus.

FETTERCAIRN, a town of Scotland, in the county of Kincardine; near it is an ancient ruin called Fenellas caſtle, in which Kenneth III. was murdered; 11 miles N.W. of Montroſe.

FETU, FETOU, or *Afuto*, a kingdom of Africa, bounded on the weſt by the river Benja, and kingdom of Commendo; on the north by the country of Ati; on the eaſt by Sabu; and by the ocean on the ſouth.

The crown is elective; and the capital, called alſo *Fetu*, ſtands in the inland country. Boſman aſſigns to this kingdom 160 miles in length, and nearly as much in breadth: he deſcribes it as commencing at mount St. Jago, or the river Seel, and terminating at mount Manſoo, or Montfort. It was formerly very powerful; but has been much reduced by civil diviſions, ſo that it is now ſubject to the abſolute controul of the king of Commendo. Before theſe conteſts it was filled with populous villages, and exhibited ſigns of wealth and plenty. Its principal riches conſiſted of grain, cattle, oil, and palm wine; and it was rendered beautiful and pleaſant by the groves that ſhaded all the roads, and ſheltered paſſengers from the rain and ſun. It is extremely well ſituated for European ſettlements, on account of the neighbouring trading kingdoms and the cheapneſs of living. The Dutch had a fort at *Elmina*, which ſee.

FETUS. See FOETUS.

FETWAS, in *Geography*, a town of Hindooſtan, in Bahar; 20 miles S.W. of Patna.

FEU, CAPE, a cape on the E. coaſt of Majorca. N. lat. 39° 44'. E. long. 3° 28'.

FEU *de Joie*, in the *Military Art*, meaning a ſalute occaſioned by ſome joyful occurrence, is generally confined to three diſtinct vollies fired by troops drawn up at open order, in which the ſoldiers elevate the muzzles of their firelocks to an angle of about thirty degrees, or more, thereby to prevent the diſcharge from doing injury to thoſe in their front.

But in large armies this ceremony is conducted on a ſuitable ſcale: the park of artillery firing royal ſalutes between the ſeveral vollies, for which, in lieu of a word of command, ſignals are given by beat of drum, or eventually by the diſcharges of three cannon: the firſt indicating that the whole ſhould "make ready," the ſecond that they ſhould "preſent," and the third that they ſhould "fire." The re-loading is performed by attending to the fuſil-man of each corps reſpectively.

In ſome inſtances, the feu de joie is performed by ſubſtituting a "running fire" from one to the other flank, in lieu of firing by volley. This makes the ceremony laſt much longer, and proves more ſtriking, eſpecially when the field-pieces attached to the ſeveral battalions diſcharge as it comes to their turn. When the force is very conſiderable, each of the three rounds of "running fire" may occupy from a quarter of an hour up to a full hour. The muſic generally performs ſome loyal ſtrain during the intervals of ſuch protracted fires, and the ceremony is always concluded by a general ſalute, in which the arms are preſented, and the colours drooped.

In fortreſſes, the whole of the cannon mounted on the works fire one round, at the ſame intervals between the diſcharges as are uſual in ordinary ſalutes ; the colours are invariably diſplayed on ſuch occaſions.

In the navy, a feu de joie conſiſts in the diſcharge of all the guns in ſucceſſion, in the above manner; but if their number ſhould not amount to twenty-one, that number of diſcharges is completed by as many repetitions of the firing of each gun as may be neceſſary. On very joyful occaſions it is common to "dreſs the ſhip," by hanging out, upon various parts of the rigging, all the colours, of whatever nation or pattern, ſo as to make a very motley, but a rich and intereſting appearance. During the diſcharges of cannon, the crew man the rigging, and conclude the ceremony by giving three cheers.

FEU-ARDENT, Francis, in *Biography*, a French monk of the Franciſcan order, noted for the fury of his zeal againſt Proteſtants, and the boldneſs of his ſeditious harangues in ſupport of the meaſures of the *league* during the reigns of Henry III. and IV., was born at Coutances, in Lower Normandy, in the year 1541. His name completely correſponded with his nature and intemperate zeal; he was a bitter enemy of the Proteſtants, and unwearied in exciting againſt them the moſt cruel perſecutions. Notwithſtanding the madneſs of his temper he was unable to ſtem the torrent of liberality then ſetting in, and he lived to ſee his party ruined, and the Proteſtants enjoying their religious and civil rights and immunities, which were ſecured to them by the famous edict of Nantes. He died at Bayeux in 1610, and it is ſaid ſo completely changed, that he was as anxious for Chriſtian union and brotherly love as he had formerly been deſirous of lighting up the flames of perſecution. He was author of Commentaries on ſeveral books of the Old and New Teſtament. He edited ſome of the works of the fathers, particularly the five books of Irenæus againſt hereſies. Bayle. Moreri.

FEUCHTWANG, in *Geography*, a town of Germany, in the principality of Anſpach, ſituated on the Sulz, formerly imperial; 12 miles S.W. of Anſpach. N. lat. 49° 13′. E. long. 10° 22′.

FEUD, Feodum, the ſame with fief or fee. See Fee.

Eſtates in land were originally at will, and then they were called *munera ;* afterwards they were for life, and then they were called *beneficia ;* and for that reaſon the livings of clergymen are ſo called at this day ; and afterwards they were made hereditary, when they were called *feoda*, and in our law *fee-ſimple*.

When Hugh Capet uſurped the kingdom of France, about the year 947, to ſupport himſelf in ſuch uſurpation, he granted to the nobility and gentry, that whereas till then they generally enjoyed their honours for life, or at will only, they ſhould from thenceforth hold them to them and their heirs. However, under the reign of Ludovicus Pius, who ſucceeded his father A. D. 814, grants of hereditary fiefs were frequent in France. Muratori obſerves, that the word *feudum*, which came to be ſubſtituted in the place of *beneficium*, does not occur in any authentic charter previous to the eleventh century ; and Dr. Robertſon adds, (Hiſt. Ch. V. vol. i. p. 269.) that a charter of king Robert of France, A.D. 1008, is the earlieſt deed in which he has met with the word *feudum*. This was imitated by William, called the Conqueror, upon his acceſſion to the crown of England ; for till his reign, feuds or fees were not hereditary, but only for life, or for ſome determinate time. See Fee.

Feuds were called by various names, according to their reſpective natures ; as *feudum antiquum*, which deſcended to a ſon, &c. from his anceſtors ; *apertum*, reſulting back again to the lord of the fee, where the blood of the laſt perſon laſt ſeiſed in fee-ſimple is utterly extinct and gone ; *honorarium* and *individuum*, a title of nobility, not of a diviſible nature, and deſcendible to the eldeſt ſon in excluſion of all the reſt ; *improprium*, an improper or derivative feud ; *maternum*, deſcending to the ſon from the mother ; *novum*, one newly acquired by the ſon, to which, in ancient times, only the deſcendants from his body could ſucceed, by the known maxim of the early feudal conſtitutions ; *novum* held *ut antiquum*, deſcendible in the ſame manner as a *feudum novum : paternum*, deſcendible from father to ſon ; and *proprium*, a proper feud, diſtinguiſhed from one improper, which are the two grand and general diviſions. Blackſt. Com. vol. ii.

Feud is alſo uſed in our ancient cuſtoms for a capital quarrel or enmity, not to be ſatisfied but with the death of the enemy ; and thence uſually called *deadly feud*.

Feud, called alſo *feida*, and *faida*, in the original German ſignifies *guerram* ; i. e. *bellum*, *war*. Lambert writes it *feeth*, and ſaith it ſignifies *capitales inimicitias*, or *implacable hatred*.

In Scotland and the north of England, feud is particularly uſed for a combination of kindred to revenge the death of any of their blood, againſt the killer and all his race, or any other great enemy.

FEUDAL, or Feodal, of or belonging to a feud or fee. We ſay a feudal matter, feudal juriſprudence, feudal ſeiſure, feudal ſyſtem, &c. A feudal lord, in default of fealty and homage from his vaſſal, may ſeize the fruits of the fee. A Neapolitan lawyer, called Caravita, has a Latin treatiſe of the feudal law, intitled "Prælectiones Feodales."

About the year 1170, a compilation of the feudal laws, as practiſed in Lombardy, was publiſhed at Milan, in two books, by two ſenators and conſuls of that city, Gerardus Niger, and Obertus de Odo. In imitation of the "Pandects," they contain the opinions of lawyers, on queſtions concerning the feudal cuſtoms, with ſome imperial conſtitutions, relating to feuds. They were long afterwards divided into five books by Cujacius, their beſt commentator, before whoſe time they had obtained ſo great an authority in many countries of Europe, that they were received in courts of juſtice as parts of the civil law. The learned Craig aſcribes this authority to imperial conſtitutions contained in them, or by which they were confirmed ; but Du Moulin, Giannone, and others ſay, that, like the books of Juſtinian, they acquired by degrees the force of laws, from uſage, from the approbation of the people, and from the tacit conſent of princes, who permitted them to be publicly taught in univerſities, enriched with commentaries, and cited in tribunals for the deciſion of cauſes. It does not appear that any ſuch regard was paid to them in England ; though in many points our laws were ſimilar, as being derived from the ſame principles, and directed to the ſame ends. Yet it is not improbable that even in the latter times of king Henry II., and, ſtill more in the next century, ſome parts of the Engliſh laws, concerning feudal eſtates, may have been regulated according to their deciſion, by the ſtatutes then made, and, in the determination of doubtful caſes, by the opinions of the judges.

When once the uſe of fees was thoroughly eſtabliſhed in France, they would needs extend it much farther ; and almoſt all the great officers of the crown thus became feudal ; even the courts of juſtice were drawn in ; in order to which, they were annexed to certain lands or revenues.

The deſign of theſe infeodations was to render the offices hereditary, after the manner of fees, which were now become ſo; and thus the offices of the grand chamberlain, grand butler, &c. came to be held by hereditary right.

As the northern nations brought in the uſe of coats of arms, by preſerving down in their families the armorial bearings of their anceſtors, ſhields, &c. as hereditary marks of honour, ſo they alſo, according to ſome, brought in the feudal law, by means of which, arms grew up to farther perfection, as is evident by many armorial figures of ancient families, repreſenting the acknowledgments and ſervices they were obliged to perform to their own lords and ſuperiors.

Thus, roſes, cinquefoils, ſpur-rowels, bow and arrows, hunting-horns, ſhips, and the like figures, were expreſſive of the ſervices they were bound to do their lord; and hence theſe figures have become common in arms throughout all Europe. For inſtance, the old barons of Arran and Lorn were obliged to furniſh their lord with a ſhip in time of war; and thence it is that their arms carry ſhips or lymphods to this time.

FEUDAL *Syſtem.* See FEE.

FEUDATORY, or FEODATARY, a vaſſal or perſon who holds of a ſuperior in fee; *i. e.* on condition of yielding him fealty and homage, or other ſervice. See FEALTY, FEE, HOMAGE, and VASSAL.

The electors, princes, and free cities, of Germany, were all feudatories of the emperor.

FEUDBOTE, a recompence for engaging in a feud or action, and for the damages conſequent thereon; it having been the cuſtom of ancient times for all the kindred to engage in their kinſmen's quarrels; according to that of Tacitus De Morib. Germanor. "Suſcipere tam inimicitias ſeu patris, ſeu propinqui, quam amicitias, neceſſe eſt."

FEUDIST, a lawyer, or doctor, learned or much converſant in feuds or fees. Du-Moulin is reckoned a great feudiſt.

FEUDO, in *Geography.* See *St.* GOTHARD.

FEVE. See AURELIA.

FEVENIST, in *Geography,* a river of Carinthia, which runs into the Drave, 6 miles N.W. of Villach.

FEVER, in *Medicine,* a term employed to deſignate various conditions of the body, in which more eſpecially the heat is augmented, the pulſe increaſed in velocity, and the other functions more or leſs deranged.

The word, *fever,* has always been uſed with great latitude, as well by medical writers, as by mankind in general; and ſcarcely two phyſicians have agreed in the definition of it which they have given. The increaſe of the animal heat, however, which is commonly both ſenſible to the touch of others, and diſtreſſing to the ſick, has been the ſubject of univerſal obſervation; whence the denomination of the diſeaſe, in almoſt all languages, bears a reference to this ſymptom. By the Greeks the word *pyretos,* πυρετος, from πυρ, *fire,* was the appellation applied to fever; and the name uſed by the Romans, *febris,* was deduced from *ferbeo,* or *ferveo,* (ſignifying to be *hot,*) by a tranſpoſition of letters common in moſt languages. From the latter our word is derived, probably through the medium of the French. That the idea of *heat* is predominant in the uſe of the term fever is obvious from the popular expreſſions which repreſent a perſon much heated, in any way, as "in a fever," and which deſignate the cold and hot ſtages, or the rigors and heats of intermittents, by the words "ague and fever." Phyſicians, however, include, in the term fever, the whole of the phenomena which belong to the diſeaſe, the cold as well as the hot and ſweating ſtages; that is, the beginning as well as the middle and end of the diſeaſe.

Fever, in the moſt extenſive ſignification of the term, is the moſt general of all the morbid ſtates to which the human conſtitution is liable; for, it is common to both ſexes, to every period of life, and to all climates and countries. Sydenham affirms, that the various forms of fever conſtitute two-thirds of the diſeaſes of mankind; and he has calculated, that as large a proportion as eight of nine of all who die are cut off by febrile diſeaſes; a proportion which is probably not over-rated, if we include in the calculation not only all the forms of intermittent, remittent, and continued fevers, and the fevers accompanied by eruptions on the ſkin, ſuch as ſmall-pox, meaſles, ſcarlet fever, &c. but alſo the various local diſeaſes and injuries of the body, which are accompanied by fever, ſuch as inflammations of all the organs, whether induced by internal cauſes or external violence.

In reviewing the numerous forms of fever, however, it is evident that, for the practical purpoſes of the phyſician, this general application of the term is too vague and indefinite; ſince the circumſtances under which fever occurs are materially different in various reſpects. The moſt obvious diſtinction, which has induced an univerſal diviſion of fevers into two great claſſes, conſiſts in a difference of origin; ſome ariſing from general cauſes operating on the body at large; while others depend on inflammation, or other local affection of a particular organ. The former have been denominated *primary,* or *idiopathic* fevers; the latter *ſecondary,* or *ſymptomatic* fevers. In the more accurate medical vocabulary of the preſent day the term fever is applied ſolely to the idiopathic fevers: in the other claſs of febrile diſeaſes the ſtate of fever is but a ſymptom, a ſecondary conſequence of inflammation, or ſome other morbid change of a particular part of the body, which conſtitutes the primary diſeaſe; when this is removed, the fever ceaſes; but in proper fever, the ſymptoms are probably independent of any pre-occurring organic diſorder, and are not regulated in their courſe or termination by the progreſs or removal of any other diſeaſe. Idiopathic fever alone is, therefore, the ſubject of our attention at preſent; the various ſpecies of ſymptomatic fever will be found under their reſpective terms of appellation, according to the organ which is the ſeat of the primary diſeaſe. Thus, for the *pleuritic* and *peripneumonic* fevers, depending on inflammation of the lungs, ſee PLEURISY and PERIPNEUMONY; for that ariſing from inflammation of the bowels, ſee ENTERITIS; and ſo forth.

Under the head of idiopathic fevers, thoſe febrile diſeaſes, which originate from a ſpecific contagion, ſuch as ſmall-pox, meaſles, ſcarlet fever, &c. might with propriety be comprehended; inaſmuch as the eruption on the ſkin, which characterizes them, is not the cauſe of the fever, but appears ſubſequent to the occurrence of the fever itſelf. Nevertheleſs, as theſe eruptive fevers differ moſt materially in their courſe, their phenomena, and their periods, and originate from a diſtinct ſpecies of contagion, it is uſeful to ſeparate them from the ſimple idiopathic fevers.

This plan has been adopted univerſally by the noſologiſts. Dr. Cullen has conſtituted three orders of his firſt claſs of diſeaſes, entitled *pyrexiæ,* or febrile diſeaſes, from the diviſion which we have juſt deſcribed; the firſt order, comprehending the ſimple idiopathic fevers, is entitled "febres," or fevers; the ſecond, including the ſymptomatic fevers, is entitled the order of "phlegmaſiæ," or inflammations; and the third, compriſing the eruptive fevers, is denominated the order of "exanthemata," or eﬄoreſcences. It may be added, that this ſcientific phyſician has likewiſe conſtituted two other orders of febrile diſeaſes; the fourth conſiſting of "hæmorrhagies," from the lungs, uterus, &c.; and the fifth, entitled "profluvia," or fluxes, containing two diſeaſes, catarrh and dyſentery, which depend on a peculiar inflammation of the mucous membranes of the bronchial tubes, and of the alimentary canal. See Cullen. Noſol. Method.

Fever, properly ſo called, or idiopathic fever, is the ſubject of the preſent article. It occurs under the form of ephemera, intermittent fevers, or agues; remittent, and continued fevers: the laſt of which appear under a variety of types, in the inſtances of the plague, gaol-fever, or typhus, low, nervous fever, &c. See the concluſion of this article.

Notwithſtanding the great prevalence of fever in all ages and climates, and the univerſal attention which it has excited among medical obſervers, from the time of Hippocrates downwards, the diſeaſe ſtill remains the ſubject of much diſcuſſion; and its eſſential nature, or the proximate cauſe of its ſymptoms, is ſtill a problem in medical ſcience. This obſcurity will appear the leſs ſurpriſing, however, when we conſider the almoſt endleſs varieties under which fever occurs: for not only are its modifications ſo various, that of thoſe fevers, which are nominally the ſame, ſcarcely any two inſtances accurately reſemble each other; but of all the ſymptoms which conſtitute thoſe varieties, not one can be found which is invariably preſent in every caſe,—not one, therefore, which can be conſidered as characteriſtic of the diſeaſe. In the technical phraſeology, we are not acquainted with any *pathognomonic* ſymptom of fever. Hence, although the concourſe of ſymptoms, which mark the preſence of fever, is well known, and eaſily recognized by a moderate degree of obſervation and experience, and conſequently capable of being accurately deſcribed, yet it is not eaſy to frame a definition of fever, which ſhould comprehend every variety that may occur.

Boerhaave, the able and learned profeſſor of phyſic at Leyden, at an early period of the eighteenth century, inveſtigated the ſubject of fever more rationally than his predeceſſors: he found that *three* ſymptoms were generally obſervable in all fevers; and therefore he deemed theſe the characteriſtic ſymptoms of fever, in which he has been followed by the noſologiſts who have ſucceeded him. "In every fever, ariſing from internal cauſes," he ſays, (Aphoriſm 563,) "there is always a *ſhivering*, a *quick pulſe*, and *heat*, varying in degree at different times of the fever." But of theſe three ſymptoms, he conſiders the ſecond, or quick pulſe, as the eſſential or pathognomonic ſymptom, and not the heat, as was the opinion of the ancients. He obſerves again, in the 570th aphoriſm, "Theſe ſymptoms, indeed, are preſent in every fever, but the *quick pulſe* alone is preſent throughout its whole courſe, from the beginning to the end, and by that only the phyſician judges of the exiſtence of fever." It cannot be queſtioned, that theſe three ſymptoms are found in the great majority of inſtances of fever, and that the quickened pulſe is the moſt univerſally obſerved, and continues during the longeſt period of the diſeaſe. But, on the one hand, theſe ſymptoms are common to the ſymptomatic fevers, as well as to the idiopathic; and, on the other, they have each been obſerved to be abſent in different inſtances, even the quickneſs of pulſe. By theſe three ſymptoms Dr. Cullen has characterized the whole claſs of febrile diſeaſes, the idiopathic, the eruptive, and the ſymptomatic fevers; in addition to which he has introduced the leſion of ſome of the functions, eſpecially of the muſcular ſtrength, which generally accompanies them. His definition of the claſs *Pyrexiæ* is as follows. "Poſt horrorem, pulſus frequens, calor major, plures functiones læſæ, viribus præſertim artuum imminutis." Theſe ſymptoms, occurring generally in the order here mentioned, are deduced from a correct generalization of the common occurrences in febrile diſeaſes; but if it can be ſhewn that each of them has been occaſionally abſent, it will be a ſufficient proof that none of them can be deemed eſſential to the exiſtence of fever. On the contrary, it will be equally eaſy to prove that all theſe ſymptoms have been occaſionally preſent, without the occurrence of fever.

The chillineſs, ſhivering, *horror*, *rigor*, or *horripilatio*, which is commonly one of the firſt ſymptoms of idiopathic fever, and often of ſymptomatic fevers, as has been obſerved by the beſt writers on the ſubject, is occaſionally abſent; the fever begins at once in the hot ſtage, or with ſome other ſymptom, as nauſea, or head-ache, to which the hot ſtage ſucceeds; and no *cold* ſtage, whether marked by the feelings of the patient, or of a by-ſtander, or by the application of a thermometer, occurs. For this fact we have the authority of Celſus: and among modern phyſicians Gorter, Burſerius, Fordyce, and others, have diſtinctly atteſted its truth. On the other hand, cold, eſtimated by the means juſt mentioned, often takes place, where no fever can be admitted to be preſent, as in hyſterical complaints. See Celſus, De Medicina, lib. iii. cap. 3. where he ſays, "aliæ protinus a *calore* incipiunt, &c." Gorter. Compend. Med. Tract. 52. § 3. Burſerius, Inſtit. Med. Pract. vol. i. p. 83. Fordyce, Diſſert. on Simple Fever, p. 11.

With reſpect to the *quick pulſe*, which is deemed by Boerhaave, and his commentator, Van Swieten, as the eſſence of fever, and the only criterion by which the phyſician judges of its exiſtence, the evidence of its abſence, which the records of medicine afford, is very abundant. It might ſeem extraordinary indeed if quickneſs of pulſe were the eſſential ſymptom of fever, that the ancient fathers of phyſic ſhould have become ſo well acquainted with the diſeaſe, without paying much attention to the ſtate of the pulſe. Yet it is certain that Hippocrates has ſeldom mentioned the pulſe, and lays little ſtreſs upon it; and we are informed by Galen, that he (Hippocrates) was the firſt writer who mentioned the pulſe. The pulſe, however, was noticed afterwards by Herophilus and Eraſiſtratus, and particularly mentioned by Aretæus. In the time of Celſus it was an object of conſiderable attention with phyſicians; but he expreſsly remarks, that in truſting to the pulſe, as a teſt of fever, we depend on a moſt fallacious criterion (fallaciſſima res); for not only external heat, the bath and exerciſe, but alſo fear, anger, and the other paſſions and emotions of the mind, even the anxiety of the patient on the approach of the phyſician, will excite and depreſs, and otherwiſe modify the pulſations. "Quas venas autem," he concludes, "conſpectus medici movet, quam facile mille res turbant!" De Med. lib. iii. cap. 6.

But not only is the pulſe quickened by heat, exerciſe, and mental emotions, as ſtated by Celſus, and by other cauſes, when no fever can be ſaid to exiſt; but farther, continued fever has been obſerved to go on even to a fatal termination, without any increaſed frequency of the pulſe. The frequency of the pulſations in health varies according to the age, ſex, climate, ſeaſon, and to the particular conſtitution of individuals. It is only about a century ſince the pulſations were counted, and within that period authors have not agreed as to the number which conſtitutes a febrile pulſe. It is admitted that in the adult age of men, the number of pulſations of the heart and arteries is commonly about 73 in a minute. (See PULSE.) But in particular conſtitutions the pulſe of health is found regularly at a much higher or lower rate: ſometimes beating 80 times or upwards, ſometimes 50, 60, or leſs in a minute. Dr. Fordyce counted the pulſe of an old man in the Charter houſe, whoſe natural number did not exceed 26 contractions in a minute. It is obvious then that the diſputes about the number of pulſations which conſtitute the febrile ſtate are frivolous: for the man whoſe natural pulſe was 40 would be in a high fever in other reſpects when his pulſe reached 60; while the perſon, whoſe pulſe in health was at 80, might labour under ſlight febrile indiſpoſition when his pulſe beat nearly 100 times in a minute. But let us advert to other facts. Sydenham long ago ſtated, that in the firſt days of a fever, which he calls *febris hiemalis*, the pulſe continued like that of a perſon in health, "ſanorum pulſui non admodum abſimilis." (Tractat. De Hyrope, poſtcripto.) Werlhoff has noticed the ſame fact in ſmall-pox, and Greding in a contagious epidemic fever. (Ludwig. Advers. Med. vol. i. p. 1. cap. 1. p. 22.) The pulſe has been obſerved to be ſlower than natural, in ſeveral inſtances of malignant fever, by many clinical obſervers, both ancient and modern. Several of theſe are particularly referred to by Burſerius (Loc. citat. p. 84. et ſeq.) It may be ſufficient to mention Ruſſell (Nat. Hiſt. of Aleppo, p. 230.), Sauvages (Noſol. Method, tom. ii. p. 307.), and De Haen (Rat. Medendi, p. 12. cap. 2. p. 50 et 117.) Nay, it ſometimes happens, as in a caſe recorded by the laſt mentioned writer, that the pulſe, which was ſlow during the continuance of the fever, becomes more frequent during the ſtate of convaleſcence and health. The pulſe, indeed, has been often obſerved to undergo conſiderable changes in the courſe of fever, when the reſt of the ſymptoms continued unaltered. Dr. Fordyce remarks, that he "has ſeen, in many inſtances, a fever take place, and go on as a continued fever, ſo that in the middle of the ſecond week the pulſe has been frequent, from 100 to 110, or even more; the tongue covered with a brown fur, and dry; the ſkin dry; there has been great depreſſion of ſtrength, coſtiveneſs, violent pain of the forehead, delirium, ſtrong evening exacerbations with ſtupidity of the eyes: in ſuch caſes the author has known the pulſations become as few as 60, 50, or even 45 in a minute, all the other appearances of the diſeaſe remaining the ſame, or the fever even increaſing in all reſpects. This ſmall number of pulſations, after continuing for two or three days, has given place to a number of pulſations as great as before, ſo that if a man had attended to the other circumſtances of the diſeaſe, and not felt the pulſe, he would have had no reaſon to ſuſpect that the pulſe had been fewer during that time. This the author has frequently ſhewn to the pupils attending St. Thomas's hoſpital, as it was ſhewn to him by Dr. Cullen, ſir John Pringle, &c. &c." (Loc. cit. page 18.) It may be added, that Dr. Home remarks that patients have died of typhus under his obſervation in whom the pulſe was not quickened. (See his Clinical Experiments.) On the whole, then, it cannot be doubted, that Boerhaave maintained an erroneous doctrine, in ſtating the quick pulſe to be pathognomonic of fever. See alſo the works of Pringle and Lind.

The increaſed *heat* is ſtill leſs entitled to be deemed an eſſential ſymptom of fever, notwithſtanding the labours of the Galeniſts to prove it the proximate of the whole diſeaſe. It is curious to obſerve the ſophiſms by which they attempted to reconcile the doctrine of their maſter, with ſtubborn facts, that are incompatible with it. Thus Sennertus affirms, that "it is not the heat generated in the heart, and thence communicated to the reſt of the body," (which is Galen's hypotheſis) "that produces or conſtitutes fever, but the morbid diſpoſition which the heat occaſions, and which is inconſiſtent with the proper performance of the functions. Hence the heat occaſioned by paſſion, violent exerciſe, or the bath, is not to be deemed fever, unleſs it reaches that degree of inflammation which diſturbs the functions." (De Febribus, lib. i. cap. 1.) But the excitement of heat, by the ſame cauſes which raiſes the pulſe, according to the obſervation of Celſus, its occurrence in hyſterical and other diſeaſes, not febrile, and its frequent abſence during the whole courſe of fever, for which we may ſtate the authority of Fordyce, and other obſervers, prove that heat is not the eſſential ſymptom of fever. "Altera res, cui credimus, *calor*, æque fallax." (Celſus, loc. citat.)

The other ſymptoms, alluded to by Dr. Cullen, in his definition of febrile diſeaſes, namely, "the diſturbance of ſeveral of the functions, eſpecially the depreſſion of the muſcular ſtrength," although they commonly occur both in idiopathic and ſymptomatic fevers, are common to a great variety of diſeaſes, and were not ſtated as pathognomonic ſymptoms.

As there is no ſymptom, then, which, being invariably preſent, characterizes the diſeaſe, called fever, we can only obtain a knowledge of the exiſtence and nature of the diſeaſe, from an attention to the concourſe and ſucceſſion of the ſymptoms. This attention is extremely important in a practical view, not only from the great variety of fevers which require an appropriate variety of treatment, but alſo from the neceſſity of modifying the treatment in different ſtages of the ſame caſe of fever. We ſhall, therefore, detail the ſymptoms of fever in the order in which they uſually occur, including the whole of thoſe which have been ſeen in various caſes, and leaving the modifications of the diſeaſe to be more particularly noticed under their reſpective appellations. The paroxyſm of an intermittent fever is generally pointed out as the moſt perfect example of the febrile ſtate, both in reſpect to the diſtinctneſs and the regularity of the ſymptoms, which characterize it. This has already been deſcribed under the article Ague. When the paroxyſm is leſs ſevere, and does not recur, it is denominated an *Ephemera*, (which ſee.) There is perhaps more of fancy, however, than of ſound obſervation, in the affinity which has been deſcribed between the intermittent and continued fevers; and eſpecially in the aſſumption of the intermittent paroxyſm, as the prototype of all febrile diſeaſes; and in conſidering continued fevers, as conſiſting but of a ſeries of theſe paroxyſms, the ſucceeding one commencing before the termination of its predeceſſor, ſo that no period of intermiſſion intervenes. Such, however, has been the practice of our beſt authors; Dr. Cullen, the ſyſtematic, has been followed by Dr. Fordyce, the practical, phyſician, in this account of the diſeaſe.

Symptoms of Fever.—The commencement of fever is generally marked by ſome degree of languor, laſſitude, and general uneaſineſs; the patient feels himſelf ill, without being able to refer his uneaſy feelings to any particular part of the body. There is alſo a liſtleſſneſs, or a deſire frequently to change the poſture, but at the ſame time the ſenſe of wearineſs diſpoſes the patient to reſiſt this inclination; the motions when made are ſluggiſh, and frequent yawning and ſtretching accompany the attempt. The mind is affected in a ſimilar way; it cannot reſt upon any object; the attention is not under the command of the will, but wanders from one ſubject to another; and as the ability of exerting the muſcular powers, or of performing any of the body becomes actually diminiſhed; there is likewiſe an actual inability of exerciſing the faculties of the mind; the patient cannot think or reaſon, even upon his ordinary affairs, with his uſual eaſe. Along with theſe ſymptoms, but more frequently after them, he feels a ſenſation of cold, commonly firſt in his back, but afterwards over the whole body; the ſame kind of ſenſation that he feels when ſurrounded by a colder medium than he is accuſtomed to: he wiſhes, therefore, to go near a fire, or into the rays of the ſun, or to put on warmer clothing. At the ſame time the face and extremities are obſerved to be pale, the features ſhrink, the bulk of every external part is diminiſhed, and the ſkin over the whole body appears conſtricted, as if cold had been applied to it. This ſenſation of cold varies much more in different inſtances of incipient fever, than the languor and laſſitude before-mentioned; in ſome caſes it is very ſlight, in others not at all felt or noticed; whilſt in many inſtances, particularly in the intermittent fevers, it becomes ſo great as to produce a tremor or ſhaking in all the limbs, with a chattering of the teeth, and frequent rigors of the trunk of the body. In this ſtate, the actual heat of the ſurface, whether meaſured by the ſenſations of a by-ſtander, or a thermometer, is conſiderably diminiſhed; in the extremities in particular it is many degrees below the ſtandard of health. (See Burſerius, loc. cit.—Currie, Medical Reports on the effects of Water, cold and warm, in Fevers, &c. p. 168, 2d edit.) Not only on the ſurface, as is generally imagined, but even over the whole ſyſtem, the heat is probably diminiſhed; the air expired from the lungs, feels cool to the back of the hand, held near the mouth. Dr. Currie ſtates, that he has found the heat under the tongue, and at the axilla, as low as 94, 93, and 92 degrees of Fahrenheit's thermometer. (The healthy temperature of the human body, it may be obſerved, is about 98° of the ſame thermometer.) Dr. Fordyce affirms, that 94° was the loweſt degree of heat that he had witneſſed under the ſame circumſtances. (Firſt Diſſertation on Fever, page 40.) The ſenſations of the patient, however, do not always correſpond with the actual degree of cold, as meaſured by the thermometer, or by the ſenſations of others; for it has been remarked, eſpecially towards the termination of the cold ſtage of the fever, that the patient feels himſelf cold, even on thoſe parts of the body which are ſhewn, by the application of a thermometer, to be of the natural heat, or even hotter than they uſually are in health. With this ſtate of coldneſs, the ſenſibility of the body is conſiderably diminiſhed; all the ſenſations, but eſpecially thoſe of touch and taſte, are leſs accurate and diſtinct than in the healthy ſtate. Dr. Fordyce remarks, that, "in the attack of fever, ſuch a degree of inſenſibility, with a feel of coldneſs, has in many caſes taken place, that even hot ſubſtances have been applied in ſuch manner as to coagulate, nay. perform the chemical analyſis of the part, without any ſenſation of heat having ariſen in the mind of the patient." (Loc. cit. p. 49.) The diminution of the faculty of ſenſation is very various in different inſtances of the attack of fever.

Upon the firſt approach of febrile languor the pulſe is not always altered in reſpect to frequency, but it always becomes weaker than before; ſometimes it is alſo ſlower than in health for a ſhort time. But as the ſenſe of cold increaſes, it becomes ſmaller, and gradually more and more frequent, and often irregular. While the contractions of the heart and arteries are thus feeble, all the ſecretions of the ſyſtem are likewiſe diminiſhed. The tongue and mouth become dry and clammy, in conſequence of the diminiſhed ſupply of ſaliva and of the mucus of thoſe parts; the ſkin alſo becomes dry, as well as pale and cold, there being little or no matter of perſpiration poured out. The changes in the urine are ſtill more remarkable; the impaired action of the ſecretory veſſels of the kidnies is evinced by the diminiſhed quantity of the urine, at this period of fever, as well as by the paleneſs of its colour, in conſequence of its holding leſs of the mucilaginous and ſaline parts in ſolution than in health, and by the abſence of any cloudineſs or depoſition when it cools. There is generally alſo a ſmaller quantity of feculent matter evacuated from the inteſtines at the commencement of fever, or in other words a degree of conſtipation, which implies a deficiency of the fluids ſecreted from the inner ſurface of the alimentary canal, as well as of the bile and pancreatic liquor, by which the fæces are rendered more liquid and moveable, and the bowels are ſtimulated to action. Analogous to theſe changes in the ſtate of the ſecretions are the ſudden and conſiderable detumeſcence of ſwellings, which may happen to ſubſiſt on the ſurface of the body, and the drying up, or ceſſation of the diſcharges from ulcers and wounds, during the cold ſtage of fever.

The reſpiration alſo ſuffers ſome change in the attack of fever, being often ſhort and frequent, and ſometimes attended with a cough, more particularly in intermittent fevers. There is at the ſame time a great anxiety, or a ſenſe of weight, fullneſs, and great uneaſineſs in the breaſt. This diſtreſſing feeling, which has been thought by ſome phyſicians a pathognomonic ſymptom of fever, and hence denominated *febrile anxiety*, is totally different from, and independent of, the general uneaſineſs all over the body, which was before mentioned, and often occurs in a very diſproportionate degree. It reſembles that anxiety which takes place from grief, fear, and other depreſſing paſſions of the mind, and which is alſo accompanied by paleneſs, and diminution of ſize of the veins, which are ſeen on the ſurface. The patient likewiſe reſpires irregularly, as one under the influence of the paſſions juſt noticed, and frequently ſighs deeply, as if to free himſelf from the load that oppreſſes the region of the heart.

At the beginning of the attack of fever, ſometimes as the very firſt ſymptom, but often later, a dull pain is felt in the ſmall of the back, which ſeems to occupy the lumbar vertebræ, but is not accurately referred to any particular point. It is very ſimilar to the pain which ariſes from weakneſs or fatigue; but, unlike that, according to Dr. Fordyce, it is equally felt in the horizontal, as in the erect poſture of the body. The head at the ſame time is affected with pain, which is commonly ſeated in the forehead over the eyes, and feels to the patient as external; ſometimes it likewiſe occupies the back part of the head; and occaſionally it is felt all round the head. It varies much in degree, but commonly increaſes as the attack proceeds; it is uſually attended with a ſenſe of weight, and is often augmented by light falling upon the eyes. A ſimilar pain generally ariſes all over the body, which the patient often deſcribes as ſeated in all his bones, without being able to particularize in what part of the body it is felt. Sometimes it is more particularly confined to the larger joints; and it is occaſionally attended with great ſoreneſs, as from over-fatigue. Such ſoreneſs, however, is more commonly confined to the ſubſequent periods of the diſeaſe.

From the commencement of the attack of fever the natural functions are always deranged. The changes in the appearance of the tongue are among the firſt indications of this derangement. At firſt the tongue appears to be thinly covered on its upper ſurface with an extremely viſcid fluid, eſpecially in the middle and towards the root, the edges and point being nearly free from it. The under ſurface of the tongue, below the point, is ſcarcely ever covered with this matter. Sometimes, at the very beginning of the diſorder, the covering of the tongue is a ſolid cruſt of a whitiſh colour, adhering ſo firmly as to be incapable of being ſcraped off; ſometimes it verges towards a brown colour. At the approach of the cold ſtage of fever the ſtomach is commonly affected; the appetite for food ceaſes, and averſion even to the ſight or ſmell of food often takes place. Dr. Fordyce remarks, that he "has known ſeveral inſtances where perſons, ſitting down to the table with a ſtrong appetite, an attack of fever having ſuddenly taken place, in leſs than two minutes they have been unable to eat any thing, and have been ſeized with perfect averſion even to the ſmell of food." (Loc. cit. p. 93.) Sickneſs at the ſtomach often comes on at the firſt attack, and this is increaſed occaſionally to ſuch a degree as to produce vomiting. More commonly, however, this does not take place at the very commencement; but the diſinclination to food increaſes gradually to nauſea, then to vomiting, which in ſome caſes is very ſevere, not only the contents of the ſtomach being evacuated, but likewiſe thoſe of the duodenum, and of the glands, the ſecretory ducts of which open into it. Bile, therefore, and the pancreatic juice, are thrown up, together with the contents of the ſtomach, and the other fluids ſecreted into the ſtomach and duodenum. Of theſe fluids, however, the bile is the moſt conſpicuous from its colour, taſte, and ſmell, and it has, therefore, often been obſerved by practitioners, while the gaſtric and pancreatic, and other juices ſecreted into the duodenum, as they are not very conſpicuous from their ſenſible qualities, have not been taken into the account. Combined with the averſion to food, and ſickneſs, there is generally a conſiderable degree of thirſt.

Few other ſymptoms, which are obſervable at the commencement of fever, remain to be mentioned. The ſtate of the countenance is very peculiar and characteriſtic, from the moment of the attack. It not only becomes pallid, or of a dirty hue, in common with the reſt of the ſurface of the body, but it aſſumes an expreſſion of dullneſs or heavineſs, partly in conſequence of the languid action or relaxed condition of the muſcles of the face, and partly from the ſame condition of the muſcles of the eye-ball, by which its form and motion are altered, and its uſual brightneſs and quickneſs are impaired. The diſpoſition to ſleep is diminiſhed or loſt; or, if it occurs, the repoſe is ſhort and interrupted, and very imperfect, ſo that there is much dreaming, during which the ideas that preſent themſelves are moſtly of an unpleaſant kind.

When the ſenſation of cold, and the attendant ſymptoms have continued for ſome time, (the period being very various in the different kinds of fever,) the cold becomes leſs violent, and is alternated with fluſhes of heat. In the more ſevere continued fevers, it frequently happens that the cold is not permanent for any length of time, but that this alternation of chills and heat takes place from the beginning. By degrees the cold goes off entirely, and a heat greater than natural is extended, at firſt unequally in different parts, but at length generally over the whole body; but even when it is ſo far advanced, that the heat, meaſured at the axilla or under the tongue, is greater than the ſtandard of health, a ſlight acceſſion of external cold will produce a general chillineſs. There is no regularity in the reſtoration of the heat to the ſurface; in ſome parts the heat is above what is natural, while in others it remains below this ſtandard; and hence ariſes that mixed ſenſation of cold and heat, which every one acquainted with fever has experienced, in the tranſition from the cold to the hot ſtage of the paroxyſm. This inequality of the diſtribution of the heat is leſs in the ſimpler forms of fever, and greater in thoſe which are more complicated and irregular. In general the ſenſe of cold predominates, even after a morbid heat has taken place at the axilla, under the tongue, and in different parts of the thorax and abdomen. At length, however, the heat of the ſurface becomes general and uniform, riſing to 102°, 103°, 104°, and ſometimes 105° of Fahrenheit's thermometer. Different authors indeed ſpeak of febrile heat four or even five degrees higher than this; but ſuch heat has never occurred under the obſervation of Dr. Fordyce or Dr. Currie, the beſt authority on this ſubject; the writer of this article has frequently employed the thermometer, in caſes of continued fever, and never obſerved a higher temperature of the body than 104°, in intermittent or continued fever, the patients being in cool apartments, with very light bed coverings. The ſenſation of heat becomes at length ſtrong and ſteady, and the acceſſion of external air does not produce a return of chillineſs as before; this ſenſation is moſt powerful in the extremities, particularly on the palms of the hands and ſoles of the feet.

The increaſe of the circulation takes place at the ſame time as the returning heat, and often in the ſame unequal manner, being evidently greater in ſome particular parts, than in others. Thus it frequently happens, that one part ſhall become red and enlarged, one arm, for inſtance, while the other is pale and contracted; the veins of the one being full, and the blood flowing in them more rapidly, while thoſe in the other remain contracted. This ſhall continue for ſome time, when the parts become affected in the oppoſite way; the arm which was florid and diſtended, becoming pale and contracted, and *vice verſâ*. This ſhifting, however, remains but a ſhort time in ſimple fever, perhaps not above half an hour; in the paroxyſms of intermittents it continues longer, and ſtill longer in the firſt attack of continued fever. Univerſal redneſs at length takes place; the features of the face and other parts of the body recover their uſual ſize, and become even more turgid; and the ſuperficial veins evince the greater circulation now going on through them by their fullneſs and increaſed ſize. The ſkin is relaxed and ſmooth, no longer exhibiting the gooſe-ſkin appearance, by its contraction round the little glands and roots of the hair, but it continues for ſome time dry. The pulſe now becomes fuller and ſtronger, and its frequency continues or is ſtill farther increaſed; in ſimple fevers, it beats occaſionally at the rate of 140 or 150 ſtrokes in a minute, with a conſiderale degree of fullneſs and hardneſs (Fordyce); but in the hot ſtage of intermittents, and in the heat of continued fevers it is moſt commonly from 90 to 110, at this early period of the diſeaſe; ſubject, however, to great variation according to the conſtitution of the patient, and the type of the fever. The reſpiration, though more free than during the chillineſs, continues ſtill frequent, and accompanied by a ſenſe of load and anxiety, which the patient endeavours to remove by occaſional laborious efforts, and deep ſighing. The ſecretions ſtill remain diminiſhed; the ſkin is parched, no perſpiration breaks forth; the tongue and mouth are alſo dry and parched, and the fur on the former becomes thicker, the urine, though it becomes higher coloured than in the cold ſtage, remains tranſparent, and depoſits no ſediment; and the bowels are coſtive. The thirſt is conſiderably increaſed as the heat advances, the nauſea and vomiting gradually diminiſh, but the averſion to food is augmented.

The corporeal ſtrength and the mental powers become more oppreſſed; the ſenſibility, however, is reſtored in general with the returning circulation and warmth of the ſurface; ſometimes it becomes even more acute than in the healthy ſtate, ſo that the ſkin is more eaſily irritated, the eyes are offended with the light, and the leaſt noiſe is heard with pain, and greatly diſturbs the feelings of the patient. The attention becomes leſs under the controul of the will, and the faculty of recollection and the reaſoning power are exerted with difficulty, and imperfectly, ſo that ſome confuſion of thought takes place, which often ariſes to delirium, when the hot ſtage is completely formed: occaſionally, indeed, a degree of delirium occurs in the beginning of the cold ſtage, but more frequently in the ſubſequent periods of the fever. The numerous and diſtreſſing dreams, which conſtantly recur in the diſturbed and unrefreſhing ſleep, which takes place in the firſt ſtages of fever, may be conſidered as the ſlighteſt degree of delirium. (See the articles Delirium, and Dreams, in *Pathology*.) In the next degree the patient, when he awakes, is ſome time before he can attend to the impreſſions made on the organs of ſenſe: he does not know his bed, his bed-chamber, or his attendants for a few minutes, but ſeems to awake as it were a ſecond time, and becomes perfectly ſenſible. If the delirium is in a little greater degree, the ordinary impreſſions of external objects produce no effect; the ideas, which float in the mind rapidly, ſeem to be excited without train or connection; the aſſociation being carried on by the internal impreſſions alone. If the attention of the patient, however, be ſtrongly excited by external impreſſion, he is capable of diſtinguiſhing the ſurrounding objects, and of returning correct anſwers to queſtions put to him; but that ſtrong impreſſion being withdrawn, he relapſes into his delirious dream. As the delirium increaſes, with the advance of the fever, the faculty of diſtinguiſhing the objects that ſurround him gradually diminiſhes; he begins to expreſs his ideas in words, *i. e.* to talk incoherently; the ideas which preſent themſelves rapidly, and without apparent connection, are generally diſagreeable and diſtreſſing. He is ſometimes in a church-yard among tombs, ſometimes falling from a precipice, ſometimes purſued by wild beaſts, in the midſt of conflagrations, &c. The delirium increaſing, he becomes completely inſenſible to external objects. This is a common progreſs of the alienation of mind in fever, beginning on the ſecond or third day, or later, and increaſing to the fourteenth or fifteenth, if the patient ſurvive ſo long; at firſt being only obvious in the night, or during the imperfect ſlumbers, or in the waking moments, when external impreſſions are fewer, or almoſt entirely excluded; but afterwards continuing night and day without intermiſſion.

With the beginning of the hot ſtage, the head-ache is commonly increaſed, and appears to be diſſimilar from that which took place in the cold ſtage. The latter pain, Dr. Fordyce remarks, always feels to the patient as external; "it is clearly a pain affecting the integuments of the head, perhaps the *ſkin* alone, at moſt the pericranium; but the pain which ariſes in the ſecond ſtage is felt by the patient internally, and gives him the idea that there is ſomething diſtending the head or the brain, ſo as to attempt to burſt the cranium." (See Firſt Diſſ. on Fever, pp. 85 and 228.) In the mean time the carotid and temporal arteries beat full and ſtrong, the eyes are rather red, and the face is fluſhed. Connected with theſe ſymptoms, which obviouſly imply an increaſed quantity and impetus of the blood carried to the brain, the organs of ſenſation, while fully capable of conveying impreſſions to the mind, nevertheleſs produce ſometimes erroneous impreſſions. Thus the patient can ſee, but he miſtakes objects; he fancies one individual is another, or that a man is a poſt: and his organs of hearing, which are alſo more readily affected, do not convey the ſame perceptions, which the ſame ſounds would excite in health. The ſame thing happens with regard to his other ſenſes.

All the ſymptoms above enumerated increaſe from the ſecond day of fever. The tongue grows more foul, and the cruſt which forms upon it thicker, until the middle of the ſecond week. Towards the end of the ſecond week this cruſt often diſappears more or leſs, and the ſurface of the tongue looks raw when moiſt, and when dry has a poliſhed glaze, eſpecially about the middle, ſome of the cruſt remaining upon the ſides towards the edges (Fordyce.)

Before theſe ſymptoms, however, have advanced to the degree juſt deſcribed, and after the general heat has continued for an indefinite time, (in the ephemeral and intermittent fevers a few hours, in continued fevers ſeveral days,) it often happens, that a partial moiſture begins to appear on the ſkin, generally on the forehead, which extends gradually downwards to the neck and breaſt, and at length a free ſweat takes place from the whole ſurface of the body. At the ſame time the ſymptoms of the firſt ſtage of the fever begin to abate, ſometimes one giving way firſt, and ſometimes another, ſo that it cannot be ſaid which has the priority: ſometimes the weight and anxiety about the præcordia are firſt obſerved to diminiſh, ſometimes the change of the pulſe from hardneſs to ſoftneſs is the firſt obvious amendment, and ſometimes the relaxation of one or other ſet of ſecretory veſſels, &c. Such a change of the ſymptoms, terminating ſpeedily in a reſtoration of the health, has been called, by a term borrowed from the Greek, a *Criſis*, (which ſee,) and the excreted fluids, which are poured forth at the time of this change, have hence been denominated *critical* diſcharges. The moſt ſtriking appearance, both to the patient and by-ſtander, is the perſpiration, which is frequently carried to the extent of profuſe ſweating, in intermittents, and the ſimpler forms of fever, but ſometimes amounts only to gentle moiſture. While the ſweating continues, all the ſymptoms of the previous ſtages abate: the preternatural heat is gradually diminiſhed; the pulſe becomes ſofter and leſs frequent; the breathing is likewiſe frequent, and more free, and is unaccompanied by ſighing, and the anxiety and heavineſs in the cheſt are greatly alleviated; the head-ache gradually goes off, and the pains of the loins and extremities ceaſe; the nauſea and vomiting no longer diſtreſs the patient, who now acquires a reliſh for light nouriſhment; the thirſt is removed; the mouth and tongue become moiſt, as the ſalivary and mucous glands pour out their fluids, and the tongue becomes gradually clean, firſt upon the edges, afterwards in the middle and near the root; the cruſt, which had formed upon it, coming off in ſmall flakes, until the whole ſurface is in its ordinary ſtate. The ſecretions of the liver, pancreas, and inteſtinal glands being reſtored, the bowels begin to act, and the evacuation from them comes to its ordinary quantity. A looſe ſtool is commonly paſſed, at the end of a paroxyſm of intermittent fever; and ſometimes a diarrhœa comes on in continued fever, and being the moſt obvious, is then conſidered as the critical diſcharge. The urine generally undergoes ſome peculiar changes in the criſis of fever: it is not only ſecreted in larger quantity, but, although bright and tranſparent when diſcharged, if allowed to remain for ſome time, it is obſerved to grow turbid, as if containing a quantity of a yellowiſh-red powder, and at length to depoſit flakey cryſtals of a dirty red colour, commonly termed a *lateritious* ſediment. Tumours, which were diminiſhed during the cold, and more painful in the hot ſtage, return to their uſual ſize during the ſweat, and ulcers again begin to diſcharge matter. The intellectual functions are alſo reſtored during the criſis; the attention of the patient is no longer abſorbed by his uneaſy feelings, the confuſion of his head is relieved, and he is not haraſſed by the perpetual recurrence of diſtreſſing images to the mind, eſpecially in his ſlumbers; a diſpoſition to calm ſleep returns; and the countenance reſumes its natural expreſſion.

It was remarked by Hippocrates, and the majority of the ancient phyſicians, that theſe *criſes* occurred more frequently on particular days of the fever, which they, therefore, obſerved with great care, as affording both particular indications in practice, and the means of prognoſticating the phenomena of the ſubſequent periods of the diſeaſe. Hence they called theſe days CRITICAL *days*, (which we have already deſcribed under that head). Theſe periodical changes, happening on particular days, are, however, ſeldom diſtinctly noticed in this country; they ſeem to occur more decidedly in warm climates, where all fevers have a greater tendency to aſſume the remittent form. Dr. Cullen, who believed that even in this country theſe critical days were obſervable, though leſs diſtinctly than in hot climates, explained their occurrence upon the principle, that continued fevers were in ſome degree diſpoſed to take on the types of intermittents; and in this principle he has been followed by Dr. Fordyce. (See Cullen, Firſt Lines, § cxix, *et ſeq.* Fordyce, Third Diſſert. on Fever, part i. p. 120.) But it muſt be remarked, that the doctrine of critical days, as taught by Hippocrates, was ridiculed by Aſclepiades and Celſus, who practiſed in the ſame climate with Hippocrates; and in the ſame city with Galen: (ſee Celſus, Loc. cit. lib. iii. cap. 4.) and Herophilus altogether denied its truth. See CRITICAL *Days*.

In this country, and in cold climates in general, continued fevers are ſeldom terminated by criſis. Some practitioners have maintained, that a criſis never takes place, whilſt others have inſiſted that criſes happen in all continued fevers. Dr. Fordyce juſtly remarks, that theſe extremes of opinion are both inconſiſtent with correct obſervation. It is admitted, however, that criſes occur much leſs frequently in this climate than in hotter countries; and we think that the phyſician juſt mentioned conſiderably over-rated the proportion, when he ſays, that "not above one-third part of the fevers which happen in London are terminated by a criſis." (Loc. cit. p. 126.) We believe the proportion to be very far below this ſtatement. In the great number of inſtances of fever, no criſis takes place, but the diſeaſe terminates in a more ſlow recovery, or in death.

The ſymptoms, before enumerated, increaſe gradually to the end of the firſt, or middle of the ſecond week; ſometimes by the ſeventh day the ſymptoms have attained their greateſt ſeverity; ſometimes, too, the ſecond week is gone through without very ſevere ſymptoms, and in other caſes ſymptoms of the greateſt diſtreſs and danger then occur; and there are all gradations between theſe extremes.

The appearances in the ſecond week, when the fever is not extremely ſevere, are often as follows. The pulſe is frequent, beating from 100 to 110, in the evening, and in the morning ſomewhat leſs; the ſkin continues dry and hot, in various degrees; the tongue is covered with a browniſh fur; the appetite is often totally loſt; thirſt continues, but is often complained of leſs during the ſecond than during the firſt week; and the depreſſion of ſtrength is conſiderable. The ſleep is diſturbed and ſhort, and the delirium is manifeſted in the intervals by the incoherence of the obſervations of the patient, until he is completely rouſed by ſome ſtrong impreſſion on the ſenſes. In the morning the delirium is leſs than in the early part of the night, and the ſleep ſometimes tolerably quiet; even during the day there is conſiderable confuſion, and occaſionally much ſlowneſs of intellect. Hence perhaps the thirſt, as well as the head-ache, and pains of the back and limbs, is leſs complained of, rather than from actual relief or diminution of theſe ſymptoms. The eyes have a dull and confuſed appearance, and commonly ſome degree of redneſs, from a number of ſmall veſſels diſtended with blood. Sometimes a degree of ſtupor comes on in the morning, and continues till the more active delirium of the night. If this ſtate ſhould remain, Dr. Fordyce obſerves, till about the fourteenth day, the evening attacks become by degrees leſs, but the ſtupor continues, with deafneſs, and inattention to external objects, and theſe appearances remain the very laſt ſymptoms of the diſeaſe.

Very frequently about the end of the ſecond week, and often ſooner, the ſymptoms begin gradually to diminiſh in ſeverity. The firſt appearance of this abatement is not uncommonly a cleanneſs and healthy look about the edges of the tongue; ſometimes, although not very generally, a ſweating takes place all over the body, and the ſkin afterwards continues moiſt; more commonly the moiſture and ſoftneſs of the ſkin appear in a leſs marked manner. The delirium abates altogether in the day, and returns leſs ſeverely at night; or if the patient be deaf with ſome ſtupor, theſe ſymptoms are little changed in the twenty-four hours, but remain until the whole of the diſeaſe has diſappeared. The depreſſion of ſtrength goes off, but leaves real weakneſs behind. The urine depoſits ſometimes a copious lateritious ſediment for a day or two, and afterwards returns to its natural appearance. Sometimes there is a copious lateritious ſediment in the urine made in the night, and a mucous one in that made in the day time. The coſtiveneſs goes off, and the fæces return to their ordinary appearance; and all the ſecretions become gradually increaſed, not equally, but ſometimes one more ſpeedily, ſometimes another. The eyes, unleſs when the delirium has ended in ſtupor, begin to have a more healthy appearance, are more compoſed and clearer, and expreſs a greater attention to the objects around them. The ſleep returns, but not equally; the patient ſometimes paſſing a quiet, at other times a reſtleſs night. The appetite returns, although ſeldom regularly; ſometimes it is voracious, but the patient is notwithſtanding ſatisfied with a very ſmall quantity of food; in the other caſes it returns very ſlowly. Although the depreſſion of ſtrength ſometimes goes off almoſt at once, yet it leaves the patient often with a greater feeling of weakneſs. Thus, however, the whole diſeaſe diſappears, and the patient recovers his ſtrength very quickly.

But although this favourable termination of fever occurs in a large majority of inſtances in this country, it is nevertheleſs a diſeaſe frequently fatal, and, under particular circumſtances, the cauſe of great mortality.

When fever terminates fatally, the ſymptoms preſent themſelves chiefly under two different aſpects, but variouſly modified, approaching to each other, or even partially combined. The individual varieties it is impoſſible to depict; a knowledge of them can only be attained by perſonal obſervation of numerous caſes at the bed-ſide of the ſick. One of the forms, juſt alluded to, conſiſts principally of a great aggravation of the ſymptoms of the hot ſtage. The heat of the ſkin continues great and pungent, and its ſurface dry and parched; the countenance is fluſhed, and the eye ſuffuſed with redneſs, and intolerant of light; the head-ache is ſevere, little or no ſleep is obtained, the delirium is augmented, and is accompanied with extreme reſtleſſneſs, often with vociferation, and even great muſcular ſtrength, ſo that the patient is with difficulty confined in bed; and the pulſe is frequent, with conſiderable hardneſs. About the end of the ſecond week theſe ſymptoms ſuddenly change; the delirium ends in an indiſtinctneſs or confuſion approaching to ſtupor, the articulation becomes indiſtinct, the breathing laborious, the ſtrength ſinks rapidly, cold ſweats, and convulſive motions enſue, and the patient is cut off in a few hours. Sometimes ſymptoms of inflammation of the lungs ſupervene, and continuing together with the delirium, hot ſkin, frequent pulſe, and brown tongue, the patient dies with ſymptoms of ſuffocation ; and ſometimes inflammation of the inteſtines, or other important organs, being ſuperadded to the original fever, accelerates and modifies the fatal termination. This has been called inflammatory fever. The other form of the diſeaſe, abovementioned, is extended more commonly to the third week, ſometimes later, and the progreſs of the ſymptoms is more gradual. The depreſſion of the muſcular powers continues to increaſe with the diſeaſe ; the eyes become ſunk, dull, and liſtleſs ; the countenance dejected, and of a duſky hue ; the delirium is attended with a low muttering, and the patient lies without the diſpoſition or the power of making any exertion, or he picks the bed-clothes ; the tongue becomes cruſted with a dark brown or black matter, a ſimilar ſordes collects upon his teeth and lips ; the pulſe is frequent, beating from 120 to 130 times in a minute, and is at the ſame time ſmall and feeble ; the reſpiration is alſo weak, generally frequent, and interrupted with ſighing or a dry cough ; the voice becomes indiſtinct or inarticulate ; and there are ſlight convulſive twitches, or ſubſultus tendinum. At length the proſtration of ſtrength becomes extreme ; the patient lies on his back, being unable to ſupport himſelf in any other poſition, and even ſlides down towards the bottom of the bed ; he is altogether inſenſible to external impreſſions ; the ſphincters, as well as the muſcles of voluntary motion are relaxed, and he paſſes his ſtools and urine involuntarily in bed ; the pulſe becomes very feeble, tremulous, and ſcarcely to be felt at the wriſt ; partial, clammy ſweats break out ; the eyes appear glazed and fixed, and the other features ſhrink ; the patient is unable to ſwallow ; his breathing becomes irregular and laborious, attended with ſome noiſe in the throat, as the fatal event approaches ; the extremities grow cold ; and, often after ſome hours, the functions of life finally ceaſe. When fever aſſumes this form it conſtitutes *typhus*, or the nervous, malignant, &c. fevers of authors.

There are ſome other appearances, which, though not the ordinary attendants on fever, occaſionally occur, eſpecially when the diſeaſe is of a ſevere kind, and which have been conſidered as evidence of malignancy, or of putreſcence. Generally in the ſecond week of the diſeaſe, but ſometimes as early as the fourth or fifth day, (ſee ſir John Pringle's Obſ. on Diſeaſes of the Army, part iii. chap. 7, and Huxham on Fevers, chap. vii. p. 97.) an eruption of ſpots, not elevating the cuticle, of a red colour, ſometimes pale, often darker, or even of a livid or purple hue, appears on the ſkin : theſe ſpots, or *petechiæ*, are thickeſt on the breaſt and back, leſs numerous on the legs and arms, and are ſeldom, if ever, ſeen on the face. They were firſt deſcribed, among the moderns, by Ingraſſia of Naples, afterwards more particularly by Fracaſtorius, under the names of *lenticulæ*, *puncticulæ*, or *peticulæ* ; whence alſo the ſame appellations were given to the fevers themſelves. (See Fracaſtorius de Morb. Contag. lib. ii cap. 6.) Petechiæ appear in fever, moſt frequently in cloſe and crowded ſituations ; formerly they were very frequent attendants on the fevers which occurred in the perſons under confinement in cloſe cells, or crowded apartments in our priſons. Dr. Willan has ſtated, however, upon the authority of the preſent ſurgeon of Newgate, that ſince a general attention to ventilation and cleanlineſs has been adopted, petechiæ do not now appear in more than one caſe of fever in thirty in that priſon. He has alſo added, from the obſervation of the phyſician of the Fever Inſtitution, in London, (the writer of this article,) that the proportion of caſes, in which petechiæ occur in that inſtitution, is about one in forty-two. (See Willan on Cutaneous Diſeaſes, order iii. *gen.* Purpura, p. 468.) Sometimes the purple ſpots are of a large ſize ; in which caſe there are often alſo livid blotches, or ſtripes like the ſtrokes of a whip, *vibices*, and hæmorrhages break forth from the internal parts, as the bowels, lungs, ſtomach, and wherever the ſurface is covered with a very thin cuticle, as from the noſtrils, the gums and mouth, &c.

A raſh of a different ſpecies, which Dr. Willan has termed *roſeola*, " a roſe-coloured effloreſcence, variouſly figured, without wheals or papulæ, and not contagious," (Loc. cit. order iii. *genus* 4,) ſometimes makes its appearance in fever, of the typhous type : ſometimes it precedes the formation of purple ſpots and vibices, and in other caſes it is ſeen early in the fever, but remains only for a ſhort time without any material conſequences. Some other cutaneous appearances occaſionally occur, as mentioned by Huxham, (Loc. cit. p. 97,) ſuch as miliary puſtules, a ſcabby eruption about the lips and noſe, and aphthæ.

Appearance on Diſſection.—An examination of the bodies of thoſe who have died of fever, though it has often thrown light upon particular ſymptoms, eſpecially on thoſe which have occurred late in the diſeaſe, has nevertheleſs failed to elucidate the ſubject of fever in general. The appearances which have been preſented to the view of the diſſector have been ſo various, the organs affected ſo different in different inſtances, even when ſuch difference could not have been anticipated from a knowledge of the ſymptoms, that the principal general inference which can be deduced from the obſervations of the anatomiſts may be expreſſed in the words of Riverius ; (ſee his Praxis Medica, lib. xxvii. cap. 2. Appendix,) that acute and dangerous fevers " rariſſimè fieri ſine internâ et peculiari viſceris cujuſdam affectione, et plerumque inflammatione ; quare nunquam omittenda cura hypochondriorum, capitis, thoracis, uteri, renum, et veſicæ ; ut omni ratione inveſtigemus, quæ harum partium inſigniter laboret, et ei, quoad fieri poteſt, ſubveniatur." Some one or other of the viſcera are moſt commonly diſordered, eſpecially by inflammation, in the courſe of thoſe fevers, each of which demands our attention reſpectively, in conducting the cure, according to the ſeverity with which it ſuffers. Dr. Donald Monro has remarked, that, in fatal fevers, " the febrile matter is apt to fall on particular parts, and there to create abſceſſes ; particularly in the brain, the lungs, and the glandular organs." (Treatiſe on Military Hoſpitals, vol. i. p. 237.) On the whole, it would appear, that the brain is the organ which has been found to have ſuffered moſt by the attack of acute idiopathic fever. But we have to obſerve, with regret, that diſſections of bodies, cut off by fever, have been often too incompletely examined, to enable us to draw any ſatisfactory comparative concluſions from them. Thus even ſir John Pringle acknowledges that of the few diſſections made under his inſpection, ſome were directed to the brain or to the bowels only, all the cavities being examined but in a ſmall number of caſes. In thoſe inſtances of fever, in which the functions of the brain were much diſordered, that organ has exhibited ſeveral morbid appearances : the moſt frequent of theſe are a congeſtion of blood ; the veſſels of the pia mater, or inveſting membrane, being all diſtended, as if injected ; the brain itſelf, when divided, preſenting a number of red points, which pour out blood ; the arachnoid coat is not unfrequently at the ſame time ſeparated from the pia mater by the interpoſition of a gelatinous or ſerous fluid ;

theſe membranes are both occaſionally thickened, their tranſparency being partially loſt, and they ſometimes adhere cloſely together in particular parts, as well as to the dura mater. Occaſionally an effuſion of ſerum is found in the ventricles of the brain. Sometimes, though comparatively in rare inſtances, the inflammation of the brain has been ſo decided, as to have terminated in ſuppuration, or abſceſſes of the ſubſtance. Theſe have been chiefly obſerved in the lobes of the cerebrum, the cerebellum in general being leſs liable to diſeaſe: but two inſtances of purulent matter being formed in the cerebellum are noticed by ſir John Pringle. (Loc. cit. part iii. cap. 7.) Even ſuppuration of the cerebrum is not a common reſult of fever in this country. Dr. Fordyce ſays, that he "has cauſed the heads of many patients, who have died with very great delirium in fever, to be opened, and never found any marks of ſuppuration. Moſt commonly the brain appeared exactly as it is commonly found. Sometimes the blood-veſſels were diſtended with blood, but never was any ſuppuration found; generally no uncommon appearanee at all." (Third Diſſert. on Fever, part i. p. 98.) In the yellow fever, Dr. Jackſon ſtates, that "the brain upon diſſection appears to be more or leſs affected in the majority of ſubjects who die in the acute ſtate of the diſeaſe; the membranes are then inflamed, or the blood-veſſels turgid to an extraordinary degree, give an appearance of commencing gangrene rather than of inflammation, properly ſo called; water is ſometimes found in the ventricles, with evident effuſion in the interſtices; but this is an effect not general, not even frequent." In the accounts of an epidemic fever, which occurred at Geneva, in the year 1805, publiſhed by two phyſicians, it is ſtated by both that congeſtion of blood was often found in the brain, but in other caſes the brain was in its natural ſtate. And a Dr. Eisfield, who publiſhed an account of an acute typhus, as it prevailed at Leipſic, in 1799, obſerves, "in very many careful diſſections of the brain (though I only once detected an abſceſs, and this was in the right hemiſphere, about half an inch in diameter) the veſſels, particularly thoſe in the vaſcular membranes, almoſt always appeared turgid with blood. The four ventricles abounded with water, and ſometimes a good deal of extravaſated blood was preſent. The cortical ſubſtance was inflamed, ſoft, and flaccid." (See Beddoes' Reſearches, Anatomical and Practical, concerning Fever, as connected with Inflammation, p. 48.) The laſt-mentioned circumſtance does not neceſſarily imply inflammation. It was obſerved by Chambon (Obſ. Clin. Pract. Obſ. 29.) that the ſubſtance of the brain in every part is often found harder than natural after malignant fevers. This, Dr. Clutterbuck remarks, we know to be a common effect of inflammation in other parts. (Inquiry into the Seat and Nature of Fever, part i. p. 173.) The writer of this article lately witneſſed an unuſual firmneſs of the brain of a patient, dead of petechial fever, at a time when the abdominal viſcera had already become very putrid. The congeſtion in the brain was very conſiderable.

Not only, however, are theſe congeſtions and inflammatory phenomena of the brain frequently abſent, but ſometimes together with them, and not ſeldom in their abſence, ſimilar appearances are obſerved in other viſcera, more eſpecially in thoſe of the abdomen. Dr. D. Monro included other organs with the brain in his mention of the morbid changes produced by fever: and ſir John Pringle remarks, that when contagious fever proves fatal, it generally terminates either in the actual mortification of ſome part, or in an abſceſs of the brain; and he adds, that "the inteſtines more particularly are diſpoſed to mortify." He likewiſe quotes the Traité de la Peſte, to prove that ſome of the *viſcera* were always mortified and inflamed, the brain and lungs moſt frequently, in thoſe who died of the plague at Marſeilles. Dr. Eisfield, continuing his deſcription of the appearances diſcovered by the diſſection of thoſe who died of the Leipſic fever, ſays, "the lungs were often found deſtroyed, inflamed, ulcerated, gangrenous, covered with much exuded lymph. The liver inflamed (eſpecially the concave ſurface) tender, flaccid, full of blood, or pale and bloodleſs. I did meet with inflammation and gangrene of the uterus, the urinary bladder, the proſtate and other glands (particularly the meſenteric) of the colon and rectum." "The pains in the head were ſometimes ſo violent, and the delirium ſo furious, as to indicate inflammation of the encephalon, which however was diſcovered in the abdomen." In three diſſections of perſons cut off by an epidemic fever in Normandy, Dr. Moucet found the veſſels of the brain and its membranes gorged with dark blood; the lungs were alſo diſeaſed; all the ramifications of the meſenteric arteries full of black coagulated blood; the inteſtines in part inflamed, in part putrid and gangrenous, in two of the caſes; a prodigious congeſtion in the ſmall curvature of the ſtomach and in all the inteſtines, eſpecially the ſmall. Of the fever which raged at Leghorn in the ſummer of 1804, Thiebault reports, "that there were few of the viſcera which it did not leave ſometimes ſound, ſometimes gangrenous, or at leaſt with black ſpots on the ſurface. This alteration was eſpecially ſeen on the concave part of the liver, the inner ſurface of the ſtomach and inteſtines, often in the right ſide of the lungs and diaphragm: the abdominal viſcera, and ſtill more the abdominal muſcles, were exceſſively flabby and tender. The cavities of the thorax and abdomen, the pericardium and the ventricles of the brain, contained a yellow liquid, often fœtid, and of a dark bloody tinge. The ſuperficial veſſels of the viſcera, eſpecially thoſe of the brain and inteſtines, appeared dilated, and their extremities filled with a black matter. 'Nothing was found conſtant but the gangrenous nature of the alterations, and their being more concentrated on the ſtomach and inteſtines than in the other viſcera.' (Recueil, period xxxiii. 12—13.) Palloni (Oſſervaz. Med. Livorno, 1804,) gives a very ſimilar account. In his diſſections, the force of diſeaſe ſtill more plainly appears to have been exerted upon the abdominal and contiguous viſcera. During the ſimilar epidemic of 1800, in Spain, profeſſors Sabater and Ramos found in the abdominal viſcera ſanious and purulent effuſion with gangrene. It is expreſsly ſaid that, in the two other great cavities, the head and the thorax, eſſential changes were ſeldom found. In ſome ſubjects, however, black gangrenous points appeared upon the lungs, and in others upon the brain. "The alterations in the abdominal viſcera were the only ones that can be conſidered as the direct and immediate product of the diſeaſe." (Berthe, Precís de la Maladie d'Andalouſie, 1802, p. 182—5.) Dr. St. Firth, houſe ſurgeon to the Philadelphia diſpenſary, informs us, in his diſſertation on malignant fever, (1804,) that the brain was *generally* found in a diſeaſed ſtate, the meninges being conſiderably inflamed, the dura mater being ſometimes agglutinated to the pia mater, the blood-veſſels turgid with blood as if injected, the brain firmer than uſual, water frequently in the ventricles, and ſometimes blood effuſed between the meninges. The ſtomach was *always* diſeaſed; great inflammation obſervable throughout; eroſions of the villous coat frequent; inflammation extending to the inteſtines; bladder diſeaſed; liver, ſpleen, pancreas, kidnies generally ſound; lungs, pericardium, and heart inflamed." We quote theſe obſervations from Dr. Beddoes' reſearches, not having the original works. We add, that, in two caſes which we lately inveſtigated by diſſection, the villous coat of the ſmall inteſtines was ulcerated in parts, and altogether deſtroyed in others; the brain at the ſame time bore marks of great congeſtion in the one caſe, and its ventricles were much diſtended with ſerum in the other.

We have dilated upon the ſubject of the morbid ſtructure occaſioned by fever, (which muſt ever be deemed highly important,) becauſe it is too much neglected, partly from a miſtaken fear of contagion from the dead body, which deterred even Morgagni from ſuch inveſtigation; and partly from preconceived hypotheſis, which has led to the examination of only one cavity of the body, when diſeaſe might be diſcovered in all.

Ratio ſymptomatum, or *explanation of the Symptoms.*—The firſt ſymptoms of every fever obviouſly indicate a diminution of the nervous power. Of the nature of this power we only know that it originates in the brain, and is communicated to every part of the animal frame by the medium of the nerves; and that the action of thoſe parts, their motion and ſenſibility, depend upon this communication. The firſt ſymptoms of fever, then, indicate that leſs of this nervous power is produced and imparted to the organs of the ſyſtem; or, to uſe a common expreſſion on this occaſion, that there is a torpor or atonic condition of the brain and nerves. This is ſhewn by the *languor* and *laſſitude*, connected with the relaxation of the muſcles. A ſimilar condition is produced by the depreſſing paſſions, acting through the medium of the mind on the nervous power; whence the whole body becomes relaxed, as is ſhewn by the lengthened muſcles of the face, the loſs of ſtrength, &c., and if the muſcles of the heart are alſo relaxed, *fainting* is produced. The *depreſſion of ſtrength* depends upon the ſame cauſe; the muſcles being unable to move the body with the uſual force, and the powers of the mind being impaired. The muſcular energy and powers of the mind are much connected in the animal economy; ſo that if the body have been fatigued, the mind cannot exert its powers of attention, memory, and judgment with alacrity, and *vice verſâ*. A ſtudent in mathematics would be unable to trace the ſteps of an intricate problem, after having contended in an athletic game; or, on the other hand, after having fatigued the mind by going through a new and laborious demonſtration, he would be unable to exert the powers of his body in a fox chaſe. We cannot think much, and uſe ſtrong exerciſe at the ſame moment. Both theſe powers, therefore, ſeem to depend alike on the nervous energy, and the ſimultaneous diminution of both implies the diminiſhed ſtate of that energy. Yet this is different from ordinary debility, and has therefore been diſtinguiſhed by the terms depreſſion of ſtrength; the powers of the body not being loſt, but only prevented from acting by the diſeaſe; for if the diſeaſe ceaſes in eight or ten hours, (as in the paroxyſm of an intermittent,) the depreſſion of ſtrength ceaſes likewiſe, and both the body and mind can exert themſelves with a vigour nearly equal to that which they poſſeſſed before the diſeaſe began, or in perfect health. The nervous power is diminiſhed, like the action of a ſpring, which is overcome by the temporary preſſure of a weight, that does not deſtroy its elaſticity.

Another reſult of the muſcular relaxation is the feeble action of the heart, on which many of the ſymptoms depend. This is evinced by the feeble, *ſmall pulſe*, by its occaſional irregularity, and even ſlowneſs, at the onſet of the fever. This languor of the circulation, eſpecially in the extreme veſſels, is the cauſe of the *paleneſs* of the *ſkin*, and the ſhrinking and diminution of ſize in the features, and every other external part, as well as of morbid ſwellings. The condition of the ſurface is the ſame, to all appearance, as is produced by the application of external cold, which conſtricts, or rather diminiſhes the action of, the ſmall ſuperficial veſſels; whence the *cutis anſerina*, or gooſe-ſkin contraction and roughneſs of the ſurface takes place. Whence alſo the *ſkin* is *dry*, at the ſame time, as perſpiration cannot be produced from veſſels in which the circulation is nearly ſuſpended. It muſt be obſerved, however, that the action of the capillary veſſels of the ſkin is not entirely regulated by the action of the heart and great arteries; for the former are ſometimes diſtended quickly, as in the bluſh of ſhame, or collapſed, as from external chill, when the pulſe remains unchanged. From the ſame cauſe, (the languor of the circulation, and the contracted condition of the extremities of the arteries,) the other ſecretions are diminiſhed. The mouth and *tongue* become *dry* from the ſcanty ſupply of ſaliva; the pancreatic juice, the bile, the mucous and ſerous excretions in the alimentary canal being diminiſhed, as well as the muſcular action of the bowels enfeebled, the fæces are not paſſed fowards, and *coſtiveneſs* takes place; the *urine* is not only ſmall in quantity, but of *pale* colour, from the diminution of the ſaline and mucilaginous animal matter, which are ſecreted by the kidnies in health, and give it its peculiar colour. From the ſame imperfect circulation the diſcharges from iſſues and ulcers ceaſe in the attack of fever.

Until we obtain a more accurate knowledge of the origin and nature of animal heat, and of the means by which it is maintained at the regular temperature of 97½° or 98°, notwithſtanding the varieties of the atmoſpheric temperature in which we live, we ſhall not be able to explain ſatisfactorily the changes which the heat of the body undergoes during the different ſtages of fever. We know, however, that the variations of the heat are much connected with the functions of reſpiration and circulation. In what are called cold-blooded animals, the function of breathing is performed at long intervals, and is capable of great ſuſpenſion without injury to life; and general coldneſs takes place in the human body, when the paſſage of the blood is diverted from the lungs, as when the fœtal organization of the heart remains in after life. With the circulation the connection of animal heat is ſo well known, that, in popular language, redneſs, or a florid colour of the ſkin, (which ariſes from its veſſels being diſtended with blood,) is almoſt ſynonymous with *heat*. In all inſtances of acute inflammation the ſenſe of heat is in a great meaſure proportionate to the vaſcularity and redneſs of the part affected. At the onſet of fever, then, both the actual *cold* and ſenſe of cold are doubtleſs the effect of diminiſhed circulation on the ſurface, which is ſomewhat augmented, perhaps, by the imperfect reſpiration which is then carried on. It is not ſo eaſy to explain ſatisfactorily the ſenſation of cold exiſting, when to the feel of another perſon the heat is natural. This may be attributed partly, perhaps, to the ſtate of torpor in the brain, partly to the diſordered condition of the ſentient extremities of the nerves, and partly to the actual chill, which remains in particular parts, while others have become warm.

The ſenſibility of the organs in general, we have ſaid, is impaired, and the ſenſations are occaſionally not only diminiſhed, but depraved. This alſo ariſes principally from the deficient circulation in the extremities of the arterial ſyſtem. Senſibility is greatly dependent upon a ſufficient circulation of arterial blood to the extremities of the nerves, as well as to the brain. Thoſe parts of the body through which red blood does not flow are poſſeſſed of little or no feeling; ſuch are the cuticle, the nails, hair, tendons, &c. while, on the contrary, parts that are extremely vaſcular, as the true ſkin, are endowed with acute ſenſibility.

Again, the increaſed flow of blood to any part is generally attended with increaſe of the ſenſibility of the part; whence the augmented ſenſibility, the ſoreneſs and tenderneſs of parts that are inflamed. Hence, then, we may explain the *diminiſhed* and *depraved* ſenſibility of the ſkin, and organs of ſenſe, in the cold ſtage of fever. Even the torpor of the brain itſelf is increaſed, and therefore partly to be accounted for by the weakened circulation in it, at that period of fever, and is probably, in many caſes, a ſecondary effect.

To the enfeebled circulation alſo, much of the *anxiety*, and ſenſe of load about the region of the heart, the *ſighing*, yawning, and ſtretching of the limbs, is to be attributed, as well as the ſhort and *diſturbed reſpiration*. The force of the heart being unable to propel the blood to the extremities of the arteries on the ſurface, a greater quantity muſt be accumulated in the great veſſels about the heart and in the lungs; whence the load and oppreſſion, the labour and irregularity of reſpiration; whence alſo the ſighing and yawning, which are a ſort of inſtinctive action, by which we dilate the lungs, give a freer paſſage to the blood, and therefore relieve, for a time, the uneaſy ſenſation. According to Dr. Fordyce, indeed, this fact has been proved by diſſection. "In thoſe diſſections," he ſays, "which have been made of patients, who have died in the attack of ſimple fever, the large veins going to the heart, that is, the vena cava, both ſuperior and inferior, the right auricle of the heart, and the pulmonary arteries, have been found diſtended with blood to a much greater degree than they are commonly, when death takes place from other cauſes." (Firſt Diſſert. p. 90.) Sometimes a *cough* attends the cold ſtage of fever, ariſing from the irritation of this accumulated blood in the thorax.

The *liſtleſſneſs* and general *uneaſineſs* which are at the ſame time preſent, are almoſt the neceſſary conſequence of theſe morbid conditions of the ſenſorium, of the circulation, of the breathing, and of the muſcles of all parts. Uneaſy feelings lead us inſtinctively to ſeek relief in frequent changes of poſture. Beſides theſe uneaſy feelings, however, there are *head-ache*, and *pains* in the *back* and the *limbs*, which have been differently explained by different phyſicians. Some have aſcribed the head-ache to the ſtate of the brain in the cold ſtage of fever, but erroneouſly, in the opinion of Dr. Fordyce, ſince, whether it occupy the forehead over the eyes, or the back part of the head, it is equally external to the ſenſations of the patient. In like manner, the ſpinal marrow, as it is improperly called, being a continuation of the ſubſtance of the brain through the tube of the ſpine, has been conſidered as the ſeat of the pain of the ſmall of the back which commonly occurs. (See Clutterbuck on Fever.) But why it ſhould occur only in that part of the back, and not along the whole ſpine, it might be difficult to explain: while, on the other hand, if it were an affection of the great muſcles of the loins, (and it very much reſembles the pain of weakneſs and fatigue,) it ſhould, like this pain, be greatly benefited by the horizontal poſture; which, indeed, we believe to be the fact, notwithſtanding the aſſertion of Dr. Fordyce. And the occurrence of ſimilar dull pains in all the limbs renders it probable that it is chiefly muſcular, and connected with a deficiency of nervous energy, as in muſcles which have been exhauſted by fatigue.

The affection of the ſtomach, indicated by the *loſs of appetite*, *ſickneſs*, *thirſt*, and *foul tongue*, ſome or all of which are among the ſymptoms of the febrile attack, may not be ſo capable of a ſatisfactory explanation. It muſt be obſerved, however, that there are at leaſt three ſources of derangement to this organ in the cold ſtage of fever; namely, the ſtate of the muſcular fibres of the ſtomach and of its ſecretions, which ſuffer in common with the other muſcles and ſecretions of the body; the great ſympathy which exiſts between the ſtomach and the brain; and, above all, perhaps, the intimate ſympathy of the ſtomach and the ſkin. It ſeems demonſtrable, from the effects of ſtimulant and tonic ſubſtances in augmenting the appetite for food, and the power of digeſtion, that a certain vigour of the muſcular part of the ſtomach is neceſſary to, and co-exiſtent with, the proper exerciſe of theſe functions; and, therefore, that a relaxation and debility of the ſame part muſt be the cauſe of a diminution of them. Obſervation alſo has taught us, that when the muſcles are exhauſted by exerciſe, the ſtomach partakes of the fatigue, and the appetite and digeſtive power are greatly impaired or loſt. The influence of a morbid condition of the brain on the ſtomach, by ſympathy, is well known to be great, inſomuch that ſome writers have conſidered this influence as amply ſufficient to account for the diſorder of the ſtomach in fever. Both in inflammation of the brain, and in the caſe of external injuries of the head, ſickneſs and vomiting are among the moſt invariable ſymptoms. Dr. Clutterbuck remarks, that the ſtomach not only receives nerves from the great intercoſtal nerve, but alſo communicates directly with the brain, by means of the eighth pair of nerves, or *par vagum*. "Hence," he adds, "it is little to be wondered at, that the functions of the ſtomach in fever, like thoſe of the other organs of ſenſe, ſhould ſuffer a deviation from the natural ſtate. In this way the uneaſy ſenſation often felt at the pit of the ſtomach in fever, the total want of appetite, the loathing and diſguſt commonly experienced even at the ſight of food, are naturally and eaſily accounted for." (Loc. cit. p. 74.) Dr. Cullen, on the other hand, is diſpoſed to conſider the ſtate of the ſkin as the principal occaſion of the affection of the ſtomach, in conſequence of the ſympathy between the two organs. The ſympathetic influence of the ſtate of the ſkin in inducing diſorder of the ſtomach is ſupported by a curious fact obſerved by Sydenham in the plague. In the attack of that diſeaſe, he remarked, that vomiting occurred, which prevented both food and medicine from remaining on the ſtomach; and that the means by which he was enabled to allay this ſymptom, was inducing perſpiration by the aid of external covering; as ſoon as the ſkin became moiſt, the ſickneſs diminiſhed, and the proper medicines were then retained. (Sydenham, Oper. ſect. ii. cap. 1.) We ſhall ſtate hereafter that the occurrence of the hot ſtage generally removes the vomiting, that of the ſweating ſtage always.

This doctrine is ſtill farther ſupported by a conſideration of the origin and removal of the *thirſt*, which occurs at the onſet of fever. The ſenſation of thirſt doubtleſs ariſes from different cauſes, and under different circumſtances; the mere dryneſs of the mouth and fauces, from evaporation of the moiſture, in conſequence of the heated breath, or from deficient ſecretion, may be attended with that ſenſation; ſometimes it ſeems to be excited by a peculiar condition of the ſtomach, while the mouth and fauces remain moiſt, as appears from the thirſt which ariſes from ſalted food in the ſtomach, or food of difficult digeſtion, or too great in quantity; or, as Dr. Fordyce ſuggeſts, it ſeems to be ſometimes occaſioned by a diminiſhed proportion of water in the blood-veſſels, as, in the caſe of diabetes, when the kidnies act with extraordinary rapidity, or after a great diſcharge of fluids by perſpiration. This author, however, conſiders the matter as not capable of being determined, (ſee his Firſt Diſſert. p. 223.) although he is diſpoſed to refer it to a particular affection of the ſtomach. (Ibid. p. 89.) This opinion, we think, is ſcarcely to be queſtioned for a moment; ſince thirſt often occurs in fever, when the tongue and fauces are moiſt, and generally before any diminution of the watery part of the blood has taken place. But ſeveral circumſtances conduce to prove an intimate connection between this affection of the ſtomach, which occaſions the ſenſation of thirſt, and the ſtate of the ſkin. It has been found by ſeamen, when accidentally deprived of drink, (as by lieutenant Bligh, and his men, in their miſerable voyage in the South ſea,) that by immerſing the body in water, or applying wet clothes to the ſkin, the thirſt has been relieved. Dr. Currie relates the caſe of a gentleman, who was prevented from taking any ſubſtance, ſolid or fluid, into the ſtomach, in conſequence of an obſtruction in the œſophagus. In the firſt days of his abſtinence the ſenſation of thirſt was very troubleſome; but it abated, and, as he declared, was always removed by immerſion in the tepid bath. (Med. Reports on Water, &c. p. 253. 2d edit.) The ſame author has ſtated, from numerous experiments, that the thirſt, which continues in the hot ſtage of fever, is almoſt inſtantaneouſly removed by the affuſion of cold water on the ſkin, which at the ſame time induces perſpiration, and reſolves the febrile paroxyſm. (See COLD.) On the contrary, the ſwallowing of cold drink, in the hot ſtage of fever, which relieves the thirſt, is often followed by a relaxation of the perſpiratory veſſels of the ſkin; and, when cold, drink does not produce a ſenſible increaſe of perſpiration on the ſkin, the relief which it affords to the thirſt is momentary only: which obviouſly proves the reciprocal ſympathy of the organs. (Currie, loc. cit. 178.) And this is farther proved, as we have already ſtated, by the ceſſation of thirſt when the ſweating ſtage of fever is eſtabliſhed.

All the ſymptoms, then, of the onſet of fever, conſtituting the phenomena of the cold ſtage, are explicable, directly or indirectly, on the ſuppoſition of a depreſſion or diminution of the nervous energy, however induced. In like manner, the ſymptoms of the hot ſtage and the ſubſequent phenomena, in continued fevers, are referrable to an imperfect recoiling, as it were, of the nervous power, and more immediately to the increaſed action of the heart and arteries, and of the capillary veſſels.

The *heat*, the redneſs of ſkin, and fluſhed countenance, the returning ſize of the external parts, the reſtoration or even increaſe of the ſenſibility of the organs, are all the reſult of the diſtenſion of the extreme veſſels by the red blood, as the oppoſite ſymptoms of the cold ſtage were the conſequence of an oppoſite condition of the circulation. Hence the frequent *ſoreneſs* of the body, which cannot bear its own preſſure without pain; hence *intolerance of light* in the eye, and the quick ſenſibility to noiſe in the ear, both of which increaſe the *head-ache*, which is now more acute, and deep-ſeated: hence alſo diſeaſed parts become more painful. The quick, and *ſtrong pulſe*, implies the greater force of the heart, and of the arterial action; nevertheleſs the dryneſs of the ſkin, and the continued ſuppreſſion of the reſt of the ſecretions, evince the continuance of a morbid condition (a conſtriction or ſpaſm, it has been called) of the extremities of the exhalant and ſecretory arteries, by which their functions are impeded. This condition bears a conſiderable analogy to the ſtate of inflammation, (ſee INFLAMMATION,) and when this ſtage of fever, and theſe particular ſymptoms are very ſevere, the fever has been called *inflammatory fever*.

Connected with, and in a great meaſure the reſult of this morbid condition of the circulation in the brain, is the *delirium*, which, though it occaſionally occurs in the cold ſtage, is uſually abſent until the hot ſtage has been formed. It is often accompanied by a throbbing or ſtrong beating of the carotid and temporal arteries, redneſs of the eyes, and fluſhed countenance, which give us reaſon to believe that it ariſes from over-excitement of the brain, by the quantity of blood thrown up into it by the increaſed action of the heart. In this ſtate the ideas crowd themſelves, as it were, upon the attention of the patient, and change rapidly from ſubject to ſubject; he is unable to court the acceſs of ſleep, in conſequence of the torrent of images which are preſented to the mind. The condition of the brain appears to be ſimilar to that of the whole of the ſentient parts: as the eye is more acutely ſenſible to the impreſſion of light, and the ſkin to that of touch; ſo the brain or the ſenſorium is more eaſily excited to thought, by the impreſſions of internal irritation, which are exceedingly multiplied in this ſtate of fever. Hence the inceſſant dreaming which diſtreſſes the patient, if he falls into an imperfect ſleep; and as the internal feelings are all of a painful nature, whether we conſider the anxiety, the head-ache, the pains of the back and limbs, or general uneaſineſs, &c. the dreaming ideas, which are aſſociated with thoſe feelings, are alſo of a painful and diſtreſſing nature. (See DREAMS, in *Pathology*.) If this increaſed action of the veſſels of the brain continues, a degree of preſſure is apparently produced by a more permanent diſtenſion of them, and a ſtupor and deafneſs come on. If the patient die in this ſtate, a general congeſtion of the veſſels of the brain is found upon diſſection: but the mere active delirium, unattended by ſtupor and deafneſs, may even prove fatal, yet no traces of the morbid condition of the veſſels of the brain ſhall be diſcoverable after death. (Fordyce, Third Diſſ. p. i. p. 99. 109.) In theſe caſes, it ſometimes happens that the delirium ceaſes ſome hours previous to death, although the other ſymptoms of fever continue. This obviouſly ariſes from the ſinking powers of the circulation; whence the action of the arteries of the head is reduced to ſomething approaching to the natural ſtate, before it ceaſes altogether with death. Delirium is occaſionally connected, it is ſuppoſed, with an enfeebled action of the veſſels of the brain; in which caſe it aſſumes another form, is not accompanied with any violence, but with great feebleneſs, and a low muttering rather than a boiſterous noiſe. It is the *delirium mite* of authors. (See DELIRIUM.) We believe, however, that even this low delirium is commonly the reſult of ſome degree of congeſtion of the veſſels of the brain, ariſing from local inequality of the arterial action, although that action may not be violent.

The *ſweating*, like the dry heat of the ſecond ſtage, is produced in a manner not very well underſtood. It was ſuppoſed by the older phyſiologiſts, as by Albinus, Haller, &c. that the ſweat, as well as the inſenſible perſpiration, is a mere exudation of the watery part of the blood through the cuticle; hence it was ſaid to ariſe, in fever, from a mechanical relaxation of the extreme arteries, which were ſuppoſed to be ſpaſmodically contracted during the hot ſtage. But it has been obſerved, by later phyſiologiſts, that this opinion reſpecting the nature of the perſpiration is contrary to all analogy, and founded only upon experiments made on the dead body. The opinion of Dr. Fordyce and Mr. Cruickſhanks appears to be the true one: namely, that the matter of perſpiration is ſecreted from the blood by the capillary arteries, and thrown out on the ſurface by organic pores in the cuticle, (however difficult to be diſcovered,) connected with the extremities of theſe arteries; and that in this proceſs there is not a ſeparation merely, but a new combination, as in ſimilar inſtances of ſecretion. (See Dr. Currie, loc. cit. p. 200.) Although, therefore, the occurrence of perſpiration has been conſidered as the cauſe of the ceſſation or diminution of the ſymptoms of fever, (and certainly no ſuch change takes place without ſome appearance of moiſture on the ſkin,) yet it is probably only one of the ſigns or effects of that ceſſation, in common with the reſtoration of the other ſecretions, which are alſo diminiſhed or ſuſpended in the attack of fever. This point, however, ſeems to be aſcertained, that the proceſs of perſpiration is a cooling proceſs, and the principal means by which the overheating of the body is prevented or removed. The heat of fever declines gradually, as the perſpiration goes on; but the rapidity with which it declines is varied by the quantity of bed-clothes, and the cloſeneſs with which the body is enveloped. While perſpiration goes on, it is difficult to raiſe the temperature of the body above the natural ſtandard, and under ſuch circumſtances it is capable of bearing very extraordinary degrees of heat, as was proved by the experiments of ſir Charles Blagden, Dr. Fordyce, and others. Whether the refrigerating effect of ſweating depends ſolely on the evaporation, or whether an abſorption of heat takes place in the proceſs of the ſecretion of perſpirable matter, is not certain.

The *turbid urine*, throwing down a ſediment of a lateritious or brick-duſt appearance, ariſes from the reſtoration of the ſecretion of the kidnies, which now ſeparate the lithic acid, as well as the animal extractive matter, in greater quantities than in health; but the urine contains, at theſe times, only a ſuper-abundance of thoſe ſubſtances which it contains in a ſtate of health, there being no new or morbid matter produced in it. This change in the urine has been likewiſe explained upon the ſuppoſition of a ſpaſm, in the ſecreting arteries in the kidnies, which ſuffered only the thinner parts to paſs, or pale urine, in the firſt ſtages of fever; but being relaxed in the ſweating ſtage, the thicker parts were allowed to paſs, and thus occaſioned the ſediment. But the kidnies, like the other ſecreting organs, are not mere ſieves, nor are thoſe thicker parts exiſting in the blood, previous to the commencement of the ſweating ſtage; they are then produced by the action of the kidnies. There is, however, an intimate connection of ſympathy between the action of the perſpiratory veſſels of the ſkin, and the ſecretion of this over-proportion of lithic acid, and animal mucilage by the kidnies: for it is generally producible at pleaſure by a doſe of Dover's powder, or other ſudorific medicine.

The ſymptoms, which occur in the later periods of fever, when it goes on to a ſevere or fatal degree, are explicable as the effects of an extreme proſtration of ſtrength. Hence the *tremors*, and ſlight convulſive motions, or *ſubſultus*, of the tendons and muſcles; hence alſo the irregular viſion, with the appearances of little bodies flying before the eyes, (*muſcæ volitantes* of authors) or of black ſpots upon objects looked at, which imply a partial loſs of ſenſibility in the retina, or nervous membrane of the eye; hence the general inſenſibility, the difficulty and labour of reſpiration, the involuntary diſcharge of ſtools and urine, the difficulty of ſwallowing, &c.

The regular *periods* at which the paroxyſms of intermitting fevers, and the exacerbations of remitting, and even of continued fevers, return, require ſome notice, although a ſatisfactory explanation may not be attainable. The fact has been generally referred to the influence of *habit*, which is productive of many phenomena in the animal economy. (See HABIT.) It is obſervable, that all men, even in a ſtate of good health, have a ſort of feveriſh condition induced in the evening, which goes off in the morning: there is ſome depreſſion of ſtrength or debility both of body and mind, and the pulſe is quicker than in the morning. In proportion as the health is more delicate, this ſtate is more evident. It is probable that this diurnal paroxyſm is to be attributed to the effect of the irritations of the day, which are ſuſpended during the night; and this diurnal habit might be ſufficient to account for the uſual evening exacerbation of continued fever. A ſimilar diurnal habit is likewiſe obſervable in many of our actions and functions; as in the returns of ſleep and waking, and of our appetites and excretions, which, if prevented from taking place, or being gratified at the accuſtomed period, are apt to ceaſe or become leſs urgent. This is often remarked with reſpect to the deſire of ſleep, to hunger, and to evacuation of the bowels. Theſe facts might afford an analogical explanation of the periodical returns of intermittent fevers, if they were all quotidian; but they afford us little aſſiſtance in accounting for the return of the paroxyſm of thoſe fevers at the end of forty-eight hours, in the caſe of tertian, or of ſeventy-two hours, in the caſe of quartan fevers. But it is remarked by Dr. Cullen, that even thoſe diſtant paroxyſms are in ſome degree connected with the diurnal revolution, as the times of their acceſſion are generally fixed to one time of the day; ſo that quotidians come on in the morning, tertians at noon, and quartans in the afternoon. (Firſt Lines, § lvi.) Some writers have attributed all theſe periods to the habit, but as the ſecond and third paroxyſms of a tertian occur as regularly, often more ſo, at the end of forty-eight hours, than the ſeventh and eighth, habit could not be the cauſe of the return in the former inſtances, whatever might be ſuppoſed with reſpect to the latter. On the whole, we can only conclude that a diſpoſition to theſe periodical changes is a general fact in the animal economy. See PERIODS *of Diſeaſe*; alſo CATENATION.

General Prognoſis in Fevers.—In continued fevers the event cannot be prognoſticated with any approach to certainty. The diſeaſe is in its nature of a dangerous tendency; and although there ſhall be no unfavourable ſymptom for the firſt ſeven or eight days, yet the fever may afterwards aſſume a dangerous character, and terminate fatally: while, on the other hand, recoveries occaſionally take place, when the ſeverity of the ſymptoms ſeemed to preclude all hope. A large proportion of the caſes of fever, however, if properly treated, terminate favourably. Under the various forms which fever puts on, we can arrive at a correct notion of the probable termination of each particular inſtance, by taking a comprehenſive view of the living machine; by eſtimating the relative importance of the ſeveral organs and their functions, in the maintenance of life; and, therefore, by obſerving accurately the number of theſe, which are affected by the diſeaſe, and the degree in which they are deranged; and we muſt farther take into the conſideration the ſpecies or type of the fever, its general tendency, as well as the particular tendency of the prevailing epidemic; and likewiſe the peculiar circumſtances of the patient, in reſpect to age, conſtitution, previous habit of body, mode of life, &c.

The prognoſis of a favourable termination is deduced principally from the leſſer degree of violence in the ſymptoms in general, or the ſmaller number of thoſe which are ſevere; and likewiſe from ſeveral changes in the courſe of the diſeaſe, which experience has aſcertained to be ſalutary.

Favourable Symptoms.—If the ſenſorium continues unaffected until the middle of the ſecond week, and a delirium moderate in degree ſhould then come on, it is not unfavourable; it implies a moderate affection of the brain. Deafneſs is moſt commonly a favourable ſymptom in this country; it implies, indeed, a morbid condition of the brain, but one which experience has proved to be free from the danger which attends the oppoſite condition. A ſleepy or dozing ſtate, from which the patient is eaſily waked, at the ſame time taking his food, and diſcharging his ſtools and urine properly, is commonly favourable. A ſpontaneous, thin, warm ſweat, eſpecially after the firſt week, or about the fourteenth day, is generally favourable; as is likewiſe a gentle bilious diarrhœa, about the ſame period, if connected with ſoftneſs of the pulſe; it generally relieves the head. A copious diſcharge of turbid urine about the ſame period, although not a common occurrence, is generally critical: the turbid appearance of the urine ſometimes anticipated the favourable changes in the other ſymptoms of fever. If the tongue, after being dry and parched, becomes moiſt and clean about the edges, it is a favourable ſymptom, and it often appears like the laſt mentioned ſymptom, for ſome time before the other changes take place; it implies a reſtoration of the ſecretions, and therefore a reſolution in the fever: it may be conſidered alſo as a ſign of ſalutary change in the organs of digeſtion. The ſtate of the pulſe, we have already obſerved, is an uncertain index; but it may be obſerved in general, that when the pulſe does not riſe to above 100 or 110, it may be conſidered as favourable. When the countenance has a natural appearance, the eyes are not dim or heavy, the patient lies in a natural poſture, (ſee DECUBITUS,) the breathing is eaſy, the voice natural, and the appetite returns, all theſe muſt be deemed favourable ſymptoms, as they indicate that there is no failure of the vital powers. When the pulſe is obſerved to riſe in ſtrength, in the latter periods of the diſeaſe, with an abatement of the ſtupor, tremor, and other affection of the nervous ſyſtem, it is favourable, implying that the morbid condition is not ſo ſevere as to reſiſt the influence of medicines.

In intermittent fevers the previous occurrence of but a ſmall number of paroxyſms is favourable; for the ſhorter the duration of the diſeaſe, the more eaſily it is cured. The poſtponing of the paroxyſm, or its occurrence later than the regular hour, is a favourable circumſtance; as is alſo that gradual change of the whole train of ſymptoms, until the fit at length becomes incomplete, either in reſpect to the cold, hot, or ſweating ſtage. The more complete the criſis and the interval between the paroxyſms, the more effectual the medicines given.

Unfavourable Symptoms.—The degree of danger, which is to be anticipated in ſevere fevers, is principally indicated by the two following circumſtances; *viz.* by exceſſive action or excitement; and by exceſſive debility, or failure of the *vis vitæ*, or nervous power. The firſt of theſe conditions, generally, is obſerved chiefly in thoſe fevers which have been called ardent, or inflammatory; but, partially, that is, in individual organs, it is not uncommon in all forms of fever. The ſecond, or exceſſive failure of the vital powers, is peculiar to fevers of the low nervous or typhous kind.

The ſymptoms of exceſſive action of the vaſcular ſyſtem, which are neceſſarily unfavourable, (for the powers of life may be exhauſted by ſuch action,) are a ſtrong, hard, and frequent pulſe; an intenſe heat on the ſurface; a quick reſpiration; a dry and parched tongue, without much fur, or that of a light colour; a violent delirium, eſpecially when commencing early; a ringing or other noiſe in the ears; intolerance of light, with a conſiderable redneſs of the eyes; intenſe thirſt; conſtant watchfulneſs, and reſtleſsneſs, with acute head-ache, or violent pain in the ear, and much throbbing of the temporal and carotid arteries. Theſe laſt-mentioned ſymptoms imply a violent action of the veſſels in the brain, approaching to inflammation, with a long continuance of which the exiſtence of the ſafety of that organ, or of life itſelf, is incompatible. If any other of the large or important viſcera are attacked with inflammation, as the *lungs*, *liver*, *inteſtines*, &c., the danger is likewiſe conſiderable. The ſymptoms, which denote the occurrence of ſuch inflammation, will be found deſcribed under the proper heads. See PNEUMONIA, HEPATITIS, ENTERITIS, &c.

The ſymptoms of a failure of the vital powers, however, which are more common in the fevers of this country, are leſs under the controul of medicines, and therefore more dangerous; and more eſpecially when conjoined with a congeſtion, or low degree of inflammation, in any of the important viſcera. We ſhall note theſe ſymptoms of failure of the *vis vitæ*, as they are connected with, and exhibited by, the diſordered ſtate of the functions of the leading organs. It has been ſtated, under a former article, that death is always occaſioned by an interruption of the functions of the brain, of the heart, or of the lungs (ſee DEATH); and accordingly the ſymptoms which occur in the functions of the ſenſorium, and in the circulation, and reſpiration, in fevers, are thoſe which mark the greateſt degree of danger.

The defect of energy in the ſenſorial functions is indicated by the extreme muſcular debility, or proſtration of ſtrength, in the latter periods of continued fevers. Thus, if the patient is unable to ſupport himſelf on either ſide in bed, but lies conſtantly on his back, and even ſlides to the foot of the bed, a dangerous debility is indicated. Tremors of the hands, (as well as of the tongue, when protruded,) and of other parts, which with a ſlight increaſe paſs to ſubſultus or ſtarting of the tendons, and theſe again into convulſions, are bad ſymptoms, as they imply an imperfect and irregular diſtribution of the nervous influence from the brain. After the tremors and ſubſultus tendinum patients frequently recover; but rarely, if ever, when convulſions ſupervene. Sir John Pringle remarked, that a tremor of the hands in the beginning of fever was one of the moſt conſtant ſigns of that fever being of a typhous nature. (Loc. cit. part iii. chap. 7. § 2.) When the diaphragm is affected ſpaſmodically, giving riſe to hiccup, it is a fatal ſymptom; as is likewiſe the relaxation of the ſphincter muſcles of the bladder and the ſtraight gut, (or rectum,) which allows the urine and the ſtools to paſs involuntarily, and which marks an extreme degree of debility. And when the muſcles of the gullet, and thoſe of reſpiration, become ſo far enfeebled, that the act of deglutition becomes difficult or impracticable, and the breathing is ſhort and very laborious, death is generally to be conſidered as near at hand. The foaming at the mouth, and the rattling noiſe in the throat, which is called by nurſes the dead-rattles, are the ſtill more immediate precurſors of death; and are occaſioned by air of reſpiration paſſing through the mucus and ſaliva, collected in the mouth and throat from total inability of ſwallowing it. Other unfavourable ſymptoms, indicating the deficiency of the nervous power, are found in the different degrees of ſtupor and delirium, which are more indicative of danger, in proportion as they appear earlier in the diſeaſe; but which often occur, nevertheleſs, to a very conſiderable extent, in caſes which terminate well: ſo that we muſt take the other ſymptoms into conſideration before we decide upon the danger of theſe. Dr. Fordyce has ſtated, that "although the patient ſhould be inſenſible to all external objects; though he ſhould ſleep very little, or ſcarcely at all; yet, if the deglutition and reſpiration ſhould remain unimpeded, the patient is not to be deſpaired of; it happens moſt commonly that he recovers. But if he reſpires with great difficulty or hardly at all, or if the deglutition be almoſt totally prevented, or if attempting it throws the patient into

couvulſive

convulſive contractions, he rarely recovers." (Third Diſſert. on Fever, part i. p. 111.) Nevertheleſs, he juſtly eſtimated the unuſual continuance or increaſe of delirium as a dangerous ſymptom : for, " on the other hand," he adds, " if the other febrile appearances do not keep pace with the delirium ; though the pulſe ſhould become more ſlow and leſs obſtructed ; though the tongue ſhould become cleaner and moiſter ; though the colour of the ſkin ſhould become more natural, the ſecretory veſſels more relaxed ; if, however, the delirium ſhould ſtill continue, without ſtupor or deafneſs, and the other marks which have been pointed out as accompanying fulneſs of the veſſels of the brain ; in ſuch caſe, notwithſtanding the practitioner and by-ſtander are flattered, the patient is frequently cut off." (Ibid.) The more active delirium is often accompanied with an inflammatory condition of the brain, even in fevers ariſing from contagion, in which the other organs evince a defect of power, and the reſt of the ſymptoms are alſo indicative of great debility : this combination of a local inflammatory action with general defect of power, whether it be conſidered as implying an inequality of the diſtribution of nervous influence, or be explained by any other hypotheſis, is invariably dangerous, in whatever organ the inflammatory action takes place, but particularly when it is in the brain. It is neceſſarily embarraſſing to the phyſician, and difficult to treat ſucceſsfully, from the oppoſite nature of the remedies required for the ſuppreſſion of the local inflammation, and of the general proſtration of ſtrength ; the nature of the one affection abſolutely contra-indicating the treatment, which the nature of the other as decidedly requires. Connected with the defect of ſenſorial power, the abſence of thirſt, while the tongue and mouth continue exceedingly dry and parched, is deemed an unfavourable ſymptom ; and a delirious patient fancying himſelf well, is equally unfavourable, as implying a great obtuſeneſs of the ſenſations.

In reſpect to the circulation, all unuſual perturbation in the action of the heart and arteries is in ſome degree unfavourable ; but eſpecially extreme frequency and feebleneſs of the pulſe, and irregularity. When the pulſe beats above 120 times in a minute, or more, in fever, it muſt be conſidered as an unfavourable ſymptom ; when it reaches 130, or upwards, the prognoſis is extremely unfavourable. Although in ſome diſeaſes, as in hydrocephalus, the pulſe has been counted at upwards of 200 beats in a minute ; yet, in fever, before it comes to 150, it is generally too ſmall and feeble to be counted at the wriſt, and the caſe is then to be conſidered as deſperate ; the pulſe, indeed, has ſometimes been ſo obſcure as not to be felt at the wriſt, for a day or two before death, when it might be felt at the temples, or in the axilla. In this ſtate, the extremities are generally cold, which is another fatal ſymptom, when combined with thoſe before-mentioned. Sometimes, from an irregularity in the action of the heart, the pulſe intermits. An intermitting pulſe, according to Dr. Fordyce's opinion, " is always a very dangerous ſymptom, excepting where it alſo took place when the patient was in health, and before the diſeaſe aroſe ; but in the attack it is particularly hazardous." (Firſt Diſſert. p. 85.) It is certain, however, that an intermitting pulſe occurs in ſome caſes along with favourable ſymptoms ; we have ſeen it in a few caſes, and only under ſuch circumſtances, in all of which recovery took place. It is remarked by Dr. Gregory, the preſent profeſſor of phyſic at Edinburgh, that when the intermiſſion is connected with an obſcurity or indiſtinctneſs of the pulſation, it is always very unfavourable. Frequent irregular fluſhes in the face, and other parts of the ſurface, are alſo among the unfavourable ſymptoms, as implying great irregularity of the circulation.

Great derangements of the reſpiration, whether ſuch as denote a degree of inflammation in the lungs, (conſtituting the *pneumonia typhodes* of authors) which, from the contra-indications already mentioned, is extremely difficult and embarraſſing to the practitioner, or ſuch as denote the failure of the muſcular powers, before alluded to, are always extremely unfavourable ſymptoms.

Deficiency of the nervous or vital power is farther indicated by the effuſions of blood which take place from the extremities of the arteries under the ſkin, forming the *petechiæ*, *vibices*, and blotches, before deſcribed. Theſe are always ſymptoms of a ſevere diſeaſe, but far from being mortal. The larger they are, and the nearer they approach to purple in their colour, the more they are to be dreaded. (Pringle, loc. cit.) Dr. Huxham obſerves, that " when black, livid, dun, or greeniſh ſpots appear, no one doubts the malignity ; the more florid, however, the ſpots are, the leſs is to be feared ; it is a good ſign when the black or violet petechiæ become of a brighter colour. The large black or livid ſpots are almoſt always attended with profuſe hæmorrhages. The ſmall duſky brown ſpots, like freckles, are not much leſs dangerous, than the livid and black ; though fluxes of blood do but ſeldom accompany them. The vibices, or large livid or dark greeniſh marks, ſeldom appear till very near the fatal period." (Loc. cit. chap. viii.) The paſſive hæmorrhages mark a greater degree of the ſame condition of the ſolids and fluids. Black and very fœtid ſtools are bad, as indicating a ſtrong putreſcent tendency of the bile and ſordes in the bowels, and as partly ariſing from blood effuſed into the canal. The urine ſometimes depoſits a black and fœtid ſediment, which conſiſts of effuſed blood, and is equally unfavourable. Theſe, together with the black fur which collects about the teeth and mouth, the fœtid breath, the diſpoſition to gangrene in parts inflamed by bliſters, or by the preſſure of the body in bed, the looſe texture, and black colour of the blood, &c., are the ſymptoms, which have been conſidered as denoting a *putrid* condition of the fluids in theſe forms of fever. It cannot be queſtioned, that there is often a putreſcent *tendency* in the circulating fluids and in the ſolids, ſo that they readily undergo the proceſs of putrefaction, when diſcharged or after death ; but it is well aſcertained, and has been confirmed by direct experiments, that an actually putrid ſtate of the ſmalleſt portion of the circulating fluids is incompatible with life. It is ſufficient, however, to know that theſe ſymptoms denote great danger, or a great tendency to death, and to have learnt from experience, the remedies which contribute to remove the ſymptoms, and to counteract that tendency.

The changes which take place in the urine were formerly much attended to, and although not ſo much is to be learnt from its appearances, reſpecting the nature and progreſs of the fever, as was once ſuppoſed, nevertheleſs this excretion ought not to be neglected by the practitioner. It is an unfavourable ſymptom when the urine, after having been turbid, becomes again pale and limpid ; as it implies a return of the torpor or conſtriction of the extreme veſſels, *i. e.* a renewal of the febrile attack, and is therefore commonly followed by other bad ſymptoms, as by delirium, congeſtions in different organs, &c. Incontinence of urine, whether dependent on a laxity or paralytic ſtate of the ſphincter muſcle of the bladder, or whether the urine is paſſed involuntarily from a ſtupor or indolence of the patient, is always unfavourable : if this is overlooked, excoriations are apt to take place from the patient lying wet, whence inflammation and ſometimes gangrene ariſe. A difficulty in diſcharging the urine, or paſſing it frequently in ſmall quantities, indicate conſiderable irritation and congeſtion of the bladder, and are therefore bad ſymptoms: a ſuppreſſion of urine may be conſidered as one of the worſt ſymptoms of fever. When the urine exhales an offenſive odour, or is black in its colour, eſpecially when containing the black or bloody ſediment before mentioned, it indicates a ſtate of the body which is dangerous. Even the ordinary healthy appearance of the urine, combined with ſymptoms of ſevere fever, is conſidered as indicating an unfavourable ſtate. (See Lommius, Medicinal Obſervat. lib. i. p. 5.)

Vomiting, eſpecially of blood, or of matters of bad colour and ſmell, is a ſymptom of extreme danger. Obſtinate coſtiveneſs in the latter ſtage of fever, which is generally accompanied with ſevere head-ache, is very unfavourable. It ſeems to imply great torpor in the bowels, in conſequence of the affection of the nervous ſyſtem. Diarrhœa, in the late periods of fever, is generally unfavourable, eſpecially when the fæces are liquid, and at the ſame time very pale, or black, and fœtid: the pale colour implying the abſence of the bile and proper fluids of the inteſtines; the black and fœtid condition indicating a corrupted ſtate of the bile and other ſecretions, or a mixture of blood, and a putreſcent tendency of the whole contents of the bowels. A more copious diſcharge of unmixed blood from the inteſtines is a dangerous ſymptom; if hiccup or convulſions follow it, death generally ſoon enſues. This condition of the bowels ſeems to ariſe in many caſes from a neglect of opening them, or removing the ſordes in the beginning. A great diſtenſion of the abdomen, or of the epigaſtric region, ariſing from flatus, which the ſtomach and inteſtines have not ſufficient power to expel, is often among the late and fatal ſymptoms of fever.

The changes of the countenance afford very important indications in reſpect to the ſeverity and probable event of the diſeaſe. With a ſmall ſhare of experience, indeed, any perſon will recognize fever, from inſpection of the countenance alone: and the diſeaſe never advances to a dangerous ſtate without being accompanied by proportionate alterations in the features. In extreme debility, the eyes are often much ſunk or collapſed; ſometimes they remain fixed and unmoved, which ſtate is connected with the coma and ſtupor; and occaſionally ariſes from a ſpaſm of the muſcles of the eye-ball, in which caſe they are alſo ſometimes prominent; at other times there is a conſtant rolling of the eyes, which is often connected with delirium: or there is a diſtortion, or ſquint, which commonly implies ſome preſſure or other affection of the optic nerves. All theſe are of courſe unfavourable ſymptoms; as is alſo that curious defect of viſion, from impaired ſenſibility of the retina, which gives riſe to the appearance of *muſcæ volitantes*. When the white part of the eye is principally ſeen, the pupil being turned upwards, and the upper eye-lid a little let down, it is unfavourable, as implying a ſpaſmodic contraction of the muſcles of the eye-ball, and great relaxation in thoſe of the eye-lid. The prognoſis is alſo bad, when a ſort of film is formed over the eye, or mucus collects within the eye-lids, on their edges, or at the angles of the eye, or when the cornea is red; or when one eye ſeems larger than the other, implying irregular action of the muſcles. Any diſtortion of the features is a bad ſymptom, for the ſame reaſon, indicating the great affection of the functions of the ſenſorium.

Great reſtleſſneſs, a conſtant motion of the arms, uncovering the boſom, or the arms and legs, which nevertheleſs are not hot, picking at the bed-clothes, as if to catch flies or inſects, grinding the teeth, (which is a ſpaſmodic affection of the muſcles of the lower jaw,) are all ſymptoms of conſiderable danger, as indicating great derangement of the nervous ſyſtem. The changes of the voice, as connected with debility of the muſcles of reſpiration, as well as of the leſſer muſcles of the larynx, are alſo unfavourable ſigns. The tone and articulation are thus variouſly altered; and the thick black cruſt and fur which collect on the tongue and lips, and in the fauces, farther contribute to impair the ſpeech, by preventing the free motions of thoſe parts. A cold ſweat, cold extremities, and great collapſe of the countenance, together with laborious reſpiration, and rattling in the throat, are ſigns of impending diſſolution.

The cauſes of Fever.—At preſent we ſhall confine our attention to the remote cauſes of fever; the proximate cauſe will be the ſubject of diſcuſſion in the ſequel. (See CAUSE, in *Medicine.*) It is not always eaſy to diſtinguiſh between the *prediſpoſing* and the *exciting* cauſes of fever; thoſe circumſtances which have been ranked among the latter by ſome phyſicians have been conſidered by others as operating only in the former way; and it would ſeem that in certain caſes, where the prediſpoſing cauſes are applied ſuddenly or to a great extent, they actually become exciting cauſes of the diſeaſe. The middle periods of life appear to be more liable to fever, than either of the extremes of old age or infancy. Inflammatory fevers in particular are more readily produced in the vigour of the conſtitution, or in youth, from the period of puberty to the age of 35 or 40. Whatever produces either of the oppoſite ſtates of plethora and ſtrength, or inanition and debility, prediſpoſes the habit to fever, and favours the operation of the exciting cauſes: plethora giving a prediſpoſition to fevers of the inflammatory kind, while inanition prediſpoſes to intermittents, remittents, and to the nervous or typhous fever from contagion. Hence, with reſpect to the laſt mentioned circumſtance, the connection between *bad diet*, or *ſcarcity of food*, and fever, has been obſerved from the earlieſt periods of hiſtory, and peſtilence and famine have been commonly mentioned together. It is probable that the extenſive occurrence of contagious fever in London, during the winters of 1799 and 1800, was occaſioned by the prediſpoſition to be affected by contagion, which the ſcarcity of proviſions in thoſe years produced; and that the almoſt total diſappearance of ſuch fever, ſince that period, muſt be aſcribed to the abſence of ſuch prediſpoſition; ſince the exciting or occaſional cauſes continue to exiſt as before. Galen juſtly remarks, "Oportet enim hoc in toto ſermone memoria repetere, quod nulla cauſarum ſine patientis aptitudine agere poteſt." (De. Differ. Febr. Tranſl. of Leonicenus, lib. i. 1809.) It is not improbable, however, that the depraved aliment, which is uſed in times of ſcarcity, may of itſelf actually produce fever. The weakneſs produced either in the nervous ſyſtem, by depreſſing paſſions, ſuch as fear and grief, or in the ſanguiferous ſyſtem, by great evacuations, appears to conſtitute a great prediſpoſition to be affected by fever. With reſpect to the *depreſſing paſſions*, there cannot be a doubt of the influence which they exert in prediſpoſing the body to ſuffer from the exciting cauſes of fever. The obſervation that the panic occaſioned by the prevalence of a contagious epidemic diſeaſe, tends to favour its progreſs, is as old as Thucydides; who has mentioned, that thoſe who were low in ſpirits, and felt much fear and anxiety during the dreadful peſtilence which he has deſcribed, were cut off moſt ſpeedily. Diemerbroeck quotes an obſervation of Pigræus, who compares the effect of imperfect aliment on the body with that of the depreſſing paſſions on the mind, in facilitating the acceſs of the plague. "Sicut mala victûs ratio præparat humores, ſic animi paſſiones præparant ſpiritus ad recipiendam peſtem; et triſtitia, terror, ira, ac metus, ſunt pabulum ac nutrimentum peſtis." And Bauderonus obſerves, "Confidentes ut plurimum ſervantur; contra meticuloſi facile corripiantur." (See Diemerbroeck, de Peſte, lib. i. cap. 8. § 9. and again, lib. ii. cap. 7. Annot. where much evidence on this point is collected.) The debility occaſioned by *fatigue*, from violent or long continued exertion, is another cauſe which prediſpoſes the body to be affected by the exciting cauſes of fever. This is, without doubt, one of the reaſons why ſoldiers, harraſſed by fatigues of a campaign, ſo readily fall into fever when confined in hoſpitals and barracks. The fact was ſo generally obſerved, at the time of the epidemic fever which Diemerbroeck has deſcribed, that many among the loweſt people abſtained from hard labour; even the peaſants during the hay-harveſt were unwilling to mow and collect the hay, being taught, by many lamentable examples, that thoſe who undertook any ſevere work were immediately afterwards ſeized with the plague. (Loc. cit.) It is probable, indeed, that very violent exerciſe, as well as violent and ſudden guſts of paſſion, may at once throw the ſyſtem into a febrile ſtate: we are certain that an ephemera, beginning with ſhivering, which is ſucceeded by heat, and, laſtly, by ſweating, is not an uncommon reſult of a ſevere day's journey, or labour, in thoſe who are unaccuſtomed to ſuch exertion. Exceſs in the gratification of the venereal appetite, as contributing to debilitate greatly, eſpecially the nervous ſyſtem, is juſtly ranked among the prediſpoſing cauſes of fever. Evidence of the pernicious influence of this exceſs was abundantly manifeſt during the laſt plague at Marſeilles, in which the recently married people ſuffered greatly. Immoderate ſtudy or other application of the mind, which not only implies a ſedentary life, but particularly an encroachment on the hours of ſleep, which greatly debilitate and exhauſt the nervous ſyſtem, alſo favours the action of the exciting cauſes of fever, if it does not actually in ſome caſes bring it on.

Yet notwithſtanding the unqueſtionable influence of a debilitated ſtate of the conſtitution, in general, in giving a prediſpoſition to fever, it has been obſerved, that perſons labouring under particular diſeaſes, which are connected with much debility, are not liable to be affected by the exciting cauſes of fever. Dr. Gregory remarks, in his lectures, that he has known perſons much debilitated by dropſy, and pulmonary conſumption, who have been greatly expoſed to the operation of contagion, without being attacked by fever; and Dr. Lind obſerves, that thoſe who labour under ſcurvy are leſs liable to be attacked with fever from contagion, than thoſe in health. (Treatiſe on Scurvy.)

There is a particular prediſpoſition attached to certain conſtitutions, (which are not to be diſtinguiſhed by any external character,) to be affected by the exciting cauſes of fever, upon every ſlight expoſure to them. This is daily exemplified in reſpect to contagion, and is often obſerved with reſpect to the effluvia of marſhes. The prediſpoſition to be affected by both theſe cauſes, but more eſpecially by the latter, is diminiſhed by the habit of expoſure; ſo that new-comers are more certainly ſeized with intermittent and remittent fevers, for inſtance in the countries where they prevail, than the inhabitants; and the attendants on patients labouring under continued fever are perhaps leſs liable to be infected than viſitors. The greateſt prediſpoſition to intermittents appears to be occaſioned by a previous attack of the diſeaſe, inſomuch that a relapſe is often produced, at ſome diſtance of time by very ſlight cauſes, and even, it would appear, without expoſure to the original exciting cauſe.

Particular ſeaſons, eſpecially thoſe in which great heat prevails, or, in low countries, thoſe which are very wet, ſeem to give riſe to a great prediſpoſition to fevers; the hot ſeaſons producing a tendency to bilious and inflammatory fevers, the wet to intermittents and remittents, and the combination or alternation of the two is particularly pernicious. The hiſtory of medicine ſhews us, that it is in ſuch ſeaſons that contagious and peſtilential fevers have moſt generally prevailed. (See EPIDEMIC.) Great heat, indeed, appears to be frequently an exciting cauſe of fever, eſpecially in warm climates. (See INSOLATION.) An expoſure to cold and moiſture appears alſo to favour the operation of the exciting cauſes of fever, eſpecially of the miaſmata of marſhes in the production of intermittent and remittent fevers. It is hence, probably, that the night-air appears to be ſo fatal near the coaſts in tropical climates, as related by Dr. Lind, Dr. Badenoch, (Med. Obſ. and Inquir. vol. iv. p. 156.) Bontius, Rouppe, and others. Dr. Lind has ſtated, that, "during the ſickly ſeaſon, a boat, belonging to the Medway man of war, which attended on ſhore every night to bring freſh proviſions, was three times ſucceſſively manned, not one of her crew having ſurvived that ſervice."

We muſt here notice a circumſtance reſpecting the prediſpoſition to fevers, in warm climates, which was firſt noticed by Dr. Lind, of Windſor, in his inaugural eſſay, publiſhed at Edinburgh in 1768, and afterwards more particularly examined by Dr. Jackſon and Dr. Balfour; namely, the influence of the moon, or of the ſun and moon conjointly, in giving a prediſpoſition to fevers to the human body. Dr. Mead, indeed, had collected ſome evidence of the influence of theſe luminaries in this climate, (ſee his treatiſe De Imperio Solis et Lunæ,) but that influence has been ſaid to be much more obvious in tropical countries, in producing relapſes or firſt ſeizures of fever. Dr. Lind obſerved eight ſeamen attacked by a relapſe at the ſame time, during the occurrence of a lunar eclipſe, which of courſe implied a full moon. Dr. Jackſon made ſome obſervations on the ſubject in 1776, in the Weſt Indies, and found that of 30 caſes of remitting fever, 28 had happened on one or other of the ſeven days preceding a new or full moon; in the following years his obſervations were continued, and ſeemed to confirm this reſult. (See London Med. Journal, vol. viii. p. 25.) In 1785, Dr. Balfour publiſhed "A treatiſe on the Influence of the Moon in Fevers," in which he ſtates that the attack of the bilious remittent fever of Bengal almoſt invariably commenced on one of the three days which immediately precede and follow the change of the moon; and that the changes of this planet are no leſs remarkable for occaſioning relapſes. "For my own part," he ſays, "I have obſerved this tendency to relapſe at the full and change invariably for theſe fourteen years; and in particular caſes can prognoſticate the return of the fever at theſe periods, with almoſt as much confidence, as I can foretel the revolution itſelf." Dr. Lind, however, fifteen years after the publication of his theſis, ſeems to have changed his opinion, and was diſpoſed to attribute the frequent attacks and relapſes of theſe fevers "to the noxious vapours ariſing from the ſwamps, produced by the high tides, which happen at the time of the full and change of the moon, and, overflowing a great part of the country, leave it in a marſhy ſtate at low water. This I am induced to believe to be the ſole cauſe," he adds, "firſt, becauſe this lunar influence entirely ceaſes, when the patient is removed but a few miles from the ſwamps that are left uncovered by the tide at low water; ſecondly, becauſe intermittent fevers are not obſerved to follow lunar periods at many places within the tropics, even at Canton, (where there is a large river and great tides,) by reaſon of the induſtrious Chineſe keeping the river within its bounds." (Lond. Med. Journal, vol. viii. p. 146.) But Dr. Jackſon contends, that at Savanna la Mar, in Jamaica, the connection of the moon with fevers is more remarkable than in any other part of the world, in which he has been; although the tide ſcarcely ever riſes eighteen inches, and the beach is ſandy. (Ibid. p. 302.) Dr. Balfour has ſupported his original doctrine in ſubſequent publications "on ſol-lunar influence;" to which we refer the reader for farther evidence. See alſo Dr. Jackſon's Treatiſe on the Fevers of Jamaica.

Exciting cauſes of Fever.—Dr. Cullen was of opinion that idiopathic fevers were induced by the operation of two exciting cauſes only; namely, *contagion*, or human effluvia, and the *miaſmata* of marſhy or ſwampy ground; the former giving riſe to continued, and the latter to intermitting and remitting fevers. (See Effluvia, in *Medicine*.) It ſeems probable, however, that this opinion was adopted rather in conformity with his hypotheſis reſpecting the nature of fever, than from a comprehenſive obſervation of facts; and his reaſoning in ſupport of it is liable to much objection, if not to an eaſy refutation. "As fevers are ſo generally epidemic," he ſays, "it is probable, that ſome matters floating in the atmoſphere, and applied to the bodies of men, ought to be conſidered as the remote cauſe of fevers; and theſe matters preſent in the atmoſphere, and thus acting upon men, may be conſidered either as *contagious*, that is, effluvia, ariſing directly or originally from the body of a man under a particular diſeaſe, and exciting the ſame kind of diſeaſe in the body of the perſon to whom they are applied; or *miaſmata*, that is, effluvia, ariſing from other ſubſtances than the bodies of men, producing a diſeaſe in the perſon to whom they are applied." (Firſt Lines, § lxxviii.) Now, it has been demonſtrated by modern experiments, that contagious effluvia are not capable of floating in the atmoſphere, to the diſtance of even of a few yards, without loſing their infectious quality, and that the noxious powers of miaſmata are ſimilarly, though not equally, limited. (See Contagion.) And, although fevers are often epidemic, yet they are ſeen daily ſporadic, *i. e.* limited to individuals, who breathe the ſame air with thouſands who eſcape; and we have endeavoured to ſhew, that the ſuppoſition of the exiſtence of thoſe cauſes of epidemics floating in the atmoſphere, is not only gratuitous, but abſolutely in oppoſition to a number of facts. (See Epidemic.) Beſides, even vulgar obſervation has left no room for doubt, that many of the circumſtances, which induce a prediſpoſition to fever, or favour the operation of contagion, miaſmata, and other exciting cauſes, (if ſuch exiſt,) are themſelves the exciting cauſes of the ſimpler forms of fever, whether denominated ephemera, ſimple fever, ſynochus, or by ſome other term. That ſuch fevers are frequently occaſioned by expoſure to great heat, and to cold and moiſture, by fatigue, anxiety and grief, watching, intemperance, &c. is admitted by phyſicians in general; (ſee Fordyce Firſt Diſſ. on Fever, p. 136 to 179. Huxham on Fevers, p. 2. &c.) and when it is conſidered how frequently we ſee individuals affected with ſevere and even fatal fevers, when no ſource of contagion was known, when no epidemic was prevalent, and when the reſt of the family, whoſe mode and circumſtances of life were in all points the ſame, were not affected by any diſeaſe, we can ſcarcely heſitate in aſſigning the origin of the fever to ſome one of the cauſes juſt enumerated. The ſtatements of the ancient phyſicians accord accurately with thoſe of the moderns, juſt quoted, on this ſubject. "Quod igitur ex laboribus," ſays Galen, "irâ, triſtitiâ, et ſolis ardoribus, atque frigoribus, vigiliis, et cruditatibus, ebrietatibus, et crapulis, quidam febricitare conſpiciuntur, nemo eſt qui, ipſâ doctus experientiâ, non agnoſcat." (De Different. Febr. lib. i.)

Contagion is, however, the exciting cauſe of the moſt dangerous and fatal forms of continued fever, whether occurrring in gaols, hoſpitals, ſhips, camps, or among the dwellings of the lower claſſes of the people, and thence denominated gaol-fever, hoſpital-fever, &c. or malignant, putrid, contagious fever, typhus, &c. Of the nature, origin, and mode of communication of contagion, as well as of the means of preventing its operation, avoiding its influence, and deſtroying its powers, we have already treated at length in a preceding article, to which we refer the reader. See Contagion.

Many phyſicians of the laſt century were of opinion that intermittent fevers were produced by contagion; among theſe were Boerhaave, Van Swieten, Baglivi, Cleghorn, and Fordyce. It is probable that theſe fevers may have ſometimes ſpread in hoſpitals, like eryſipelas, puerperal fever, and other diſorders, not in themſelves contagious, before the preſent ſyſtem of ventilation and cleanlineſs was fully adopted; but, we believe, that few phyſicians at preſent ſupport that opinion. Lanciſi was the firſt who pointed out the connection of intermitting fevers with the effluvia of marſhy ground; his obſervations, however, were long overlooked by medical men. But, in our own country, we have now ample evidence of this connection: it is chiefly in the low and fenny counties, as in Lincolnſhire, Cambridgeſhire, the hundreds of Eſſex, &c. that agues originate; and thoſe which are ſeen in London, and other parts remote from the fens, can generally be traced to thoſe counties. In the neighbourhood of the Pontine marſhes, near Rome, the fact is ſo univerſally known, that the villages are all perched upon the hills; and there are ſcarcely people ſufficient in the levels to expedite travellers from the poſt-houſes. The army-phyſicians have alſo obtained much deciſive evidence relative to this fact. The nature of the exhalations of marſhes, which give riſe to intermittent and remittent fevers, is not however aſcertained: it is obvious that it is not moiſture alone, evaporating from the ſurface of the marſhes; it appears to be rather the reſult of the decompoſition of animal and vegetable matter in water. (See Miasmata.) Sir John Pringle remarks, "that neither canals, nor even large inundations, where the water is deep, are nearly ſo dangerous, or exhale ſo much noxious vapours, as marſhy grounds, or meadows that have been once floated and but lately drained; and that fields, though dry in appearance, may yet be moiſt by the tranſpiration of the ſubterraneous water." (On Diſeaſes of the Army, part ii. chap. 2.) "It has been generally remarked," Dr. Rollo obſerves, "that the effluvia of marſhes are moſt active, when the water is drained off, and the earth appears, which was certainly the caſe in St. Lucia: the greater part of the regular intermittents, that is, of the milder fevers we had, happened when the rains were moſt frequent, and before the ſtagnating pools diſcovered their bottoms; but the moſt dangerous remittents appeared when the marſhes had no water, but a ſlimy matter on their ſurface. Cairo is healthy while the Nile inundates the neighbouring lands; but when the mud is expoſed, on the retiring of the river within its banks, the fevers begin to rage as the miaſmata riſe. Theſe effluvia, like thoſe of contagion, as we have already ſtated, are limited in their operation, we mean in the diſtance to which they are capable of being communicated through the air, in an active ſtate. Dr. Lind obſerves that, in ſhips lying at ſome diſtance from a ſwampy ſhore, the men eſcape intermittent fevers, though immerſed in fogs; but when they approach near ſhore, or communicate with the land, they become affected. Thoſe who were ſent on ſhore for proviſions, eſpecially in the night, as mentioned by Dr. Badenoch, ſpeedily periſhed in conſequence of the fever thus induced; partly, perhaps, in conſequence of a pre-diſpoſition to be readily affected by the miaſmata occaſioned by the cold of night, and partly from the condenſation and more active ſtate of the miaſmata ariſing from the ſame cauſe. Theſe effluvia riſe to ſo ſmall a height, that ſoldiers lying in the firſt floors of barracks in Jamaica were leſs affected than thoſe in the ground floor, as ſtated by Dr. Hunter: who has alſo affirmed, that a few hundred yards often include the limits between healthy and unhealthy ground in camps. (Obſervat. on the Diſeaſes of the Army in Jamaica.) See EPIDEMIC, under the ſecond head; where other facts are enumerated, and ſome obſervations added reſpecting the diſappearance of intermittent and remittent fevers in London, and other large cities, in conſequence of the removal of the ſources of miaſmata, by improvements in the ſtructure, and cleanlineſs of the ſtreets, &c. Under all theſe circumſtances, intermittent and remittent fevers are moſt prevalent in autumn, in which ſeaſon, eſpecially when wet, they are the fatal endemics in low and damp countries. Of this we have a recent example in the mortality occaſioned by the late unfortunate expedition to the iſland of Walcheren; which, indeed, might have been anticipated; (Oct. 1809,) for ſir John Pringle long ago obſerved, when ſpeaking of the United Provinces, "but the air is worſt in Zealand, as that province is not only low and watery, but ſurrounded with the oozy beaches of the eaſtern and weſtern Scheldt, and the moſt marſhy parts of the country; ſo that almoſt every wind, except from the ſea, adds to its native moiſt and unwholeſome air." (Loc. cit. part i. chap. 1.) In the autumn of very wet years, intermittents have been obſerved to occur even in high, and at other times dry ſituations; thus they were produced in certain high parts of Northamptonſhire, where they were not known to have exiſted either before or ſince, in the year 1782, which was remarkable for the wetneſs of the ſummer. (See the Syllabus of Lectures given at Guy's Hoſpital, p. 15.) The operation of heat, in augmenting the deleterious effects of theſe miaſmata, is evident, as well from the general occurrence of intermitting and remitting fevers in the autumnal ſeaſon, as from the more frequent and formidable fevers of this ſort, which are generated in warm climates; witneſs the periodical fevers of Cairo on the retiring of the Nile, and thoſe which occur near the other great African rivers; as on the coaſt of Guinea, where the country is often half depopulated by them, and ſome parts even quite deſerted from this cauſe. (Ibid.) The overflowing of the Euphrates, and the ſtagnation of the water on the adjoining deſert, have always been conſidered as the principal cauſes, eſpecially in the hotteſt ſeaſons, of the fatal remitting fever of Buſſorah. (See Tranſact. of a Soc. for the Improv. of Med. and Chirur. Knowledge, vol. i.) Whence the Arabs ſometimes inundate the deſert, by breaking down the banks of the Euphrates, in order to be avenged on the Turks of Buſſorah. The fevers induced by a ſingle inundation have been known to deſtroy between twelve and fourteen thouſand of the inhabitants of that place. (See Wilſon on Fever, vol. i. p. 193.) It is fortunate, however, that the marſh miaſma is not, like contagion, capable of adhering to clothes, or other ſubſtances; but is diſſipated and becomes harmleſs in the atmoſphere, as we have before obſerved, at a ſhort diſtance from its ſource.

It is worthy of remark, that both contagion and miaſmata, or, to uſe the words of Dr. Cullen, both "human and marſh effluvia," appear at times, to operate rather as prediſpoſing than exciting cauſes; while thoſe circumſtances before enumerated, as inducing a prediſpoſition, become in fact the exciting cauſes of the fever which enſues. It has been obſerved by Dr. Lind, and others, that perſons expoſed to the influence of contagion, ſometimes receive it into the ſyſtem, in which it remains latent, or producing only ſlight indiſpoſition, ſuch as head-ache, languor, &c. for a conſiderable time; when expoſure to cold, an act of intemperance, in drinking, eating indigeſtible food, fatigue, watching, or anxiety ſhall occur, and immediately the contagious fever is produced; which would lead us to believe that many of thoſe perſons who remain uninfected, after conſiderable expoſure to contagion, eſcape in conſequence of the abſence of ſuch exciting cauſe. "The ſame cauſes, which give riſe to relapſes," ſays Dr. Lind of Haſlar, "I am inclined to think do ſometimes *excite*, or render active, an infection, before received into the body, but ſo ſlight, as of itſelf to produce no bad conſequences. I am confirmed in this opinion by the quick and ſenſible effect of infection from bad fevers, when in ſuch a degree as of itſelf to communicate the diſeaſe. But if a perſon perceives no ſymptom of an infection, till many days after having left his place of abode, and is firſt taken ill of it immediately after having been wet with rain, expoſed to cold or damp, or having been guilty of intemperance and exceſſes, it is probable that theſe cauſes have *excited* this dormant poiſon into action; and that, without their influence, it would never have affected the conſtitution." (Lind on Fevers and Infections, chap. ii. § 1.) In a ſimilar manner, the marſh miaſmata often exert no influence on the conſtitution, for ſeveral weeks after the perſon has left the fenny diſtrict, when the ague ſhall be immediately excited by a debauch, a quarrel, being wet or chilled, &c.

Expoſure to *cold* is commonly mentioned among the exciting cauſes of fever; and it can ſcarcely be doubted that the ſimpler forms of fever do frequently originate from this cauſe: and as theſe more ſimple fevers are occaſionally converted into the more ſevere or malignant ſpecies, by the confined or uncleanly ſituation of the patient, by improper treatment, or in conſequence of ſome peculiar ſtate of the conſtitution, ſo *cold* may juſtly be ranked among the common cauſes of fever. This notion, however, as it is popularly entertained, is carried far beyond its juſt extent. We have already ſeen that cold operates by pre-diſpoſing the body to be acted upon by contagion and by marſh miaſmata; and alſo, ſecondarily, by calling into action the dormant poiſon of both ſpecies. In theſe caſes, its operation is only indirect. More commonly the popular opinion ariſes from a miſtake, which conſiſts in ſuppoſing the firſt *ſymptoms*, (*viz.* the ſhivering and ſenſation of cold) to be in fact the *cauſe* of the fever; theſe ſymptoms being conſidered as the effect of an external chill, when they are, in truth, the reſult of the internal condition of the circulation and nervous ſyſtem, as before explained. Hence fevers have been attributed to cold, which proved to be the eruptive fever of ſmall-pox, or meaſles, and, of courſe, originated from contagion. On the whole, expoſure to cold muſt be conſidered as moſt commonly concurring with the noxious effluvia, and other cauſes, in producing idiopathic fever, and not as alone the active agent. Thouſands are conſtantly expoſed to cold in this climate, in whom no fever is excited; and in the great majority of thoſe who are affected by cold, the diſeaſes thus occaſioned are principally the ſymptomatic fevers connected with local inflammation, conſtituting the ſecond claſs of "Phlegmaſiæ" in Dr. Cullen's arrangement, as mentioned in the commencement of this article. The general effects of cold on the human body, as well as its particular effects in the production and alleviation of diſeaſes, have been diſcuſſed at length under a former head. See Cold, in regard to *its action on the living Body.*

It would appear that the effluvia ariſing from animal, and even vegetable ſubſtances, during the proceſs of *putrefaction*, have in ſome inſtances given riſe to fevers of a ſevere and fatal kind. (See Epidemic.) But under what particular combination of circumſtances ſuch fevers have been excited, it were not eaſy to ſtate: it would ſeem, however, that animal putrefaction alone is not capable of producing theſe effects; ſince perſons engaged in particular trades, in which they are much expoſed to theſe effluvia, do not ſuffer from fever, as ſkinners, nightmen, &c.; nor are ſtudents of anatomy particularly affected by fevers from the often very putrid effluvia of a diſſecting room.

A redundance of *bile* has been ſuppoſed to be a common exciting cauſe of intermitting, remitting, and continued fevers, chiefly from the circumſtance, that it is often thrown up from the ſtomach in conſiderable quantity, during the ſickneſs which occurs at the onſet of theſe fevers. But it ſhould be obſerved, that vomiting, however excited, (whether by the commencement of fever, by ſubſtances taken into the ſtomach, or by agitation on ſhip-board at ſea,) if often repeated, with violent ſtraining, generally brings up alſo the contents of the duodenum, and emulges the ducts, which open into that part of the inteſtines. Bile, therefore, and pancreatic juice, are thrown up in the laſt efforts to vomit, but not in the beginning. This appearance of bile, therefore, is not an eſſential part of the attack of fever; it is merely accidental. "If the pancreatic juice," ſays Dr. Fordyce, "had been blue, and had any particular taſte or ſmell, and the bile had been colourleſs, inſipid, inodorous, or as much ſo as the pancreatic juice is, in that caſe, whatever has been ſaid of the redundancy of bile, as an eſſential part of the attack of fever, would have been ſaid of the pancreatic juice." (Firſt Diſſ. on Fever, p. 95.) Dr. Cullen remarks, that the opinion may have been partly countenanced by the fact, that intermitting and remitting fevers, being the effects of marſh effluvia, occur moſt frequently in the warm ſeaſons, and the latter in warm climates, from the influence of which the bile is diſpoſed to paſs, by its ſecretories, in greater quantity than uſual, and, perhaps, alſo changed in its quality; but he conſiders this appearance of bile, when vomiting takes place, as a circumſtance accidentally concurring with the fevers, from the ſtate of the ſeaſon in which they ariſe. (Firſt Lines, § 51.)

When an exciting cauſe of fever has once produced its operation, the conſtant or repeated application of that cauſe is not required to keep up the diſeaſe; on the contrary, the diſeaſe will then go through its courſe, although the cauſe be entirely removed; nay, farther, it will not be increaſed, it is ſaid, in degree or duration, by a ſubſequent application of the ſame cauſe, but will go through its courſe unaltered. (Fordyce, Firſt Diſſert. p. 180, *et ſeq.* alſo in Tranſact. of a Soc. for the Improvement of Med. and Surg. Knowledge, vol. i. art. 1.) Thus, to adduce a palpable example, a ſecond inoculation of ſmall-pox adds nothing to the violence of the diſeaſe produced by the firſt inſertion of the poiſon: thus, alſo, to uſe the words of Dr. Fordyce, "a fever taking place from infection in the moſt wealthy and nobleſt perſons in the country, and treated with all attention, with regard to infection, goes through its courſe in the ſame manner as in a patient in an hoſpital, where there are many others afflicted with the ſame diſeaſe, provided that attention is paid that there ſhall be an equal change of the air of the atmoſphere, and freedom from putrefaction." (Loc. cit. p. 189.) On the whole, this ſtatement may be conſidered as begging the queſtion, and Dr. Fordyce ſeems to have generalized too far, in transferring his obſervation reſpecting ſmall-pox to idiopathic fever. For if, with regard to contagious fever, we produce "an *equal* change of the air" in an hoſpital, as in the chambers of the rich, the contagion cannot be conſtantly applied in any conſiderable quantity. And, with reſpect to intermitting and remitting fevers, it is a well known fact, (even ſtated by Dr. Fordyce himſelf, though explained upon the notion of avoiding humidity,) that thoſe fevers, although they remained obſtinate while the patient continued expoſed to the miaſmata, which produced them, ſpeedily yield to the ſame treatment, when the patient is removed See the Tranſactions before quoted, p. 14.

Doctrines reſpecting the Nature or proximate Cauſe of Fever.—Phyſicians have been eager to explain the nature of diſeaſes from the earlieſt dawn of medical hiſtory, and have too often quitted the laborious taſk of obſervation in purſuit of hypothetical ſpeculations, which have tended to obſcure, rather than to elucidate, the ſcience of pathology, and to retard the progreſs of its improvement. Inſtead of accurately marking and comparing the phenomena of life, and thence deducing the laws of the animal economy, whether in health or diſeaſe, phyſicians have too often contented themſelves with transferring the deductions of the collateral ſciences to the doctrines of life, miſpending their time and talents in finding out analogies, which exiſted only in their own imaginations. Hence not only the fictions of the Greek philoſophy, but the principles of the more certain ſciences, of mechanics, of chemiſtry, of magnetiſm, and of electricity, have been aſſumed in ſucceſſion as explanatory of the action of living bodies, and have each contributed not a little to confuſe the language and opinions of pathologiſts. This is more particularly obvious with reſpect to the doctrines relative to fever; which, from the univerſality of its occurrence, the ſtriking appearances which it exhibits, and the ravages which it has committed in all ages, has always arreſted the attention of mankind, and has employed the pens of the moſt enlightened profeſſors of medicine for upwards of two thouſand years. Nevertheleſs, it is at this moment a ſubject of diſcuſſion, and of much difference of opinion; phyſicians being divided in their views both of the eſſential nature of the diſeaſe, and reſpecting the ſeat which they aſſign to it in the body; and one of the lateſt practical writers on the ſubject, whom we have often quoted, has affirmed, that "what the real derangement in the ſyſtem is, which produces the external appearances in fever, is not at all known." Fordyce.

Although nothing abſolutely ſatisfactory, however, is to be obtained from an inveſtigation of the doctrines which have been promulgated relative to fever, it will be neceſſary to ſtate the outlines, eſpecially of thoſe of modern times, which have aſſumed a ſyſtematic ſhape, and have given colour to the various modes of practice that have been purſued.

Various gratuitous hypotheſes reſpecting morbid derangements of the fluids of the animal body, and the generation of new morbid humours, have prevailed, with occaſional modifications, from the time of Hippocrates downwards: and although in the ſyſtems of Hoffmann and Cullen, and ſtill more completely in thoſe of Brown and Darwin, theſe hypotheſes are rejected, and are alſo exploded among Britiſh practitioners in general, as incompatible with more correct obſervation, they are nevertheleſs the prevalent doctrines of the people at large. (See HUMORAL *Pathology*.) Hippocrates conſidered the morbid heat as the eſſence of fever, and upon this notion he ſeems to have founded his diſtinction of the varieties of the diſeaſe; as the *cauſus*, καῦσος, or burning fever; the *leipyria*, λειπυρία, in which the external parts are cold, while the internal are hot; and the *epialus*, ἐπίαλος, or mild fever, in which there is a ſimultaneous feeling of heat and cold. (See Hippoc. lib. i. and ii. περι νουσων, § 5 (Edit Fæſij. ac Prænot. &c.) Theſe different forms of fever he aſcribes to the ſuperabundance of one or other of the four humours, blood, phlegm, yellow and black bile, (ſee HIPPOCRATES,) and he ſeems to conſider the diſeaſe as the reſult of a conteſt on the part of nature, (the preſiding principle of the animal body,) to expel the morbid humour, or to render it inert and harmleſs by the proceſs of *concoction*.

Paſſing by the abſurd notions of Aſclepiades, reſpecting the motion of atoms or corpuſcles, which, when it was free, conſtituted health, and, when obſtructed, excited fevers, &c. which again differed according to the ſize of the corpuſcles; (ſee Cælius Aurelianus, lib. i. cap. 14.) and the hypotheſes of other ancient phyſicians, which have been imperfectly tranſmitted to us; we come to the doctrines of Galen, which were univerſally received and taught, where ſcience exiſted, for the ſpace of thirteen centuries. The hypotheſis of Galen was little more than an amplification of that of Hippocrates, with which he combined other hypotheſes, deduced from the philoſophy and ſcience of his age, and thus, by giving a ſyſtematic form to the doctrine, and ſupporting it with much learning, he at once multiplied and perpetuated the corruptions of medical ſcience, which the inductive and experimental philoſophy of our own times has not yet exterminated. (See GALEN.) He alſo conſidered the preternatural heat as the eſſence of the febrile ſtate, and enters into ſeveral plauſible ſtatements explanatory of its origin. He obſerves that heat is excited by motion, by putrefaction, by the direct application of heat, as of the ſun or fire, or by the retention of warmth, which ſhould be diſſipated, or by the addition of a ſort of ferment. Whence the exciting cauſes of fevers are eaſily underſtood in regard to their operation: the heat of the atmoſphere, which prevails about the riſing of the dog-ſtar, increaſes the heat of the heart, (being taken in by breathing the hot air,) and alſo the heat of the arteries on the ſurface; over-fatigue and violent exerciſe occaſion heat by the friction of the muſcles, tendons, and joints; depraved and crude aliments produce an acrid and pungent humour, which excites heat; and the putrid miaſms in the air, during the periods of peſtilence, when inſpired, excite putrefaction and heat in the body, eſpecially when the habit is already prediſpoſed to putrefaction, from bad diet, &c. The fevers thus excited are modified by the prevalence or putrefaction of one or other of the four humours of Hippocrates: of the three kinds of intermittents, the quotidian ariſes from the corruption of phlegm, the tertian from that of the yellow, and quartan from that of the black bile. Wherever the heat begins, it extends to the heart, whence the general commotion of the veſſels is excited: "and Nature is employed in exerting her powers, endeavouring to aſſimilate the good humours to the parts which are to be nouriſhed, and to expel the bad humours. But if at any time Nature is unable to expel all the morbid humour, either from its thickneſs, its abundance, or its tenacity, or from ſome obſtruction of the paſſages, or from her own want of power, it neceſſarily will undergo putrefaction, if it remains long in the animal body." But by putrefaction Galen appears to mean any new combination or change of quality, for he includes *concoction* under that term. "Altera autem putrefactio, quam et coctionem eſſe diximus, &c." (De Differentiis Febrium, lib. i. See alſo Van Swieten Com. ad Aph. 730.)

This doctrine, which became known throughout Europe on the revival of learning, kept poſſeſſion of the ſchools until the middle of the ſeventeenth century, when a new light was thrown upon the ſubject of the animal economy by the diſcovery of the circulation of the blood. But in the various parts of this doctrine, afterwards variouſly combined with the ſyſtems which originated with the further progreſs of the collateral ſciences, we ſee the rudiments of moſt of the theories which the modern ſyſtematics advanced; until at length the phenomena, connected with the irritable and ſenſible properties of the living ſolid, were attentively inveſtigated in the courſe of the laſt century. A humoral pathology, connected with the notions of obſtruction, acrimony, lentor, plethora, or putrefaction in the vaſcular ſyſtem, and of a regulating principle, nature, *autocrateia*, *archæus*, *anima medica*, *vis medicatrix naturæ*, or by whatever term it may have been deſignated, was found in all the ſyſtems, down to that of Boerhaave incluſive, whether among the mathematical, chemical, or mechanical ſects. (See MEDICINE.) Hence various means of removing fevers were ſuggeſted, and remedies were employed by one ſet of theoriſts for correcting acrimony, for reſiſting putrefaction, for aiding concoction, for obviating plethora, for evacuating the morbid humours, or for diluting them; and regulations were adopted by ſome for ſupporting the operations of nature, and for removing obſtructions or interferences with them; while others, conſidering the rational ſoul as the directing principle, were content to look on, and truſt to its wiſdom, cultivating what they called the art of medicine *by expectation*; which conſiſted rather in renouncing all art, and in baniſhing all active remedies.

Theſe doctrines, reſpecting the morbid condition of the humours in febrile diſeaſes, and the conflict of nature in attempting to ſubdue their effects, to change their nature, and to expel them from the ſyſtem, &c., originated in ignorance of the ſtructure and operations of the animal frame, were propagated by the bigotry of learning, which would rather err with Galen, than queſtion his authority on matters of the ſmalleſt moment; and were ſtrengthened by the facility with which the new diſcoveries in chemical and mechanical philoſophy combined with them, in explaining the motions of the circulating fluids. They were countenanced alſo by the various diſcharges which occaſionally occur in the criſes of fevers, of which the notion of concoction, or of fermentation and deſpumation, deduced from a chemical analogy, afforded a plauſible explanation. But we have already ſtated, that the inferences drawn from the appearance of theſe diſcharges were incorrect; for that the latter were the ſigns and effects of a favourable change in the diſeaſe, and not the cauſes of it. (See CONCOCTION, and CRISIS.) Nor is the notion of a *materies morbi*, in the fluids in fever, ſanctioned either by obſervation, or by the moſt ſucceſsful plan of cure. When the diſcharges alluded to conſiſt of the ſecreted fluids, they contain nothing which is not ordinarily preſent, although in leſs quantity; when they conſiſt of blood, it cannot be imagined that the ſmall portion evacuated has contained all the morbid humour with which the general maſs was infected. But many fevers are cured without waiting for concoction, or evacuation; and the occurrence of abſolute intermiſſions is not eaſily reconcileable with the exiſtence of ſuch morbid humour.

The dawn of a more correct knowledge of the morbid actions of the animal ſyſtem, of which ſome glimmerings had appeared in the writings of our countryman, Willis, and of Baglivi, (in their treatiſes "de Pathologia Cerebri et Nervorum," and "ſpecimen de febra motrice et morboſâ,") was obvious in the works of Hoffmann, before the middle of the laſt century. He directed the attention of phyſicians to the primary moving powers of the animal frame, the functions of the nervous ſyſtem; functions which, had not the pernicious influence of learned authority led medical obſervers out of the proper train of inveſtigation, could not have been overlooked for ſo many ages. The properties of the living ſolid were now inveſtigated by Gaubius, Haller, and others; even Boerhaave himſelf began to attend to them, and in the fourth edition of his Aphoriſms, (ſee Aph. 755.) added the words, "fortè et *nervoſi* (*ſcil. ſucci*) tam cerebri quanquam cerebelli cordi deſtinati inertiæ," (a ſluggiſhneſs of the nervous fluid communicated from the brain to the heart,) to the ſluggiſhneſs of the arterial fluids, which he had formerly ſtated as the proximate cauſe of intermittent fevers.

From this time the phenomena reſulting from the ſenſorial functions in diſeaſe became the ſubject of more attentive inveſtigation, and hence have ariſen three modern ſyſtems, in which the nature of fever is explained by a reference to theſe functions, to the excluſion of any ſuppoſition of diſeaſe in the fluids, except as an effect of the fever. Theſe are the theories of Cullen, of Brown, and of Darwin. The theory which Dr. Cullen promulgated, from the medical chair in the univerſity of Edinburgh, almoſt rivalled that of Boerhaave in the extent of its reception; and even continues to be adopted, with ſlight modifications, by ſome later writers. (See Currie, Reports on Water, p. 165, 2d edit.) It had the merit of great ingenuity, and of according more completely with the advanced ſtate of knowledge reſpecting the functions of life, than the hypotheſes which preceded it. The Brunonian theory of fever is not particularly prominent in the general ſyſtem of its author, who reduced all diſeaſes to two or three very ſimple principles, without much regard to the variety of phenomena, by which they are characterized. That of Dr. Darwin is more complex, but much more comprehenſive in it's application to the varieties of fever; it is obſcure, however, from the peculiar language in which it is expreſſed. We ſhall ſtate the outlines of each of theſe theories.

Dr. Cullen's Theory.—The firſt change induced in the animal ſyſtem, by the operation of the exciting cauſes of fever, is, in the opinion of Dr. Cullen, a "diminution of the energy of the brain;" which is indicated by all the ſymptoms of the firſt ſtage of fever, as we have already explained. The powers of the body and the mind, the functions of ſenſation and motion, reſpiration, circulation, and ſecretion, all fail, or are diminiſhed in the general debility; but after a certain time, a morbid increaſe of ſome of theſe functions, eſpecially of the circulation, takes place, with an augmentation of the heat. The three ſtates of debility, of cold, and of heat, which regularly ſucceed each other in fever, in the order juſt mentioned, are preſumed to exiſt in the relation of cauſe and effect; the firſt ſtate being the reſult of the ſedative or debilitating influence of contagion, marſh miaſmata, and cold, which are the exciting cauſes. Dr. Cullen acknowledges his inability to explain ſatisfactorily, how the debility produces all the phenomena of the cold ſtage, eſpecially the *ſpaſmodic* conſtriction of the extreme arterial veſſels, which is inferred from the ſuſpenſion of the ſecretions, and the ſhrinking of parts in the cold ſtage, as well as from the continuance of this ſuſpenſion in the hot ſtage, after the action of the heart and large arteries is increaſed. Were the conſtriction of the cold ſtage merely the reſult of the weakened action of the heart, it is ſuppoſed, that, on the return of its ordinary or increaſed action, the conſtriction would be removed, and the ſecretions reſtored. Here Dr. Cullen reſorts to "the *Vis Medicatrix Naturæ*, ſo famous in the ſchools of phyſic," the innate preſerving power of the conſtitution, which has been appealed to for the ſolution of difficulties by all medical theoriſts, from Hippocrates downwards. This "ſpaſm of the extreme veſſels," then, is conſidered as "a part of the operation of the vis medicatrix naturæ;" at the ſame time, Dr. Cullen is of opinion, that, during the whole courſe of fever, there is an atony exiſting in the extreme veſſels, depending on the diminiſhed energy of the brain, and that the relaxation of the ſpaſm requires the reſtoration of the tone and action of theſe. To this atony in the veſſels of the ſkin, he attributes the loſs of appetite, nauſea, and vomiting, the ſtomach being affected by ſympathy. The ſpaſm induced in the extreme veſſels throws a load of blood upon the central parts of the circulating ſyſtem, which proves a ſource of irritation to the heart and arteries, and excites them to a greater action, which continues till the ſpaſm is relaxed or overcome. The hypotheſis is thus briefly recapitulated. "Upon the whole, our doctrine of fever is explicitly this. The remote cauſes are certain ſedative powers applied to the nervous ſyſtem, which, diminiſhing the energy of the brain, thereby produce a debility in the whole of the functions, and particularly in the action of the extreme veſſels. Such, however, is, at the ſame time, the nature of the animal economy, that this debility proves an indirect ſtimulus to the ſanguiferous ſyſtem; whence, by the intervention of the cold ſtage, and ſpaſm connected with it, the action of the heart and large arteries is increaſed, and continues ſo till it has had the effect of reſtoring the energy of the brain, of extending this energy to the extreme veſſels, of reſtoring therefore their action, and thereby, eſpecially removing the ſpaſm affecting them; upon the removing of which, the excretion of ſweat, and other marks of the relaxation of excretories take place." (Cullen, Firſt Lines, § 46.)

Plauſible as this hypotheſis undoubtedly appears, it is liable to ſeveral objections; partly, becauſe it is gratuitous in ſome particulars, and partly, becauſe it is not applicable to all the phenomena of fevers. In the firſt place, it muſt be remarked, that by aſſuming the exiſtence of a peculiar power or agent, ſuch as the vis medicatrix naturæ, we acquire no knowledge, and advance not a ſtep farther in our explanation of the facts, than if we ſtated ſimply that the facts occur. It is an admiſſion, that the facts are inexplicable, that they are part of the phenomena of life, which we deem incapable of farther generalization in the preſent ſtate of our knowledge. This creation of imaginary agents, to account for ultimate facts, has had a pernicious influence in every department of ſcience. What information did philoſophers acquire reſpecting the laws of gravitation, by the ſubſtitution of an ether; or phyſiologiſts, reſpecting ſenſation and muſcular motion, by the ſuppoſition of a nervous juice? Yet upon the ſame footing ſtands this *autocrateia*, or vis medicatrix, in regard to the laws of the animal economy. It is an impoſition, by which we conceal from ourſelves our own ignorance, and prematurely arreſt the progreſs of inquiry. But this by the way.

This hypotheſis, however, is not only gratuitous in the aſſumption of a particular agent, but alſo in aſſuming the exiſtence of a *ſpaſm* in the extreme veſſels, and in ſuppoſing the cold ſtage to be the cauſe of all that follows. The phenomena, preſented by the ſkin in the cold ſtage, may ariſe from the mere feebleneſs of the heart, which is rendered unable to diſtend the diſtant and minute veſſels with blood, or from a mere inaction of the cutaneous capillaries, independently of the heart, as we believe to be the caſe; and not from a ſpaſmodic contraction of the extreme veſſels. And the preſumption of the continuance of that ſpaſm, when the ſuperficial veſſels are filled and diſtended with blood to a preternatural degree, would appear to be inconſiſtent with obſervation; for ſpaſm and diſtenſion are terms of oppoſite import. The ſame veſſels, which receive little or no blood in the cold ſtage, and are over diſtended with it in the hot ſtage, cannot be in both caſes affected with ſpaſm. But, it is contended, the perſpiratory veſſels at leaſt are ſpaſmodically conſtricted in the hot ſtage, for no fluid is poured out. Here, however, it ſhould be obſerved, that, although the poverty of language, which compels us to borrow the terms of mechanical ſcience, in ſpeaking of the phenomena of life, may render the uſe of ſuch a word as conſtriction admiſſible; yet it is not from a mere mechanical conſtriction and relaxation of the extreme arteries that the perſpiration and other ſecreted fluids paſs off. Theſe fluids are not pre-exiſtent in the blood, and ſeparated as through a ſieve, but are produced by new combinations, effected by an unknown and inexplicable action of the ſecreting extremities of the veſſels: this action is interrupted by various conditions of the veſſels, by their over diſtenſion, it would ſeem, as well as by their collapſe; and as we are ignorant of the proceſs of ſecretion, ſo we know not how it is ſuppreſſed. The ſuppoſition of ſpaſm is equally gratuitous in both caſes; and the word conſtriction is only to be conſidered as expreſſing, by an incorrect analogy, the non-appearance of the fluids to be diſcharged. The contraction of the veſſels in the cold ſtage, and their diſtenſion in the hot, are equally to be conſidered as part of the concourſe of the ſymptoms, and not an eſſential cauſe of the fever.

The hypotheſis, which aſſumes the ſpaſm of the extreme veſſels in the cold ſtage, as the cauſe of all the following ſymptoms, is not merely gratuitous, however, it is alſo inconſiſtent with the various phenomena of fever. This inconſiſtency ſeems to have ariſen from the aſſumption of a ſimple intermittent or ephemeral paroxyſm, as the prototype of every form of fever. But in many of the forms of pyrexia, and even of idiopathic fever, there is no evidence of the exiſtence of this ſpaſm. The cold, it is true, generally uſhers in the paroxyſm of an intermittent; but it is often ſcarcely obvious in that of a remittent, and in various caſes of continued fever it does not appear at all; ſo that the effect occurs without its imagined cauſe. Beſides, there is often no proportion between the two; the cold ſtage may be ſhort and ſlight, when the ſucceeding hot ſtage is long and ſevere, and *vice verſâ*. Even admitting, with Dr. Cullen and Dr. Fordyce, that continued fevers are but a ſeries of paroxyſms, following each other, and generally diſtinctly divided by exacerbations and remiſſions, yet a cold ſtage does not occur to introduce the exacerbation, and conſequently the ſucceeding phenomena are not the reſult of a ſpaſm or cold fit. A degree of pyrexia, marked by heat, quick pulſe, oppreſſion, languor, &c. is often produced by various ſtimuli, ſuch as much heating food, or drink, exerciſe, &c. but the cold ſtage is wanting.

We may conclude, therefore, that the occurrence of the heat, and its concomitant phenomena in fever, depends upon ſome other principle in the animal economy, and not upon the exiſtence of a cold ſtage, and its ſuppoſed ſpaſm. As well, indeed, might we fix upon the heat as a cauſe of the phenomena, which, in continued fevers, ſucceed it; ſuch as the delirium, proſtration of ſtrength, &c.; and, in truth, the omiſſion to notice the influence of the morbid heat upon the future progreſs of the ſymptoms conſtitutes, as Dr. Currie has juſtly remarked, an imperfection in Dr. Cullen's theory. For it is certain, that the accumulation of the heat itſelf is a ſource of much irritation to the vaſcular and nervous ſyſtems, as is proved by the relief which follows the abſtraction of it by means of cool air, and the application of cold water to the ſkin; for as the heat is decreaſed, the pulſe immediately becomes leſs frequent, head-ache and reſtleſſneſs are diminiſhed, ſleep is induced, and even perſpiration is excited.

We have yet to add, that the idea of a proximate cauſe, implies that, which being preſent, the diſeaſe is preſent, and being abſent, the diſeaſe diſappears. Now, the cold ſtage is only preſent during a ſmall part of the progreſs of fever, which is another reaſon for conſidering it only as one in the concourſe of the ſymptoms.

The Brunonian Theory.—We have already given a brief view of the ſyſtem by which Dr. Brown attempted to explain all the phenomena of the living body, whether in health or diſeaſe (ſee Excitability); and the various modifications of fever were of courſe included in that explanation. The increaſing number of facts, which the proper ſtudy of the animal economy after the time of Hoffman produced, enabled the pupil to advance a ſtep beyond his maſter, in generalizing thoſe facts: and it cannot be doubted, that ſome of the dogmas of Brown were the reſult of a legitimate induction, and therefore ſome of his principles were more juſt than thoſe of Cullen. But like moſt theoriſts, he overſtepped the boundary of obſervation, and involved himſelf in hypotheſis, to which he made facts bend by miſrepreſenting them. Fevers, like all other diſeaſes, are attributed to debility, direct or indirect; and he affirms "that the diſtinctions that phyſicians have made about the differences of fevers are all without foundation, and that they are all the ſame, with no other difference but in degree, and that, unleſs in that reſpect, they do not differ from other diſeaſes of the ſame form." (Elements of Medicine, § 662. note *m.*) But he does not attempt to explain how the various ſucceſſion of ſymptoms reſults from the ſtate of debility, or how the various modifications of the pyrexiæ are to be accounted for upon this principle. The only approximation to ſuch an explanation, that we have been able to diſcover, reſembles the one given by Dr. Cullen, inaſmuch as it is little more than an enumeration of the leading changes in the ſymptoms, but leſs explicit than that of Dr. Cullen. We are told, that "the debility during the cold ſtage is the greateſt, that of the hot leſs, and that of the ſweating ſtage, which ends in health for the time, is the leaſt of all. Hence in a mild degree of the diſeaſe, as cold is the moſt hurtful power, its effect is gradually taken off by the agreeable heat of the bed or of the ſun, and the ſtrength thereby gradually drawn forth. The heart and arteries, gradually excited by the heat, acquire vigour, and, at laſt, having their perſpiratory terminations excited by the ſame ſtimulus, the moſt hurtful ſymptom is thereby removed, the hot fit produced, and afterwards the ſame proceſs carried on to the breaking out of ſweat." (§ 666.) We are farther told that "the cauſe of all theſe diſeaſes (*viz.* fevers, from the ſimple and intermittent to the gaol-fever and the plague,) is the ſame with that of diſeaſes not febrile, to wit, debility; differing only in this, that it is the greateſt debility compatible with life, and not long compatible with it." (§ 670.) It may appear ſtrange that a theory ſo vague and inexplicit ſhould have obtained the number of admirers, which the doctrines of Brown have every where gained. The moſt rational of its advocates however, Dr. Wilſon, who has ſtripped the ſyſtem of many of its errors and inconſiſtencies, not content with theſe general terms, has ſtated the proximate cauſe of fever, according to the Brunonian principles, to be "a change in the laws of excitability, in conſequence of which the ſame agents no longer produce the ſame effects:" that is to ſay, the ſame external agents, food, light, exerciſe, &c. which in health produce moderate excitement, in fever produce exceſſive excitement. He adds, however, "how the remote cauſes of fever act in inducing this change, and on what *change in the living ſolid* this change in the laws of excitability depends, we neither can, nor ever ſhall be able perhaps to determine." (Treatiſe on Febrile Diſeaſes by Al. Phillips Wilſon, &c. vol. i. p. 559.)

Upon this ſtatement, it is only neceſſary to remark, that Dr. Wilſon has fallen into the error which is common in the diſcuſſion of proximate cauſes, that of miſtaking the ſymptoms for the diſeaſe itſelf. The change in the law of excitability is but a general expreſſion for the change in the phenomena of the individual life, *i. e.* for the ſymptoms of the fever; whereas, the change in the living ſolid is, in fact, the eſſence of the diſeaſe, *i. e.* the proximate cauſe of the ſymptoms, which he deſpairs of inveſtigating ſucceſsfully.

Dr. Darwin's Theory.—In the theory of this ingenious phyſician, the phenomena of fever are referred to thoſe laws of organic life, which he has deduced with great acuteneſs from a comprehenſive view of the phenomena of the living ſyſtem. His theory, indeed, is much involved in the obſcurity of the language, which he has choſen to adopt; it is, occaſionally perhaps, aided by fancy, where obſervation was deficient: and it is given by its author "rather as obſervations and conjectures, than as things explained and demonſtrated:" but it appears to afford a glimpſe of the true explanation of the concourſe of ſymptoms in fever, under its various forms, "a foundation and a ſcaffolding," to borrow the author's words again, "which may enable future induſtry to erect a ſolid and a beautiful edifice." (See Zoonomia, or the Laws of Organic Life, by Eraſmus Darwin, M.D. &c. Claſs 4. *Supplem. ad finem.*) Dr. Darwin's ſyſtem is grounded upon the ſame fundamental principles, as thoſe of the Brunonian ſchool (ſee Excitability); the incongruities of which, however, he not only in a great degree avoided, but he likewiſe introduced a principle, which had been overlooked by Brown, namely, the principle of *aſſociation*, or ſympathy, by which, doubtleſs, many of the actions of the living body are regulated. It is upon the obſervation of this principle, that the Darwinian theory of fever is chiefly conſtructed; whence the author gave it the title of the "*Sympathetic* Theory of Fever."

Two general laws of the animal economy are ſtated by Darwin, as well as by Brown; 1. That all excitement or action of the living organs and functions occaſions a diminution or exhauſtion of their power (*excitability* in the language of the latter, *ſenſorial power* in that of the former,) according to the degree of excitement; 2. That reſt, inactivity, or the abſtraction of the uſual ſtimuli, render thoſe organs more ſuſceptible of the action of the ſtimuli ſubſequently applied. Thus, when a ſmall part of the capillary veſſels of the ſkin are expoſed for a ſhort time to a cold medium, as when the hands are immerſed in iced water for a minute, theſe capillaries become torpid or quieſcent, owing to the abſtraction of the ſtimulus of heat. The ſkin then becomes pale, becauſe no blood paſſes through the external capillaries, and appears ſhrunk, becauſe their ſides are collapſed from inactivity, not contracted by ſpaſm; the roots of the hair are left prominent from the ſeceding or ſubſiding of the ſkin around them; and the pain of coldneſs is produced. But in this ſituation, if the uſual degree of warmth be applied, theſe veſſels regain their activity; and, having now become more irritable from an accumulation of the ſenſorial power during their quieſcence, a greater action of them follows, with an increaſed glow of the ſkin, and another kind of pain, which is called the hot-ache, enſues. Here we ſee an epitome of ſimple fever beginning in the vaſcular ſyſtem. When the ſame operation goes on more generally, as by immerſion in the cold bath, the cold fit ſucceeded by the hot fit is more general, and both may be increaſed and prolonged by continuing in the bath, which has indeed proved fatal to ſome weak and delicate people, and to others who had been much exhauſted by heat and exerciſe; the ſame torpor and ſubſequent orgaſm having extended to the heart and great veſſels.

Thus far the two theories nearly accord; but beyond this point the Brunonian doctrine leaves us to a general ſtatement of debility, altogether inadequate to account for the various forms and phenomena of fever. But Dr. Darwin appeals to other eſtabliſhed facts in the animal economy, upon which theſe varieties appear to depend. From theſe a third general law may be deduced; namely, 3. That the functions of different parts of the ſyſtem are ſo far catenated, or aſſociated with each other, as it were in circles, either from direct connection in ſtructure, from the habit of acting together, or more frequently from cauſes at preſent inſcrutable, (ſee Catenation,) that an increaſe or decreaſe of the action of one organ is followed or accompanied by an increaſe or decreaſe of the action of another; ſometimes by a ſimilar change, that is, increaſe followed by increaſe of activity, or decreaſe by decreaſe; but occaſionally by the contrary change, that is, increaſe followed by decreaſe of activity, and *vice verſâ* in the aſſociated parts. The former of theſe is termed a *direct* ſympathy; the latter a *reverſe* ſympathy. The inſtances of ſympathy between different parts of the animal frame are very numerous. To the medical reader it were ſufficient to mention the ſympathies in the functions of the ſtomach and brain, the ſtomach and ſkin, the ſtomach and heart, the brain and heart, the ſkin and lungs, the uterus and mammæ, &c.; but for the unprofeſſional reader a brief illuſtration may be requiſite.

The ſympathetic action of the ſtomach and the brain occurs perpetually to the obſervation of the phyſician. Thus indigeſtion, however induced, is frequently the cauſe of head-ache; and head-ache, dependent upon certain ſtates of the brain, produces loſs of appetite and ſickneſs, as in hydrocephalus. We have alſo inſtances of both direct and reverſe ſympathy between theſe organs; for when the action of the veſſels of the brain is languid and feeble, as in approaching ſyncope, nauſea and loſs of appetite occur in the ſtomach, in which caſe the ſympathy is direct; but when the veſſels of the brain are acting with increaſed power, as in phrenſy, nauſea and loſs of appetite are likewiſe induced, in which the ſympathetic action is reverſed. Similar ſympathies occur between the ſtomach and ſkin. Thus, moiſtening the ſkin relieves thirſt, as we have already ſtated; and a copious draught of warm liquor will often at once produce a perſpiration on the ſkin. We have ſeen that Dr. Cullen attributed the ſymptoms in the digeſtive functions in fever almoſt entirely to ſuch a ſympathy; and that Sydenham removed ſickneſs and vomiting by exciting perſpiration. The ſtimulating influence of food on the nerves and veſſels of the ſtomach generally excites, by direct ſympathy, the nerves and veſſels of the ſkin, and produces a glow on the ſurface; but in certain debilitated conſtitutions, or ſtates of the conſtitution, the ſame ſtimulus in the ſtomach occaſions, by reverſe ſympathy, a chillineſs, even a ſhivering, and paleneſs of the ſkin. Expoſure to a cold atmoſphere (which abſtracts the ſtimulus of heat) occaſions an increaſe of appetite and of the digeſtive power, in ſtrong habits; but the ſame expoſure often deſtroys the appetite, and produces even nauſea, in feeble conſtitutions; theſe may be conſidered as inſtances of direct and reverſe ſympathy; or perhaps both as inſtances of direct ſympathy, the ſenſorial power accumulating in the ſtrong conſtitution, and producing increaſed action of the cutaneous veſſels; but not in the weak. The actions of the ſtomach and the heart are catenated to a conſiderable degree; heating food and drink generally quicken the pulſe, and the action of narcotic poiſons on the ſtomach immediately diminiſh its frequency and ſtrength, and often cauſe it to intermit. The actions of the ſkin and lungs are alſo much aſſociated; thus cold applied to the ſkin, and producing torpor of the cutaneous capillaries, as ſhewn by the paleneſs, chilly ſenſation, &c. immediately occaſions difficult and laborious breathing, probably from a ſimilar torpor being produced in the capillaries of the lungs. The loſs of appetite and nauſea induced by the action of the uterus after conception, and by inflammation, or the irritation of a ſtone in the kidnies, may be conſidered as examples of a reverſe ſympathy between theſe organs. There are many inſtances of the ſympathy of parts connected by ſtructure, or by the habit of acting together. Thus, the irritation of a ſtone upon the neck of the bladder produces an action of the lower gut, with a fruitleſs effort to ſtool, denominated teneſmus; and, *vice verſâ*, a teneſmus, as in dyſentery for inſtance, often excites a degree of ſtrangury or fruitleſs effort to paſs urine. In the ſame way, not only will a pungent odour, affecting the noſtrils, excite tears, but the ſudden impulſe of ſtrong light upon the eyes very frequently excites ſneezing; which may be obſerved daily in the ſtreets of London, during the ſummer, in perſons who ſuddenly receive the reflected light from a white pavement, as they paſs from a ſhade. Thus alſo ſympathetic pains of the mammæ occur in diſorders of the uterus, which organs are connected in the functions and purpoſes which they ſerve in the animal economy. See SYMPATHY, and CATENATION.

Theſe three laws or principles of action in the animal economy, then, 1. The exhauſtion or diminution of the ſenſorial powers by exertion; 2. The recovery or accumulation of the ſame powers, during quieſcence or impaired action; and, 3. The direct and reverſe aſſociation of parts, by which the actions of one part give riſe to actions in others, are the grounds of Dr. Darwin's explanation of the phenomena of fevers. We have ſeen how the cold and hot fits of ſimple fever are produced, from the external influence of cold; the firſt by the torpor of the capillary veſſels, from the abſtraction of the ſtimulus of heat; the ſecond, by the renovated activity of the capillaries from the accumulation of ſenſorial power during that torpor. Dr. Darwin, however, remarks, that this renovated activity of the capillaries is not owing to the renewed action of the heart, which forces them open by the mechanical impulſe of blood; that the action of the capillaries often recommences ſooner than the action of the heart, theſe veſſels having a greater mobility than the heart and large arteries, as appears in the ſudden bluſh of ſhame; and that, in low fevers, the capillaries acquire increaſed ſtrength, as is evinced by the fluſh and heat of the ſkin, while the pulſations of the heart and arteries remain feeble. Hence ſimple fever is of two kinds; in one the pulſe is ſtrong, in the other weak: in the fever with ſtrong pulſe, not only the cutaneous capillaries, but alſo the heart and arteries readily acquire a greater activity by the accumulation of ſenſorial power during the torpid ſtate, which laſt is farther increaſed by direct ſympathy with the increaſed activity of the capillaries; this happens in ſtrong conſtitutions, and is often ſeen in vernal intermittents: in the fever with weak pulſe, on the contrary, the heart and arteries do not acquire much increaſe of ſenſorial power, but continue in ſome degree in their ſtate of torpor, while the orgaſm of the capillaries is produced, whence there is a hot fit, with feeble pulſe.

But when the ſympathies of other parts of the ſyſtem are called into action, together with this torpor and orgaſm of the cutaneous veſſels, and of the heart and large arteries, the fever-fit becomes more complicated and dangerous. And again, when the torpor commences, from the operation of other exciting cauſes of fever in other organs of the body, and extends, with the ſubſequent orgaſm, by direct or reverſe ſympathy, to the organs aſſociated with them, other various forms and modifications of febrile diſeaſe are produced. Thus, if the ſtomach is affected with torpor, either primarily, as from the action of contagion, ſwallowed with the ſaliva, or ſecondarily, by its ſympathy with the cutaneous capillaries, or with ſome internal viſcus, a total loſs of appetite occurs, followed by ſickneſs and vomiting. If the brain is affected, either primarily, as by the depreſſive paſſions, by exhauſtion from watching, &c. or ſecondarily, as by the influence of contagious or marſh effluvia, received into the ſtomach, or the lungs, then proſtration of the general powers, head-ache, delirium, ſtupor, tremors, convulſions, &c. are induced. In the ſame way, the ſecretions from the internal organs, as from the kidnies, are diminiſhed when a torpor takes place in them, either primarily, or by ſympathy with the cutaneous capillaries, or other parts, and are reſtored with the renovated action. Theſe phenomena take place in different degrees in almoſt all fevers, and vary according to the nature of the organs primarily affected, and to the ſtate of the conſtitution, or of the organs individually. Thus when the ſtomach is ſlightly diſordered, as by indigeſtible food, or when the vaſcular ſyſtem is deranged from expoſure to cold, (when no inflammation is produced,) the fever which enſues is mild, the brain ſuffers little by ſympathy, no delirium, &c. occur, and health is ſoon reſtored. If, on the contrary, a virulent contagion acts upon the ſtomach, and through its medium upon the brain, the ſenſorial powers are greatly exhauſted, and the complication of dangerous ſymptoms, ariſing from the morbid condition of the nervous ſyſtem, and from the total loſs of powers in the organs of digeſtion, occurs, conſtituting the contagious, nervous, and malignant fevers, or *typhus*, under its various forms and denominations. The opinion that contagion operates firſt on the ſtomach, has been adopted by Dr. Lind, and other practical writers, and is corroborated by many facts. When the contagion is ſufficiently powerful to produce an immediate and ſenſible effect, ſickneſs, together with a diſagreeable taſte, which has been deſcribed as "reaching to the ſtomach," is its uſual operation, (ſee Lind on Fevers and Infection, chap. ii. ſect. 1.) and is followed by ſhivering tremors, head-ache, and a low and weak or irregular pulſe, from the ſympathy of the brain and the ſkin. The primary action of the contagion on the ſtomach is probably the cauſe of the greater virulence of the caſual, than of the inoculated ſmall-pox, which however is liable to be varied by the quantity of the contagious matter received by its virulence, and by the previous ſuſceptibility of the conſtitution. When the ſenſorial powers of the ſtomach, heart, and brain, are primarily exhauſted by narcotic poiſons, as by digitalis, tobacco, and contagion, (which both Brown and Darwin conſider, perhaps erroneouſly, as exhauſting by exceſs of ſtimulus,) theſe organs are longer in recovering their excitability, than when they ſuffer from defect of ſtimulus, or ſecondarily, from ſympathy with the capillaries of the ſkin, or of ſome other organ. From either ſpecies of exhauſtion the ſenſorial power in voluntary or involuntary muſcles might be removed by a ſhort quieſcence; but with the heart *to reſt is death;* whence that organ recovers more ſlowly, and thus produces fever with weak pulſe. Thoſe organs which are in perpetual action, indeed, being endowed with a greater abundance of vitality, recover their ſenſorial powers in the ſame proportion more readily, otherwiſe life could not continue. As the ſenſorial power accumulates, the actions of thoſe organs increaſe; whence a degree of inflammation often occurs in the brain and its membranes, accompanied with fluſhed countenance, redneſs of the eyes, and delirium, ſometimes followed by ſtupor; or a ſimilar inflammatory action occurs in the ſtomach, or inteſtines, or in the lungs, or the heart. Theſe, however, are generally ſecondary effects of low fever, but death is ſeldom produced without ſuch an occurrence in ſome of thoſe viſcera. Dr. Darwin juſtly conſiders the painful or uneaſy feelings, or (to uſe his language, the ſenſorial power of ſenſation,) excited eſpecially when inflammation takes place, as contributing farther to augment the actions of the heart and arteries, and of all the moving ſyſtem along with them; whence the pulſe, under ſuch circumſtances, acquires a degree of ſharpneſs in its ſtroke, unobſerved in health.

When the ſtomach is ſecondarily affected, and the torpor is primarily produced in ſome other viſcus, the actions of which, on the reſtoration of the ſenſorial power, are augmented to the degree conſtituting inflammation, and of courſe pain, or the ſenſorial power of ſenſation is alſo excited, as in pleuriſy or peripneumony, the heart and arteries, not having been exhauſted by a narcotic power, as by contagion, ſoon reſume a ſtrong action, the pulſe becomes hard, and the diſeaſe is termed an inflammatory fever, or phlegmaſia. "Thus," ſays Dr. Darwin, "the peripneumony is generally induced by the patient reſpiring very cold air, and this eſpecially after being long confined to warm air, or after being much fatigued and heated by exceſſive labour or exerciſe. For we can cover the ſkin with more clothes, when we feel cold; but the lungs, not having the perception of cold, we do not think of covering them, nor have we the power of covering them, if we deſired it; and the torpor thus produced is greater, or of longer duration, in proportion to the previous expenditure of ſenſorial power by heat or exerciſe. This torpor of the lungs affects the ſkin with ſhuddering, and the ſtomach is alſo ſecondarily affected; next follows the violent action of the lungs from the accumulation of the power of irritation, and an inflammation of them follows this violent action, &c." (Loc. cit. Supplem. i. § 16. 7.)

The theory, of which we have thus given an imperfect account, ſtripped of the peculiar phraſeology of the author, appears to us incomplete, as it confeſſedly is, to afford an approximation to at leaſt a more comprehenſive and more conſiſtent doctrine of febrile diſeaſe, than any that has yet been promulgated: more comprehenſive, becauſe it not only includes the varieties of idiopathic, but alſo of ſymptomatic fevers; while other hypotheſes ſcarcely embrace more than one form of the firſt, namely, the ephemeral, or intermittent paroxyſm, and have dwelt too much upon ſome particular ſymptom, as the cauſe of the whole diſeaſe, ſuch as the heat, the cold fit, or the quick pulſe; and more conſiſtent, becauſe it is derived from thoſe laws of the animal economy, which have been deduced from the obſervation of the general operations of life, both in health and diſeaſe. To the language, however, many objections ariſe, as well as to ſeveral collateral ſtatements, which are employed in filling up the outline, which we have drawn; ſuch as the notion of a retrograde action of the abſorbents, of the abſorbent action of the capillary veins, of the exceſſive ſtimulus of digitalis, and the matter of contagion, &c.; but theſe are not eſſential parts of the doctrine. We ſhall now proceed to ſtate briefly the principal points of another theory of fever, lately publiſhed, which, from the erudition and practical knowledge with which it has been maintained, is entitled to conſideration. We allude to

Dr. Clutterbuck's Theory.—Fever has uſually been called a *general* diſeaſe, affecting all the functions, in contradiſtinction from *local* diſeaſes, in which ſome particular organ is the primary ſeat of the diſorder, and the affections of the other functions are ſecondary, or ſymptomatic. But Dr. Clutterbuck denies the exiſtence of general diſeaſe, and maintains that all general or extenſive derangement of the animal ſyſtem is referrible to local derangement in ſome one organ. The organ univerſally affected in all the varieties of idiopathic fever which differ but in degree, as well as in thoſe which ariſe from ſpecific contagion, as malignant ſore throat, ſcarlet-fever, ſmall-pox, &c. is, in the author's opinion, the brain. This is manifeſt, he contends, from the ſymptoms, as the head-ache, the depreſſion of ſtrength, and other derangement of the animal functions, the delirium, the tremors, failure of viſion, &c. It is manifeſt from the nature of the remote cauſes which act chiefly on the brain and nervous ſyſtem, as intoxication, fear, grief, and other paſſions, external irritation, not to mention miaſamta and contagion, of the operation of which we are ignorant; as well as from the prediſpoſing cauſes, which probably conſiſt in a deficiency of ſenſibility, as in idiots, negroes, old people, and *infants:* but it is more particularly manifeſt from the conſequences of fever whether after recovery, or after death, aſcertained in the latter caſe by diſſection. Among the conſequences of fever, which are not uncommon after recovery, are an impaired condition of the ſenſes; ſuch as deafneſs, imperfect viſion, depraved taſte; paralytic affections, or convulſive complaints, as epilepſy and chorea; derangement or loſs of the mental powers, ſuch as melancholy, great irritability of mind, loſs of memory, or even complete fatuity. The conſequences, obſerved by diſſection after death occaſioned by fever, are frequently viſible diſeaſe of the brain, of which ſeveral examples are quoted by the author. He then proceeds to ſhew, that the local affection of the brain, thus manifeſt, is in fact *inflammation* of that organ; or that fever, therefore, "is nothing leſs than a ſpecies of *phrenitis*, or topical inflammation of the brain," and ſhould be arranged in the order of *Phlegmaſiæ*, with pleuriſy, enteritis, and other ſymptomatic fevers: but as phrenitis has been generally applied to a particular form of inflammation of the brain, and implies delirium, which does not always occur in fever, although it is a frequent ſymptom, Dr. Clutterbuck propoſes the term *Encephalitis* as the denomination for fever. The arguments adduced in proof of the notion that the topical affection of the brain, in fever, is inflammation, are, 1. The analogy between the ſymptoms of fever and thoſe of inflammation, *viz.* pain, heat, throbbing, acute ſenſibility, &c. being common to both; 2. The occaſional buff of the blood in both; 3. The ſimilarity of ſeveral of the exciting cauſes of both; 4. The occaſional alternation of fever with inflammation; 5. The analogy in regard to the cure of the two diſeaſes generally, as by means of blood-letting, vomiting, ſweating, purging, bliſtering, and the application of cold; 6. The ſymptoms of fever not being diſtinguiſhable, on the whole, from thoſe which belong to phrenitis, as deſcribed by authors; 7. That the morbid condition of the brain, diſcovered by diſſection, is ſuch as implied previous inflammation. (See an Inquiry into the Seat and Nature of Fever, &c. by Henry Clutterbuck, M. D. 1807.) The author has illuſtrated theſe arguments at conſiderable length, with great perſpicuity, and with an ample collection of facts and obſervations, compiled from the records of medicine; but our limits confine us to a mere ſketch of the general doctrine, and to a few obſervations relative to its apparent ſolidity and truth.

In the firſt place, Dr. Clutterbuck, like other theoriſts enamoured of a favourite doctrine, appears to have laid too great ſtreſs upon thoſe phenomena which ſupport that doctrine, and to have conceded leſs to oppoſing facts, than they are entitled to claim. Hence, in retracing the delineations of fever, in the words of the moſt creditable writers, he has diſtinguiſhed by italics all thoſe ſigns which indicate derangement of the encephalon, by which they are made to ſtand the moſt prominent features in the picture. Hence, alſo, he has aſſumed the poſition, that the derangements of the natural and vital functions, which are nearly, if not altogether, as univerſal concomitants of fever, as the diſorders of the animal functions, are, nevertheleſs, in all caſes, ſecondary ſymptoms, originating from the primary affection of the brain. Thus the nauſea, the vomiting, the total loſs of appetite, and of the digeſtive power, are believed to be always ſympathetic of the affection of that organ; ſo likewiſe is the quickened action of the heart and arteries, and of the reſpiration. That this, however, is a gratuitous aſſumption may be ſhewn, 1. By attending to the very hiſtories which Dr. Clutterbuck has quoted, in which the occurrence of the deranged condition of the ſtomach is as conſtantly mentioned, as that of the diſorder of the encephalon; 2. By obſerving, that the ſympathy between the brain and the ſtomach is perfectly reciprocal; ſo that the brain ſuffers in ſympathy with the ſtomach, not leſs manifeſtly than the ſtomach with the brain; and, 3. By remarking, that the ſymptoms of diſordered ſtomach are capable of being relieved or removed, while the ſuppoſed cauſe (affection of the brain) remains; the thirſt being allayed, and the ſickneſs removed, by changing the ſtate of the ſkin only, the former by moiſtening it with water, the latter by exciting ſweat, as obſerved by Sydenham. Whence Drs. Cullen and Darwin ſeem to be rather juſtified in attributing the derangement of the ſtomach, when it is affected ſecondarily, more frequently to its ſympathy with the ſtate of the ſkin, than of the brain.

Farther, the connection of many of the leading ſymptoms with ſome diſorder of the brain, or common ſenſorium, is admitted by all, and equally favours the hypotheſis of the other authors, as well as that of Dr. Clutterbuck; ſince whether the brain is primarily or ſecondarily affected, certain phenomena in the nervous ſyſtem muſt neceſſarily enſue. We have juſt ſtated ſome reaſons for believing that it is often thus ſecondarily affected; and it now remains to offer our reaſons for ſuppoſing, that inflammation of the brain, when it does occur in fever, (to which we cannot conſider it as eſſential,) is commonly ſecondary likewiſe.

The firſt ſymptoms of the affection of the brain are by no means thoſe which indicate inflammation or unuſal excitement of the ſenſorium; on the contrary, they are ſuch as indicate an oppoſite ſtate, which Dr. Cullen has termed *atony* and *collapſe*, and Dr. Darwin *torpor*: the head-ache itſelf, according to the obſervation of Dr. Fordyce, is altogether diſtinct from the head-ache of inflammatory excitement, or of the hot ſtage. Any ſymptoms that can be interpreted as indications of local inflammations, ſuch as redneſs of the eyes, protruſion of the features, fluſhed countenance, throbbing of the arteries, and even delirium, are the appearances belonging to a ſubſequent period of the fever. But at this ſubſequent period, inflammatory congeſtions are liable to occur in the other viſcera, if not ſo frequently, at leaſt, not unfrequently; as in the ſtomach, for example, the inteſtines, the lungs, and other organs. This fact has been noticed by many phyſicians of accurate obſervation. Riverius long ago remarked that "acute and malignant fevers ſcarcely ever occur unaccompanied by inflammation in ſome one of the viſcera;" and he has ſtated in another place, in moſt diſtinct terms, that we ought aſſiduouſly to recollect, that all thoſe fevers, with which local inflammation is conjoined, are not ſymptomatic, but often idiopathic, and that the inflammation ſupervenes, not being the cauſe, but the conſequence of the fever; "quæ febrem iſtam non efficit, ſed illi potius ſuccedanea eſt." Thus, he adds, "we frequently obſerve, in practice, that patients labour under continued fever for a day or two before pain of the ſide and other ſymptoms of pleuriſy appear; thus alſo many perſons on the third or fourth day of fever fall into inflammation of the brain, &c." "Sic nobis frequenter in uſu practico videre licet ægrotantes, ab initio febre continuâ laborantes per unam aut alteram diem, antequam dolor lateris et alia pleuritidis ſigna appareant: ſic *multi* tertia vel quarta febris die in *phrenitidem* incidunt, &c." (See River. Prax. Med. lib. xvii. cap. 1.) Dr. Donald Monro, whoſe teſtimony on ſubjects of morbid anatomy is of conſiderable weight with Dr. Clutterbuck, remarks, when ſpeaking of malignant fever, that "this fever occaſions in general more or leſs redneſs (I do not know that we can properly call it true acute inflammation) of the membranes; and the febrile matter is apt to fall on particular parts, and there to create abſceſſes, particularly in the brain, the lungs, and the glandular organs." (See his Treatiſe on Military Hoſp. vol. i. p. 237. and Dr. Clutterbuck's Treatiſe, p. 172.) Obſervations to this effect might be eaſily multiplied, and we have already enumerated ſeveral in a former part of this article. It is ſomewhat ſingular, that Dr. Clutterbuck, who quotes the remark of Dr. Monro, ſhould deem it favourable to his hypotheſis of excluſive inflammation of the brain; ſince it obviouſly proves an equal liability to inflammation in other organs, if it proves any thing. Now, it muſt be admitted, that, if fever depends upon inflammation of the brain, and is merely ſymptomatic of ſuch a ſtate, this ſtate muſt be always preſent, when the ſymptoms of fever occur; one clear negative example is ſurely fatal to the theory. Dr. Beddoes collected a conſiderable quantity of evidence from the hiſtories of diſſections, made during the prevalence of ſeveral epidemic fevers on the continent, from which it is proved, indeed, that congeſtion, or ſome other morbid appearance was frequently obſerved in the brain or its membranes; but it is alſo ſhewing that abſceſſes, gangrene, or other marks of inflammation, were not leſs frequently found in the viſcera of the thorax and of the abdomen, eſpecially in the ſtomach and liver. Theſe facts we have detailed, when ſpeaking of the conſequences of fatal fevers, as diſcovered by diſſection, and it is unneceſſary to repeat them here. Dr. Beddoes is fairly led (ſuppoſing the facts accurately repreſented) to this inference, that "in idiopathic fever, the ſtomach and contiguous parts have been found more conſtantly and more deeply affected with inflammation, than the brain and its membranes." (See Reſearches, Anatomical and Practical, concerning Fever, &c. by T. Beddoes, M. D. publiſhed in 1807.) But leſt the teſtimony of authors of little note may be queſtioned, we ſhall quote that of one of the moſt able and experienced of our hoſpital phyſicians, Dr. Lind of Haſlar. Speaking of a deſtructive contagious typhus, which prevailed in the French fleet in 1757, he ſays, "the ſymptoms of the fever were the ſame as we have already given in the deſcription of the gaol diſtemper. On diſſection, the *brain* of thoſe who died was found *perfectly ſound*, though during their ſickneſs the head had always ſeemed greatly affected; in two caſes only, out of twenty which were inſpected, the blood-veſſels of it appeared a little enlarged. The *lungs* were generally found gorged with blood, and ſeemed to have a gangrenous diſpoſition. The *abdomen* more immediately ſuffered by the diſeaſe, particularly the *liver, ſtomach,* and *inteſtines*; in the inteſtines there was often found a green offenſive liquor, ſometimes worms." (See Lind on Fevers and Infections, chap. iv. ſect. 3.)

We are compelled to conclude, then, that inflammation occurs only occaſionally in the brain; that this organ is liable to inflammation only in common with the other viſcera; and that inflammation is in all the organs a ſecondary reſult of fever, and not its eſſential cauſe. In this view of the ſubject, all the arguments from analogy between fever and inflammation, which Dr. Clutterbuck has brought forward, may be (and, indeed, muſt be) admitted; while, at the ſame time, they add no weight to his theory: for the analogy is equally favourable to the notion of a ſecondary, as of a primary occurrence of inflammation. And we cannot but obſerve, before we take leave of theſe doctrines, that theſe analogies, which Dr. Clutterbuck has pointed out, as well as the various facts which we have quoted from Riverius, Monro, Beddoes, and Lind, tend to confirm the hypotheſis of Darwin, under which theſe facts, contradictory as they are to the opinions of Dr. Clutterbuck, are reduced to a perfect conſiſtency. It may be added, that a doctrine, according moſt accurately with that of Dr. Clutterbuck, has been taught for ſome years paſt by Dr. Ploncquet, in the univerſity of Tubingen; which, however, was altogether unknown in this country, previous to the publication of Dr. Beddoes, which we have here quoted.

The Method of Cure.—Since all the inquiries which have hitherto been made, reſpecting the nature or proximate cauſe of fever, have failed to elucidate the ſubject in a clear and ſatisfactory manner, we cannot attempt to effect a cure of the diſeaſe upon any principle deduced from a knowledge of its eſſential nature. Nevertheleſs we are not left without principle, to purſue a blind empiriciſm on the one hand, or to ſtand altogether inactive and uſeleſs ſpectators on the other, while the fever proceeds through its courſe. Many of the humoral pathologiſts, indeed, who conſidered the febrile actions as ſo many ſalutary efforts of nature to expel ſomething noxious from the conſtitution, were led to adopt a feeble and inert practice, (la medicine expectante, as the French call it,) under which, beyond a doubt, theſe ſuppoſed ſalutary exertions of the *vis medicatrix* often proved fatal in their conſequences. But a more enlightened experience has evinced the propriety of attempting to interrupt the progreſs of every fever in the outſet; although it muſt be allowed, that the means which we poſſeſs of effecting this object are very limited and uncertain in their operation, inaſmuch as they are only ſucceſsful, when employed within three or perhaps four days from the acceſſion of the fever; and even within that ſhort period frequently fail to arreſt the diſeaſe. When this failure takes place, or when the proper meaſures are not reſorted to, until too late a period of the fever, experience has nevertheleſs furniſhed us with a few practical principles, by which the future operations of the conſtitution may be conſiderably modified, and the otherwiſe fatal conſequences of the diſordered actions may be obviated. Theſe principles relate chiefly to the counteraction of the exceſs, defect, or irregularity of the vital motions, either in the ſyſtem at large, or in particular organs, during the progreſs of the fever.

The firſt object of the practitioner is to arreſt the febrile affection, if poſſible, in its very commencement. This is ſometimes accompliſhed by very different means; which ſeem to poſſeſs this power, however, in common, namely, of exciting a conſiderable commotion, or *ſhock* (we are compelled to borrow mechanical terms) in the living ſyſtem. The two moſt efficacious remedies of this nature are emetics, and the affuſion of cold water on the ſkin; the former of which has this advantage, that it may be employed in the very onſet of the fever, during the preſence of the rigors; while the latter, although perhaps more powerful in its operation, is inadmiſſible until the hot ſtage be completely formed. (See Cold, *effects of, as a remedy.*) If an active *emetic*, as a full doſe of the ipecacuanha root, or of the tartarized antimony, (emetic tartar,) or a combination of theſe medicines, be adminiſtered during the continuance of the chills, and a free vomiting is excited, the cold fit is often ſpeedily terminated, and a general glow, accompanied with a degree of perſpiration, is produced. Or if the emetic be delayed until the hot fit have commenced, its operation is frequently followed by a free perſpiration, as well as by a relief to all the concomitant ſymptoms; and the fever, eſpecially if this operation be aided by other means, which we ſhall mention immediately, is prevented from proceeding, and the patient is left with a ſlight degree of weakneſs only, from which he recovers in two or three days. The *cold affuſion*, as it has been called, or the daſhing of cold water over the naked body of the patient, from a bucket or from the ſhower-bath, has certainly occaſioned a ſudden termination of the diſeaſe in many inſtances, when employed on the firſt, ſecond, or third day of continued fever. This fact was ſufficiently eſtabliſhed by the late Dr. Currie of Liverpool, and by his numerous correſpondents, as well as by Dr. Robert Jackſon, and others. (See Currie, Reports on Water, &c. in Fever, 1798, &c.; and Jackſon, Expoſition of the Practice of affuſing cold Water on the ſurface of the Body, as a Remedy for the Cure of Fever, 1808.) The circumſtances under which this active remedy may be reſorted to with perfect ſafety and certain relief, if not with the deſired effect of cutting ſhort the progreſs of the fever, have been aſcertained by the obſervations of that ſcientific phyſician, (Dr. Currie,) and confirmed by the ſubſequent experience of all who have adopted the practice. We have ſtated the reſult of this experience in a former article, already referred to; (ſee Cold,) and ſhall here only repeat the rule which Dr. Currie laid down; namely, that the good effects of the cold affuſion are to be expected, "when there is no ſenſe of chillineſs preſent, when the heat of the ſurface is ſteadily above what is natural, and when there is no general or profuſe perſpiration:" under circumſtances the reverſe of theſe, in any one reſpect, the application of external or internal cold is not only not ſalutary, but actually unſafe. It is obvious, then, that the cold affuſion is not to be reſorted to until the hot ſtage of fever is completely formed, until the heat has become ſteady and equal over the ſurface and extremities, and expoſure to ſlight cold no longer excites ſhivering, or renews the ſenſation of chillineſs. When this ſtage is eſtabliſhed, the greater the degree of cutaneous heat (the ſkin being dry) the ſafer the application of the cold, if hot the more beneficial. Perſpiration, diminution of heat, of head-ache, of thirſt, and of frequency of pulſe, and a diſpoſition to ſleep, are the general reſults of this operation, at any period while the dry heat continues; but before the end of the third day theſe reſults are frequently final.

The effects of theſe two active agents, in interrupting the train of febrile action in its commencement, are generally aided by ſome other means, which partly operate in a ſimilar manner upon the nervous ſyſtem, and partly contribute to maintain the ſalutary changes which they have induced: theſe are principally diluents, diaphoretics, and cathartics, to which ſome phyſicians have added bliſters. After the operation of an emetic, eſpecially when, from ſympathy with the ſtomach, the ſkin has become warm and moiſt, the proceſs of perſpiration may be beneficially ſupported by the adminiſtration of ſuch diaphoretic medicines as are not poſſeſſed of any cordial or ſtimulating qualities; it being the object of the practitioner to avoid any cauſe which may excite the heart and arteries, or the capillaries of the ſkin, to inordinate action, to which they are but too prone, after the exiſtence of a cold ſtage. Hence the confinement of the animal heat around the body, by heaping a load of covering over the patient, is likewiſe a pernicious practice, under theſe circumſtances. The perſpiration ſhould, therefore, be encouraged only by the exhibition of ſmall doſes of ſome preparation of antimony, or the neutral ſalts, and by the free uſe of tepid, aqueous liquids. An active cathartic may perhaps operate on the nervous ſyſtem in a manner ſomewhat ſimilar to the cold effuſion, or an emetic; and Dr. Hamilton of Edinburgh affirms, that it may ſuperſede the uſe of the latter. (See Obſervations on Purgative Medicines.) At all events, the operation of a purgative contributes to allay inordinate action, by the evacuation which it occaſions, as well as by removing the irritation of ſordes in the alimentary canal, and therefore tends to keep down the riſing motion of the circulating ſyſtem, in the commencement of the hot fit. Experience, in ſhort, has taught us, that the action of an emetic, adminiſtered at the commencement of fever, and followed by that of a gentle diaphoretic and a purgative medicine, frequently interrupts the progreſs of the ſymptoms, from whatever cauſe the fever may originate. Dr. Fordyce, however, is of opinion that the beneficial effects of the preparations of antimony and ipecacuanha, do not ariſe from the ſickneſs which they produce, as Dr. Cullen and others believed; for he affirms that other ſubſtances, which produce ſickneſs to as great a degree as any preparation of antimony, as the root of ſquill, for inſtance, have no power of interrupting the progreſs of fever; and that even the antimonial medicines, when they excite vomiting in very ſmall doſes, do not carry off a fever ſo effectually, as when larger doſes are borne without exciting ſickneſs. He admits, however, that "vomiting in itſelf has a tendency after the ſickneſs which produced it is over, to occaſion a glow or warmth over the whole body, followed by moiſture on the ſkin, ſoftneſs of it, an univerſal ſoftneſs and relaxation of the whole muſcles, a flow of fluids through the whole ſecretory veſſels, a general tranquillity over the whole ſyſtem, and a diſpoſition to ſleep: (Third Diſſert. on Fever, p. ii. p. 63.) in ſhort to produce appearances ſimilar to the criſis of fevers; but more eſpecially when the vomiting is excited by preparations of antimony or ipecacuanha, and therefore he recommends the adminiſtration of an emetic in the commencement of every fever. He ſeems, however, to conſider the *ſweating*, which theſe medicines excite, as moſt frequently contributing to cut ſhort the ſymptoms of fever, independently of vomiting. "If antimonial preparations be exhibited in a doſe juſt not ſufficient to produce ſickneſs, and the doſe be repeated at intervals of about three hours, aided by ſmall quantities of ſome warm watery liquid, until a profuſe ſweat be produced; and if this ſweating be kept up by repeating the antimonials every four, five, or ſix hours, as the patient can bear it, without ſickneſs, for four and twenty hours in ſucceſſion, it often happens that the fever is entirely carried off; eſpecially if the remedy be adminiſtered the firſt three or four days of the diſeaſe." If this practice be adopted in the firſt or ſecond day of continued fever, Dr. Fordyce believes that one half, or certainly one third of the caſes which occur, will be prevented from proceeding. (Loc. cit. p. 86.) He farther obſerves, that if theſe remedies fail to carry off the diſeaſe altogether, they convert it into an intermittent, a circumſtance which we never experienced, or alleviate the ſymptoms, ſo that it goes through its courſe with leſs violence and danger. (pp. 74. 83. & 88.) He juſtly recommends the adminiſtration of the emetic and other antimonials in the evening; firſt, becauſe the operation tends to produce ſleep, and this tendency will then coincide with the habitual period of reſt; and ſecondly, becauſe the ſudorific effect will alſo coincide with the remiſſion of the natural evening paroxyſm, towards the morning.

Of the uſe of bliſters, which have been recommended as beneficial in the onſet of fever, eſpecially of the typhus mitior, or mild contagious fever, and of blood-letting, we ſhall have occaſion to ſpeak hereafter, as well as to enlarge on the uſe of exciting perſpiration and applying cold.

If the means juſt mentioned have not been employed within the firſt three days, or at the utmoſt until the fourth day of fever, or if they have failed to arreſt the progreſs of the diſeaſe, it will then proceed through an indefinite courſe, which medicine has not the power to interrupt. The taſk of the phyſician is then limited to a careful obſervation of the ſucceſſion of the phenomena as they ariſe, and to oppoſe and counteract, by thoſe means which his art affords, every action which may be dangerous to the ſyſtem at large, or to any important organ. Now, in the progreſs of continued fever of almoſt every form and denomination, the vital actions are productive of danger, chiefly from exceeding their ordinary degree of rapidity or ſtrength, on the one hand, or from falling ſhort of it on the other. Hence, whatever theory of the diſeaſe may have been adopted, two leading *indications of cure* have been propoſed by different writers, which are the ſame in import, however differently expreſſed; namely, 1. To diminiſh thoſe actions and changes which are in *exceſs*; and, 2. To increaſe thoſe which are *defective*. In the language of Dr. Cullen, the firſt indication is "to moderate the violence of re-action;" and the ſecond "to remove the cauſes, or obviate the effects of *debility*." And again, in the terms of the Brunonian doctrine, as adopted by Dr. Wilſon, the indications are, 1. "To change *exceſſive* into moderate excitement;" and, 2. "To change *atony* into moderate excitement." Dr. Cullen, indeed, has added a third indication, *viz.* "To obviate or correct the tendency of the fluids to putrefaction," which we believe to be involved in the ſecond; ſince the tendency to putrefaction is without doubt the reſult of the debility or loſs of power in the ſolids, and to be obviated principally by thoſe means which reſtore this power.

The firſt indication, which is "to diminiſh exceſſive action," requires to be fulfilled more or leſs, in every form of continued fever, in its early ſtage. (For the treatment of the ſimple, intermitting, and remitting fevers, ſee EPHEMERA,

MERA, AGUE, and REMITTENT.) In the ſynocha, or inflammatory fever, this is the principal indication to be followed; in the ſynochus, or ſub-inflammatory fever, it is the rule of practice in the greater part of the diſeaſe; and even in typhus, originating from contagion, it is commonly to be kept in view in the firſt days of the complaint, and partially for a longer period. We are not in poſſeſſion of any means, by which we can with ſafety effect a direct diminution of the actions of the animal ſyſtem in fever: our meaſures, therefore, are limited to a negative or indirect reduction of excitement, by withdrawing or diminiſhing thoſe irritations or ſtimuli, which are conſtantly applied to the body, in one degree or other, and actually excite the actions of life, (ſee EXCITABILITY,) or which are more particularly the conſequence of the febrile ſtate. Of the firſt of theſe irritations, the ordinary impreſſions made upon our ſenſes, the exerciſe of the body and mind, the uſe of food and drink of various qualities, are examples; of the latter, the exceſſive heat, the thirſt, and the various painful ſenſations, &c. The ſyſtem of avoiding theſe as much as poſſible, or of moderating their force, when that is impracticable, conſtitutes what has been called the *antiphlogiſtic regimen*, which it is requiſite to purſue in almoſt every continued fever. Although the irritations naturally occurring in health, are doubtleſs ſalutary, and ſupport the activity of the living body; yet, in the febrile ſtate, when the body is more ſenſible to the operation of ſtimuli, on the one hand, and more feeble, (in typhus at leaſt,) and therefore leſs capable of bearing their action, without ſuffering exhauſtion, on the other, they become exceedingly prejudicial.

1. In the hot ſtage of fever, the ſenſes are generally more acute, and the ordinary impreſſions excite a painful irritation, and thus contribute to augment the vaſcular action, and to increaſe head-ache, reſtleſsneſs, &c. Hence the obtruſion of too much light is to be prevented, all noiſes are to be excluded, and ſuch covering, or bed, to be employed as is leaſt uneaſy to the body of the patient. In large towns, ſtuffing the ears with cotton may perhaps more effectually leſſen the effect of noiſe than laying ſtraw in the ſtreet. But no impreſſion is to be more carefully guarded againſt than that of external heat; while at the ſame time every other means of increaſing the heat of the body is to be ſhunned. Both theſe precautions are to be obſerved as ſoon as a hot ſtage is fully formed, and to be attended to during its continuance; the more the morbid heat is augmented, the more neceſſary this attention becomes, ſince the uneaſy ſenſations connected with it are the conſtant cauſe of increaſe to all the other ſymptoms. This is not leſs evident, than the general and ſpeedy relief which follows the abſtraction of this morbid irritation, *i. e.*, in the common phraſe, the application of cold. Yet it was formerly an univerſal practice, to augment the heat in the early ſtages of fever, in ſpite of the inſtinctive feelings of the patient; partly under a notion, that ſweating might thus be produced, and a criſis accompliſhed; and partly from an hypothetical opinion, that heat contributed to accelerate the proceſs of concoction, and therefore to ſhorten the fever. Our countryman, Sydenham, was one of the firſt to point out the advantages of a contrary practice, which he adopted when the reſt of European phyſicians were purſuing the hot regimen. The ſame notion of the humoriſts, and with others, the fear of the ſubſequent debility and proſtration of ſtrength, which occur in the latter periods of typhous fever, and the doctrine that debility is the proximate cauſe of the diſeaſe, have alſo contributed to conjoin with this a ſtimulating mode of treatment, in fevers of this character; ſo that ſome practitioners no ſooner hear the name of fever, eſpecially when the epithets putrid, contagious, malignant, &c., are connected with it, than they immediately ply the patient with wine, Peruvian bark, and other ſtimulants and cordials, whatever be the period or circumſtances of the diſeaſe, for the purpoſe of obviating or anticipating the conſequences of debility. This the experience of all enlightened and unprejudiced phyſicians of the preſent day, condemns as a pernicious error, in the early ſtages of fever, when there is a dry heat on the ſurface of the body. For not only is the general vaſcular action, and with it the head ache, delirium, thirſt, reſtleſsneſs, &c., directly augmented, but they are alſo indirectly increaſed by the increaſe of the irritation of ſuperficial heat; and the very debility, which is intended to be prevented, is, therefore, actually accelerated and augmented, in conſequence of the exhauſtion which over-excitement induces. Thus *petechiæ*, and other ſigns of putrefaction (as they have been termed,) were common reſults of the hot regimen; which, on the other hand, was inadequate to produce a criſis by ſweating, or to ſhorten the febrile ſtate by concoction, as we ſhall preſently ſtate.

The reduction of the morbid heat, then, conſtitutes an important part of the ſyſtem of avoiding irritation. It is accompliſhed by external and internal means: the external conſiſting of the application of cool air, or of cold or tepid water to the ſurface of the body, and of ſurrounding the patient with light clothing, by which the animal heat is not accumulated; and the internal, of cold drink, and perhaps of what have been denominated refrigerant medicines. The human body evolves a ſufficient quantity of heat to preſerve its regular and agreeable temperature, in ſo rare a medium as the air, when the temperature of this is not under 62° of Fahrenheit's thermometer, or unleſs it contain moiſture; and in air at 62°, the caloric diſengaged from the body is neither carried off, nor permitted to accumulate ſo as to become unpleaſant. But if more caloric be diſengaged than in health, a lower temperature will be required for its due abſtraction, in proportion to the greater heat and ſtrength of the patient. A temperature of the air in his apartment of between 45 and 55 degrees will be the moſt grateful, perhaps, in the ordinary forms of typhus. In the ſynocha, in which the temperature of the body is higher, that of the patient's bed-room may be kept as low as 35° or 40° with advantage. In this country, the former temperature is very commonly attainable; if the heat of the atmoſphere be higher, the evaporation of watery fluids, ſprinkled upon the floor or other parts of the bed-room, eſpecially ſuch as are impregnated with the eſſential oil of aromatic plants, contributes ſomewhat to reduce the temperature, and feels refreſhing to the patient. The free admiſſion of pure air is at all times neceſſary, not only as producing evaporation and conſequent coolneſs, but as carrying off the morbid effluvia ariſing from the body, and affording a pure pabulum for reſpiration; of which we ſhall have occaſion to ſpeak hereafter. The late Dr. Gregory, father of the preſent profeſſor at Edinburgh, uſed to remark, when he had been viſiting one of the richer claſs of people in fever, that if he had the patient in a cool ward of the infirmary, he could enſure his recovery; whereas, from the mere circumſtance of the heat and cloſeneſs of the apartment, which he could not regulate according to his wiſh, he would in all probability, find the ſymptoms of the fever increaſed at his next viſit. The writer of this article has frequently experienced the great and obvious benefit of a cool and well ventilated room, independently of medicine. He has viſited patients, who had applied for admiſſion into the Houſe of

Recovery, in their own cloſe and ſuffocating apartments, and found them in a ſtate of delirium, with dry black tongue, great heat, and other bad ſymptoms; having directed them to be removed to the Houſe, he has found them cool and perfectly collected, with other ſymptoms of equal amendment, on the following morning, from the mere influence of a cool bed, and an airy apartment.

Another mode of reducing the morbid heat is the application of cold or tepid water to the ſkin. As the fever is now ſuppoſed to have advanced beyond the fourth day, after which period a complete ſolution of it is not to be expected, either the cold affuſion may be employed, or the ſurface of the body may be waſhed, by means of a ſponge, with cold or tepid water, or tepid water may be uſed in the way of affuſion. The ſame precautionary rules, as we have already ſtated, are to be obſerved in regard to all theſe modes of the external application of cold water. The tepid affuſion (*i. e.* of water heated to that degree which is warm, but not hot to the ſenſations, or from 87° to 97° of the ſcale of Fahrenheit,) produces a cooling effect, equal to that of cold affuſion, partly in conſequence of a more ſpeedy evaporation, and partly becauſe ſo great a glow, or re-action, as it has been called, does not ſucceed. “Where the object is to diminiſh heat,” Dr. Currie obſerves, (Reports on Water, vol. i. p. 69. chap. x. 2d edit.) “that may be obtained with great certainty by the repeated uſe of the tepid affuſion, ſuffering the ſurface of the body to be expoſed in the interval to the external air; and if the beams of the ſun be excluded, and a ſtream of wind blows over it, the heat may be thus reduced where cold water cannot be procured, even in the warmeſt regions of the earth, on the plains of Bengal, or the ſands of Arabia.” The effects of the affuſion of tepid water on the ſkin are thus enumerated. “It very generally produces a conſiderable diminution of heat, a diminiſhed frequency of the pulſe and reſpiration, and a tendency to repoſe and ſleep. I have alſo uſed it in feveriſh diſorders of various kinds where the lungs are oppreſſed, and the reſpiration laborious, and where of courſe the oppreſſion might be dangerouſly augmented by the ſudden ſtimulus of the cold affuſion. It is alſo applicable to every caſe of fever, in which the cold affuſion is recommended, and thoſe may receive much benefit from it whoſe fears or whoſe feebleneſs deter them from that energetic remedy. I have not, however, found its effects ſo permanent as thoſe of the cold affuſion, and I have never ſeen it followed by the total ceſſation of regular fever, as often occurs after the cold affuſion.” (Currie, loc. cit.)

Where the affuſion of cold or tepid water is not employed in fever, benefit may be derived, though in an inferior degree, by ſpunging or wetting the body with cold or warm water, or vinegar and water. According to Dr. Currie’s experience, however, it is not only leſs effectual, but in many caſes leſs ſafe; for the ſyſtem will often bear a ſudden, a general, and a ſtimulating application of cold, when it ſhrinks from its ſlow and ſucceſſive application. In the Houſe of Recovery belonging to the Fever Inſtitution of London, all theſe meaſures have been conſtantly employed according to the circumſtances of the patient, as pointed out by Dr. Currie, and relief has been invariably the reſult; no individual remedy, to which we have reſorted, has appeared to produce ſo prompt and decided a diminution of the febrile ſymptoms; which, though often temporary only, is in many caſes permanent, and renders the future courſe of the diſeaſe apparently milder and ſhorter, than it would otherwiſe be.

The ſenſation of *thirſt* is another irritation, which is often very diſtreſſing in fever. In this inſtance, as in that of extreme heat, the inſtinctive feelings of the patient direct him to the ſource of relief; to ſimple diluent drink in the one caſe, as to expoſure to cool air, or immerſion in water, in the other. Had not the rage for hypotheſis for ages, blinded the practitioners of medicine, the obvious propenſities of the conſtitution could not have been ſo long and ſo obſtinately thwarted, nor the groſs inconſiſtency have been committed, of acknowledging the ſuperintendance of nature, her ſalutary and healing exertions, her *vis medicatrix*, yet of counteracting her inſtinctive diſpoſitions and operations with ſo much induſtry. Thus, drink, as well as cool air, has been denied to patients in fever by ſome phyſicians, and, when allowed, was directed to be given warm, notwithſtanding their deſire for it cold. The ancient phyſicians, indeed, with whom obſervation on the whole was paramount to hypotheſis, generally admitted of a free uſe of cold drink: Galen conſidered it as a moſt important remedy in fever; and Avicen, Rhazes, and others of the Arabian phyſicians, were more indulgent in this reſpect than the Greeks. Nevertheleſs, Aetius recommended total abſtinence from liquids until the thirſt was greatly augmented, and then to allow it to be fully gratified by copious draughts of cold drink. Celſus alſo recommends the uſe of copious cold drink in the height of the fever, “but not before the fourth day, and *after* great thirſt.” (De Medicina, lib. iii. cap. 7.) “In the article of drink,” he ſays, in another place, “the ſtruggle is great, and that in proportion to the ſeverity of the fever; for this inflames the thirſt, and demands water moſt importunately, when it is moſt dangerous.” (Lib. iii. cap. 6.) After the revival of learning, when the Galenical hypotheſis of concoction was univerſally adopted, cold drink was generally prohibited until the fever had attained its acme, under the notion that it increaſed the crudity of the fluids, and prevented the progreſs of concoction: “verùm materiam morbi incraſſando, atque intus includendo,” ſays Lommius, “longe facere coctioni rebelliorem, itemque meatus, quibus ea tandem vacuari debeat, obſtruere.” (Lomm. de Febribus contin. curandis, ſect. iii. cap. 2.) The concluſion, however, which common ſenſe would deduce from a conſideration of the inſtinctive propenſities of the conſtitution, is fortunately corroborated by obſervation and experience. Dr. Fordyce, after refuting ſome arguments and ſtating ſome facts, upon this point, adds this remark: “the author, therefore, concludes, that as it is of no uſe to reſtrain the patient from drinking as much as he pleaſes, or to compel him to drink more than he chuſes, ſo it is of no uſe to prevent him from drinking it of the degree of heat that he likes beſt.” (Third Diſſertat. p. i. p. 211.) The abſurd oppoſition to the intimations of nature, which many practitioners have been led to maintain by equally abſurd reaſoning, almoſt juſtifies a ſarcaſm of the late Dr. Moore, who ſaid, that “between a good phyſician and a bad one, there was a wide difference; but between a good phyſician and none at all, the difference was very little.” At preſent, however, the obſervation is not applicable; ſince the abſurdities of former phyſicians are now adopted by the people at large, and one of the greateſt difficulties which a practitioner has to encounter at preſent, is to prevent the miſchief of popular interference, and to defend the operations of the conſtitution from popular interruption.

With reſpect to the uſe of cold drink in fevers, Dr. Currie aſcertained that its ſafety and utility are dependent on the ſame principles, and that its adminiſtration is to be regulated by the ſame rules, as the external application of cold; namely, that when there is a ſteady heat of the ſurface,

face, without any ſenſe of chillineſs, or a general perſpiration, it is ſafe and ſalutary, and attended by ſimilar effects, though generally leſs in degree, than thoſe of the cold waſhing. This principle was, indeed, long ago pointed out by Galen and others, though with leſs preciſion. The degree of corporeal heat, the ſtrength of the patient, the ſummer ſeaſon, &c., are ſtated by Lommius, from the ancients, as indicating the ſafety of cold drink. "Fiduciam addunt, ſebris admodum urens, ætas juvenilis, corpus boni habitus, firmorumque viſcerum, atque his (ut ſere fit) junctæ vires, æſtas media, conſuetudo. Ingens febris ardor ſine noxâ frigidæ impetum ſuſtinet, &c." (Loc. cit.) The effects of cold drink, when copiouſly taken in the hot ſtage, as deſcribed by the ancients, as by Aëtius, Celſus, &c. are ſweating, a diſpoſition to ſound ſleep, and relief from the fever. "Poſt quæ," ſays the author juſt quoted, after having mentioned the quantity of cold water drank (three or four pints), and occaſional vomiting or diarrhœa produced by it, "reclinati ac probe operti, mox uberrimis ſudoribus totas noctes, vel etiam altiſſimè dormientes, defluxerunt, quibus finitis, omnem in poſterum amiſerunt febricitationem." Cold drink is ſeldom employed, at preſent, to this extent; but a treatiſe was publiſhed nearly a century ago, by the reverend Dr. Hancock, of St. Stephen's, Walbrook, entitled "Febrifugum Magnum, or common water a cure for all fevers," in which he ſtates, that very copious draughts of cold water, drank at bed-time, at the beginning of fevers, invariably produced copious ſweating, and a ſolution of the diſeaſe, in ſeveral caſes, which he has related. He was not, however, aware, that ſuch a practice was only ſafe after the hot ſtage was completely formed.

2. Another irritation, which it is requiſite to avoid in fever, is motion, eſpecially that which requires the exerciſe of the muſcles; and it muſt be obſerved, that every motion of the body is more ſtimulant and exhauſting in proportion as the body is weaker. Hence that poſture is to be choſen which employs the feweſt muſcles, and which keeps none of them long in a ſtate of contraction. In the horizontal poſition, the patient is ſupported in every part by the bed, and he is not obliged to exert many of his muſcles to maintain an equilibrium, as when in the erect poſture. Some muſcular exertion is, however, required to lie on one ſide or the other, although it be imperceptible in health; ſince in the extreme proſtration of ſtrength, in the laſt ſtage of fever, the patient invariably ſlides upon his back. Speaking, which as it alſo tends to accelerate reſpiration, ſhould be particularly refrained from.

3. The exerciſe of the mind alſo adds much to the excitement of the body, more eſpecially when there is conſiderable debility, as in fever, and when, therefore, the exerciſe of the mental powers requires more exertion on the part of the patient. Hence as ſoon as a febrile attack has come on, every circumſtance that can lead to thought, and eſpecially to ſuch as is connected with anxiety, or may tend to excite paſſion or emotion, is to be carefully ſhunned. It is ſcarcely neceſſary to warn the practitioner againſt exciting anxiety in the mind of the patient about his diſeaſe, by making it the ſubject of converſation in his preſence; but it ſhould be inculcated to nurſes and friends, and all unneceſſary attendants and viſitors ſhould be excluded, that the ſubject of buſineſs, and all other intereſting converſation may be avoided.

4. A very important part of the antiphlogiſtic regimen relates to the nature and qualities of the food and drink to be given to perſons labouring under fever, particularly in the early periods of it. The preſence of recent aliment in the ſtomach always proves ſtimulant to the ſyſtem, and the more ſo in proportion to the quantity received, to the ſolidity of its texture, and therefore the difficulty of its digeſtion, &c.; in all theſe points the irritation ought to be moderated as much as poſſible, conſiſtently with the ſafety of the patient. In the beginning of continued fever no great quantity of nouriſhment is immediately required, the ſyſtem being able to ſupport itſelf for a time, without any thing being thrown in to be formed into chyle and blood. Total abſtinence from food, for the firſt few days of continued fever, was much practiſed by the ancients, who have left us a great many precepts reſpecting the regulation of the diet in febrile diſeaſes. A conſiderable degree of abſtinence in fact is rendered abſolutely neceſſary by the loſs of appetite, and even averſion to food, which prevail through the greater part of the courſe of fever; but ſome aliment becomes requiſite to prevent the patient from ſinking under the exhauſtion of the diſeaſe. In the firſt place, however, no principal meal ſhould be employed under theſe circumſtances, even were the organs of digeſtion capable of retaining a large quantity of food, or of converting it into chyle, on account of the irritation which it would induce: ſmall quantities, therefore, ſhould be given, and repeated more frequently than in health. In the ſecond place, no ſolid animal food ought to be given during the exiſtence of continued fever, however ſlight. The effect of ſuch food, when taken, if the ſtomach do not altogether reject it, is to increaſe the heat of the patient, not only to his own ſenſations, but ſtill more to the feel of the by-ſtander, and frequently, though not always, to the thermometer; to increaſe the frequency of the pulſe and reſpiration; to excite great reſtleſſneſs and a ſenſe of uneaſineſs, and to augment the depreſſion of ſtrength, during the time that it remains in the ſtomach and inteſtines. In ſhort, it totally deranges the fever, and often produces the appearance of a freſh paroxyſm. (Fordyce.) If the ſame kind of food be perſiſted in, it increaſes the evening exacerbations extremely, brings on delirium much more rapidly, and to a much greater degree than it would otherwiſe ariſe, and in every way aggravates the danger of the diſeaſe. Dr. Fordyce preſſes a farther caution ſtrongly upon the attention of his readers: "even after the diſeaſe has been terminated by a criſis," he ſays, "animal food, in a ſolid form, ſhould be rejected, there being no cauſe which has produced relapſes, as far as the author's obſervation has gone, ſo frequently as uſing ſolid animal food too ſoon," from a notion that it would ſpeedily reſtore the ſtrength of the patient. And he properly ſuggeſts that under ſuch circumſtances, the fever being gone, the depreſſion of ſtrength no longer exiſting, and no farther cauſe of weakneſs remaining, "the patient, with very moderate nouriſhment, and the ſleep and reſt which are ſo apt to enſue after the fever has been completely carried off, will have his ſtrength reſtored in a very ſhort time, without uſing any thing that ſhall run any riſk of reproducing the diſeaſe." (Third Diſſert. part i. p. 184.) The moſt proper nouriſhment in fever, then, conſiſts of light, fluid, vegetable matters; eſpecially the farinaceous ſubſtances, coagulated by heat. Decoctions of barley have been employed for this purpoſe, as the ſimpleſt nouriſhment, from the earlieſt ages; and the ſeeds of oats, or other farinaceous grain, with the huſks removed, afford ſimilar food by decoction in water. The various forms of vegetabe ſtarch, which are prepared under the names of ſago, tapioca, arrow-root, &c. anſwer the ſame purpoſe of furniſhing aliment, which gives the leaſt diſturbance to the organs of digeſtion. The *polenta* of the ancients, which was compoſed of a decoction of baked flour, or of bread twice baked, which we call *ruſks*, was much recommended in acute diſeaſes. All vegetable ſubſtances, however, are not to be employed indiſcriminately as food, in fevers. Even the

farinaceous ſubſtances, if diſſolved in water, without being coagulated by heat or otherwiſe, afford a very viſcid food, which is not eaſily digeſtible, and diſturbs the ſtomach and the conſtitution at large: all ſuch vegetables as cabbage, lettuce, green peaſe, and the like, are to be rejected, on account of their diſpoſition to run into the vinous and acetous fermentations, which the ſtomach, having its powers depreſſed, is not ſtrong enough to counteract, whence a conſiderable quantity of vapour is extricated, which diſtends the ſtomach and inteſtines, and produces partial ſpaſmodic contractions in them. All kind of food which is adheſive to the ſtomach produces irritation in the ſyſtem, ſuch as ſtrong ſolutions of gum Arabic, jellies, formed from the fleſh of young animals, or from the membranous parts, which ſhould therefore be avoided. The fruits, eſpecially the ſub-acid or ſummer fruits, or ſuch of them as, from containing leſs mucilage, are not very prone to fermentation, (Fordyce,) afford a light and agreeable nouriſhment, as grapes, &c.; thoſe which conſiſt of much acid, and little ſugar, although agreeable in ſmall quantities, do not contain ſufficient nouriſhment to be depended upon, ſuch as lemons. Another claſs of fruits, which contain, beſides native vegetable acid, a fermentable mucilage, ſugar, and a quantity of farinaceous matter, ſuch as apples, pears, apricots, peaches, &c. ſhould have their mucilage coagulated by heat, when given to patients in fever: baked, boiled, or roaſted, they conſtitute a light and nutritious food. If animal food be employed at all during the progreſs of continued fever, (and the prejudice in favour of it in this country is ſo ſtrong, that it is almoſt impoſſible to prevent the attendants on the ſick from giving it, or to convince them that the patient can be ſuſtained through the fever without it;) it ſhould be uſed only in ſolution in water, and ſolutions only of the muſcular parts of full grown animals. Theſe afford a leſs viſcid fluid than the fleſh of young animals, or than the membranous, tendinous, or ligamentous parts: the fat or oily part ſhould be removed by cooling and ſkimming it off, before the ſolution be given to the ſick.

5. The nature of the *drink* which is proper to be given to perſons labouring under fever requires ſome conſideration. We have already obſerved, that, with reſpect to quantity, it is uſeleſs either to force the patient to drink more than his thirſt requires, or to debar him from drinking as much as it urges him to take; and alſo, with reſpect to its temperature, that it may be taken cold, even in large quantity, under the ſame circumſtances as the application of cold externally; namely, when the patient is in a ſteady heat, without any ſenſe of chillineſs on the one hand, or profuſe general perſpiration on the other. In regard to the quality of his drink, the principle of avoiding irritation or excitement of the arterial action is to be conſtantly kept in view, at leaſt in the early ſtages of fever. When there is conſiderable heat of the body, water from the ſpring is generally moſt grateful to the palate of the patient, and is not, perhaps, to be excelled in wholeſome qualities by any combination of art. The ſlight empyreumatic flavour given to it by toaſted bread, or the impregnation of it with a ſmall quantity of the eſſential oil of the plants of the claſs *didynamia* of Linnæus, ſuch as ſage, balm, &c. muſt be deemed altogether indifferent in their effects on the diſeaſe; and may be employed or not, according to the ſuggeſtion of the palate of the patient. All fermented and ſpirituous liquors, as directly ſtimulant to the ſyſtem, ſhould be interdicted during the early and middle ſtages of continued fever, of whatſoever denomination. Dr. Fordyce, miſled by a piece of hypotheſis reſpecting the proceſs of digeſtion, and miſconſtruing the meaning of the word *fermentation*, has recommended "weak vinous fluids" as drink in fevers. As theſe are in a ſtate of fermentation, he ſays, "and as ſubſtances in a ſtate of fermentation are apt to excite any other fermentation that the ſame ſubſtances are capable of, are perhaps uſeful to excite in the ſtomach the *fermentations* by which the food is converted into chyle; they are, therefore, ſo far, perhaps, better than pure water." (Third Diſſert. part i. p. 216.) But this is an abuſe of terms; for there is no analogy between the proceſs of the vinous fermentation in vegetables, and that of animal digeſtion; and the ſame author had already cautioned his readers againſt the uſe of thoſe vegetable ſubſtances as food, which were prone to fermentation, on account of the ill conſequences which ſuch fermentation produces. A more free uſe of vinous liquors is reſorted to, with great detriment to the patient, by ſome practitioners, who ſuppoſe that fever is a diſeaſe of mere debility, and therefore think of ſtimulating from the moment the idea of fever occurs: and the ſame pernicious practice is purſued by the people in general, at leaſt the uninformed part of them, from the truly Engliſh prejudice, that if a perſon cannot eat, (*i. e.* cannot take *ſolid* food,) he cannot live; and that wine and ſpirits are therefore requiſite to *nouriſh* him. Theſe notions are ſo general among the uninformed, whether in or out of the profeſſion, that it requires the conſtant vigilance of the practitioner to prevent the practical miſchief reſulting from them: we have hence thought it neceſſary to ſpeak ſtrongly upon this point; and regret that Dr. Fordyce, whoſe opinion is by ſome deemed little leſs than oracular on this ſubject, allowed himſelf to be miſguided by an hypotheſis, ſo as to give any countenance to the practice. While the indication of avoiding irritation is to be purſued, fermented liquors, even of the loweſt quality, ſuch as ſmall beer, are ſcarcely admiſſible, unleſs the febrile excitement be very moderate.

6. There are other irritating powers which are occaſionally applied, and require to be removed in fevers; theſe are eſpecially a collection of crude and undigeſted food in the ſtomach, and of fæces in the inteſtines. If food had been taken a ſhort time previous to the attack of fever, it muſt remain undigeſted, and therefore tend to aggravate ſeveral of the ſymptoms, eſpecially the uneaſineſs about the præcordia, the head-ache, the heat, and the velocity of the circulation and reſpiration. This, therefore, is another reaſon for the adminiſtration of an emetic, as well as for the free uſe of diluting liquids. And the ſtimulus of retained fæces in the bowels equally ſuggeſts the propriety of laxative medicines or glyſters, by which they may be removed; for, while preſent, they occaſion a ſenſe of fulneſs and weight in the abdomen, and of uneaſineſs and reſtleſſneſs in every part of the body, and augment the fever conſiderably. Of the effect of purgatives, as a general evacuant remedy, we ſhall have occaſion to ſpeak immediately. "The avoiding of irritation in all theſe particulars," Dr. Cullen obſerves, after a brief enumeration of the ſame circumſtances, "conſtitutes the antiphlogiſtic regimen, abſolutely neceſſary for moderating the violence of re-action; and, if I miſtake not, is proper in almoſt every circumſtance of continued fevers." (Firſt Lines, § 132.)

To enable us to fulfil the firſt indication of "diminiſhing exceſſive action" in the ſyſtem, ſeveral remedies are commonly uſed in aid of the antiphlogiſtic regimen: theſe are chiefly ſuch as produce an evacuation of the circulating fluids directly, or of the ſecretions from them through their reſpective emunctories: for, as it is believed that the activity of the ſyſtem depends, in a great meaſure, upon the ſtimulus of the fluids diſtending the veſſels through which they circulate, it is inferred, that the diminution of the quantity of the fluids muſt diminiſh the activity of the ſanguiferous ſyſtem. The fact is proved by experience, whatever explanation may be adopted.

Blood-letting, by opening a vein in the arm, or any other part of the body, is the moſt direct means of diminiſhing the quantity of fluids in the ſyſtem, and has been reſorted to from very ancient times; its effects have been explained by various hypotheſes, which it is not neceſſary to enumerate or diſcuſs. To abſtract that fluid, which is the immediate pabulum of life, cannot, it is obvious, be a matter of indifference to the conſtitution: if it be the moſt powerful means of influencing the vital actions, ſo it is the moſt dangerous when improperly employed: if the moſt effectual mode of diminiſhing excitement, it is conſequently the moſt apt to induce extreme debility. A cautious conſideration of many circumſtances is, therefore, requiſite in determining on the propriety of blood-letting in fever. Dr. Fordyce affirms, ſpeaking of fever in the ſenſe in which we have defined it, (as diſtinct from the *phlegmaſiæ*, or local inflammations,) that, "the taking blood from a large vein, in any part of the body indiſcriminately, never diminiſhed, ſhortened, nor carried off a fever, in any caſe he has ſeen, nor has he found any upon record in which it had this effect." (Diſſert. Third, part ii. p. 4.) A ſtatement which may, perhaps, render the extent of his reading very queſtionable; but which, as it relates to the fevers of this country, we are diſpoſed to conſider as correct. A pure inflammatory fever, or ſynocha, is never ſeen, we believe, in this country; patients are ſeldom deſtroyed by a mere general excitement, without topical congeſtion; but commonly by the ſubſequent exhauſtion, together with local injury of ſome particular organ. In the fevers which we are acquainted with in this climate, then, blood-letting is generally to be avoided, on account of the danger of the ſubſequent debility which it occaſions; more eſpecially when we conſider that this debility is to be expected, at all events, to enſue, in conſequence of the failure of the digeſtive powers which ſupport the waſte of the body; of the loſs of ſleep neceſſary to reſtore the vital energy; and of the conſtant over-action of the whole ſyſtem, which is followed by proportionate exhauſtion. In typhus, under all its modifications, theſe obſervations demand attention; and it is now generally admitted that blood-letting is a pernicious practice in that form of fevers. It were not eaſy, indeed, to comprehend how the practice in low fevers could have been ſo generally and ſo long purſued, did we not know the influence of authority in perverting obſervation. While the precepts of Galen and Celſus were followed by Sydenham, Huxham, and others, theſe ſagacious obſervers did not fail to remark the occaſional injuries which the practice produced; (ſee Wilſon on Febrile Diſeaſes, vol. i. p. 671, *et ſeq.*) yet they did not eſcape from the trammels of authority, but repeated the practice, expreſſing "great concern and aſtoniſhment" at the failure and miſchief, which were often moſt evident. (See Huxham on Fevers.)

As the employment of blood-letting, in idiopathic fevers, requires much caution and diſcernment, the following circumſtances were ſuggeſted for the conſideration and guidance of the practitioner by Dr. Cullen. 1. The nature of the prevailing epidemic; from which we learn the nature of the ſymptoms which are to be expected, as well as the influence of different remedies. 2. The nature of the remote cauſe: all fevers ariſing from contagion, whatever be the ſtate of the patient, or the appearances of the diſeaſe in the commencement, will ſoon aſſume the form of typhus, and therefore blood-letting is ſeldom admiſſible, although the excitement in the beginning be conſiderable. 3. The ſeaſon and climate in which the fever occurs; for the ſymptoms are much more violent, and the changes more ſudden in ſultry than in temperate climates, in the autumn than in the ſpring. The practitioners in hot climates have been divided in their opinions reſpecting blood-letting; but in this, as in moſt other caſes, the extremes are to be avoided; and it ſeems probable, that blood-letting is only to be employed in tropical climates, when the violence of the excitement threatens to prove ſpeedily fatal, or to induce extreme debility, and then only to puſh it to that extent, which the urgency of the ſymptoms abſolutely requires. (See Fever, *yellow*.) 4. The degree of phlogiſtic diatheſis, or of high excitement; which, however, it is difficult to define. The ſame degree of excitement, which warrants blood-letting in an epidemic, which partakes much of the *ſynocha*, or inflammatory character, or in a fever from cold, violent exerciſe, or rage, does not warrant it in a typhoid epidemic, nor in fever from contagion. 5. The period of the diſeaſe. In the moſt ardent fevers, as ſoon as the ſymptoms ſhew any tendency to decline, the proper period for blood-letting is paſt. Even Huxham, prejudiced as he and moſt of his contemporaries were in favour of this remedy, admits that "bleeding, unleſs in the beginning, ſeldom did ſervice." 6. The age, vigour, and plethoric ſtate of the patient. 7. The patient's former diſeaſes, and habits of blood-letting; if he has been ſubject to inflammatory complaints, more vigorous remedies may be employed; and if he has been in the habit of loſing blood, he bears the loſs of it better, as habitual blood-letting produces habitual plethora. 8. The appearances of the blood drawn; which are chiefly the firmneſs or looſe conſiſtence of the coagulum, the preſence or abſence of the *buffy coat*, the proportion of ſerum to the craſſamentum, &c. (See Blood, *morbid alterations of the*.) 9. And, laſtly, the effects of the blood-letting that may have been already practiſed; namely, the continuance or alleviation of the ſymptoms, the occurrence of debility, &c. (See Cullen loc. cit. § 142, and Wilſon on Fevers, vol. i. pp. 648, and 668, where this ſubject is fully and ably diſcuſſed.) On the whole, however, few caſes of fever in this country require venæſection, and in no caſe, perhaps, under any circumſtances, is this remedy admiſſible after the firſt five days of the diſeaſe.

But the uſe of *local blood-letting*, by means of leeches, or cupping, is often of great advantage in certain conditions of fever, more eſpecially in relieving local congeſtions of blood in the head, and the ſymptoms thence reſulting. Thus, when there is much head-ache, or delirium, accompanied by fluſhing of the countenance, and redneſs of the eyes, the application of a few leeches to the temples, or the ſcarificator and cupping-glaſſes to the ſame part, or to the nape of the neck, or even taking four or five ounces of blood from the jugular vein, has often diminiſhed theſe ſymptoms conſiderably, ſometimes carried them off entirely, and with them the whole fever. Under the ſame circumſtances bleeding from a part diſtant from the head has been of no manner of uſe. If the ſtrength of the patient be much diminiſhed by the fever, or otherwiſe, the application of one leech to each temple is often of conſiderable uſe. (Fordyce.) We are diſpoſed to believe, that the local evacuation of blood is a remedy too much neglected in the general practice in fever.

Sweating is another mode of diminiſhing exceſſive vaſcular action in fevers. The obſervation, however, that a free ſweating commonly takes place in the criſis of intermittent fevers, and in thoſe which occaſionally occur in continued fevers, has led to much abſurd and pernicious practice, for the purpoſe of forcing perſpiration. Practitioners miſtook one of the ſymptoms of the ceſſation of fever for the cauſe of that ceſſation. But neither does ſweating certainly carry off fever, (for it frequently takes place without even producing any alleviation,) nor is it alone a ſymptom of its ceſſation. Under ſuch circumſtances there is a general increaſe of all the ſecretions, the ſaliva, urine, &c.; and the tongue becomes moiſt, the ſkin ſoft, and ſo on. But when ſweating is excited by the hot regimen, by ſtimulant alexipharmic medicines, a load of bed-clothes, and a heated atmoſphere, theſe beneficial accompaniments do not take place; on the contrary, the heat of the body, the thirſt, and general excitement are increaſed, as well as the head-ache, anxiety, and difficulty of breathing; and the very reverſe of the indication of "removing irritation, and diminiſhing exceſſive action," is accompliſhed. This artificial excitement, ſupported by the hot regimen, perhaps, will enable us to account for the appearance of relief often produced by blood-letting, and for the perſeverance of our anceſtors in the uſe of that remedy. More accurate obſervation, however, has decided, that, in general, the moſt advantageous perſpiration is produced by the oppoſite plan, *viz.* by cooling the body, and diminiſhing excitement; in which caſe it is an indirect conſequence of the treatment, and approaches more to the ſpontaneous ſweating, which accompanies the natural ſolution of fever. On the whole, therefore, the uſe of diaphoretic medicines is to be conſidered rather as auxiliary, than as an eſſential part of the treatment of fever.

The principal medicines now employed for the purpoſe of exciting perſpiration are the neutral ſalts, eſpecially thoſe compoſed of an alkali with the vegetable acids, and the preparations of antimony. The neutral ſalts poſſeſs a very feeble power, which is ſuppoſed to be *refrigerant;* a term which is not very intelligible, and perhaps originated from the cold produced during their ſolution; the combination of potaſh or ammonia with vinegar, or lemon juice, are chiefly employed. But antimonials are more certain in their operation upon the ſkin. Of theſe the ſecret preparation of Dr. James, commonly called James's powder, the *pulvis antimonialis* of the London pharmacopœia, which is probably the ſame as the former, and the tartarized antimony, or emetic tartar, are principally uſed. They are all ſomewhat uncertain in their operation, and none of them is poſſeſſed of any ſpecific febrifuge quality; the two former, conſiſting of the ſimple oxyd, and therefore being liable to be combined with any acid in the firſt paſſages, and thus to be rendered more or leſs active, according to the quantity of acid which may be accidentally found there, are more uncertain in their action, than the emetic tartar, in which the antimony is already ſaturated with an acid. The moderate uſe of diluent drinks tends to aid the operation of diaphoretic medicines, partly by the ſympathy of the ſkin with the ſtomach, and partly, perhaps, by ſupplying an increaſe of the thinner parts of the blood. The uſe of diluents was carried to a great extent by the Spaniſh and Italian phyſicians, in what they called the *diæta aquea,* which conſiſted of abſtracting every other kind of aliment and drink, and giving, in divided portions every day, for ſeveral days together, ſix or eight pints of plain water, generally cold, but ſometimes warm. (See Philoſoph. Tranſactions, vol. xxxvi.) But this drenching has not been ſubſequently countenanced either by reaſon or experience. The uſe of diluent drinks has been ſuppoſed to be advantageous by diminiſhing the acrimony of the blood, and conſequently its ſtimulating quality, in fevers; but the exiſtence of this ſtate of acrimony has never been proved, and we are not acquainted with any evidence that renders its exiſtence probable.

Purging, ſo far as to empty the bowels of undigeſted aliment, or fæculent matters remaining in conſequence of the weakened periſtaltic motion, we have already ſaid, is uſeful, by removing a troubleſome ſource of irritation. Dr. Cullen, Dr. Fordyce, and others have conſidered this as the only advantage derived from emptying the inteſtines, and believed that it merely obviates the miſchief, which would enſue from the retention of thoſe matters. Dr. Fordyce, indeed, aſſerts that all evacuation beyond this is detrimental, as inducing debility, "and that ſimple evacuatiou from any of the glands, as tending alſo to weaken, is detrimental inſtead of being uſeful." Many other phyſicians have expreſſed ſimilar opinions, and rather diſſuaded us from the uſe of purgatives, among whom are De Haen, Werlhoff, ſir J. Pringle, &c. who, with Dr. Cullen, conſider it "ſufficient to prevent coſtiveneſs by almoſt daily clyſters, if the patient had not otherwiſe regular ſtools." (Pringle, Diſeaſes of the Army. p. iii. cap. 1. See alſo Cullen, loc. cit. § 149, &c.) Dr. Cullen conſiders purging as injurious, both from producing debility, and from taking off the determination to the ſkin, and thus preventing perſpiration; but this, in the active ſtate of fever, is not, we believe, the reſult of its operation; ſince, as we have ſhewn, with regard to the diminution of the febrile heat by cold water, whatever tends to allay the exceſſive action of the cutaneous veſſels, tends to produce a flow of perſpiration. The neceſſity of preventing any accumulation in the bowels, however, whether by repeated clyſters, or gentle laxatives by the mouth, is univerſally admitted.

But ſince the prejudices of ſyſtem and of particular ſchools have been ſomewhat laid aſide, it has been obſerved by ſeveral intelligent practitioners, that a more active employment of purgative medicines is frequently beneficial in fever; and that not only in inflammatory fever, but in typhus. Dr. Hamilton has recently called the attention of the medical world to this important ſubject; and he affirms that he has for many years given up the uſe of emetics and clyſters in typhus; and that he finds all the advantages of theſe remedies obtained in a more effectual manner by cathartics given internally. (See his Obſervations on the Utility of Purgative Medicines.) With this view he chiefly employs a combination of the ſub-muriate of mercury, or calomel, with a few grains of jalap or rhubarb. He conſiders, that, if fever does not originate in many inſtances from an accumulation and corruption of the contents of the alimentary canal, it is generally connected with, or productive of, ſuch a ſtate; and he affirms, that the removal of the dark and offenſive matter which purging, under ſuch circumſtances, generally effects, is a moſt important ſtep in the cure of fevers. The preſence of theſe matters in the canal is a ſource of augmentation to the general fever; and we have in ſeveral caſes ſeen delirium removed, the head-ache diminiſhed, and the ſtate of the ſkin, tongue, and circulation, proportionally alleviated by the operation of a moderate cathartic; in ſome inſtances, in which the fever had been preceded by conſiderable conſtipation, a briſk cathartic or two have appeared to remove the ſymptoms altogether. In the early ſtage of fever, then, cathartics are adviſeable, both as removing a great ſource of irritation, and as exciting the glands which open into the bowels, and the mucous follicles and exhalant arteries in their coats, to pour out an increaſed quantity of fluids, by which the general excitement is diminiſhed; although in a conſiderably leſs degree than by blood-letting. (See CATHARTIC.) The firſt operation, of removing irritating ſordes, is afterwards neceſſary during the whole progreſs of the fever; and in the weakeſt condition the uſe of a clyſter may be reſorted to. The ſecond operation, with a view of emulging the biliary ducts, and of evacuating the morbid ſecretion of the liver, and of the other glands, and clearing the whole canal, is often required during the continuance of the diſeaſe. This is indicated, 1. By the appearance of the ſtools, whether they are of a highly bilious colour, which implies a copious extrication of bile from the liver; or of a dark brown or green hue, and very offenſive odour, which implies a morbid ſtate of the ſecretion; 2. By pains in the abdomen, eſpecially when there is at the ſame time a degree of fulneſs and tenſion in the epigaſtric and hypochondriac regions, and a tenderneſs perceived on preſſing the abdomen; or when there is alſo a degree of *teneſmus*, or frequent deſire to go to ſtool. 3. When, together with theſe ſymptoms, the tongue is much loaded and parched, or ſometimes when there is a conſiderable ſpitting, when the countenance is of a dirty or leaden hue, and the breathing more oppreſſed than the ſtate of the circulation would lead us to expect. Sometimes with this ſtate of the abdomen and countenance a great languor takes place, even to fainting, although there are no other ſymptoms of extreme proſtration of ſtrength, and the pulſe, though quick, is not equally languid; under ſuch circumſtances we have ſeen the languor ſpeedily removed by a copious evacuation from the bowels. A degree of dyſenteric affection is not unfrequently ſeen in the advanced periods of fever, that is, a frequent diſcharge of looſe or ſlimy ſtools, with ſome griping and teneſmus; this is moſt effectually relieved by purgatives with which opiates are combined, in order to obviate the irritation and exhauſtion which the operation of the cathartics might induce. Calomel and opium combined in ſmall doſes ſeem to anſwer this purpoſe very effectually. Where the mere emptying of the bowels is the object of the medicine, and eſpecially where extreme weakneſs has already come on, or is to be ſpeedily expected, the milder neutral ſalts, as the ſulphate of magneſia, the Cheltenham, or Rochelle ſalts, caſtor oil, magneſia and rhubarb, &c. are the moſt proper remedies; but the more active agents, as calomel, and jalap, in moderate doſes, (Dr. Hamilton's formula conſiſts of three or four grains of the former, with ſix, eight, or ten of the latter,) are requiſite; and theſe, indeed, may almoſt ſuperſede all other laxatives; or ſenna, rhubarb, &c. may be given with the calomel. It is not very important to dilate on the different remedies; for when the indication is underſtood, the means of fulfilling it will readily occur. An active purgative, during a ſtate of extreme debility, may be productive of great miſchief; and in the laſt ſtages of contagious typhus ſuch a medicine is to be abſtained from altogether: even the mildeſt cathartic operation has, at ſuch times, occaſionally produced a dangerous ſinking of the vital powers. But from this fact it were an error to infer, that active purgatives are to be diſcarded altogether from our practice in typhus, as the Brunonians have aſſerted.

The humoral pathologiſts, from an hypothetical notion of the remains of the *materies morbi* being retained in the conſtitution after the ceſſation of fever, have directed the adminiſtration of cathartics to carry them off, and to preſerve the convaleſcent from their future influence; and ſir John Pringle has ſuggeſted the propriety of uſing them, during the ſtate of convaleſcence, with a view to prevent a too haſty repletion, which an indulgence of the appetite is ſometimes apt to produce; but, he obſerves, cathartics at that time ſeem otherwiſe neceſſary. But Dr. Fordyce remarks, that he has obſerved more relapſes to take place when purgatives have been uſed after the ceſſation of fever, than when they have not been employed. Indeed, the notion of the humoriſts, that by partial evacuations, whether by bleeding or purging, the remaining fluids could be deprived of the morbid matter, ſuppoſed to be diffuſed in them, is too abſurd to require a ſerious refutation. Nevertheleſs, this practice of purging, "to carry off the dregs" of fever, ſmall-pox, &c. is ſtill generally prevalent among the ignorant, both in and out of the profeſſion.

Bliſtering the ſkin has been reſorted to as a remedy in fever, upon two very different principles, which are ſcarcely conſiſtent with each other, and neither of them, perhaps, is much entitled to our confidence. Inflammation, and ſuppuration, or ſome other diſcharge, having been obſerved to precede the ceſſation of fever in certain caſes, this proceſs was attempted to be imitated by the application of bliſters or irritants, compoſed of cantharides, muſtard, &c.; and the humoriſts, with their uſual abſurdity, ſuppoſed that theſe applications would, like a magnet, attract the morbid matter to this irritated part, by which it might be carried off. On the other hand, the inflammation, thus excited, has been conſidered by others as ſtimulant to the ſyſtem, and therefore as uſeful to ſupport the ſtrength in the laſt ſtage of proſtration, the diſcharge being altogether overlooked.

Had the recommendation of bliſters, as a general remedy in the early ſtages of fever, reſted only upon the principles and practice of the humoriſts, we ſhould have diſmiſſed the ſubject briefly: but it has been maintained by ſeveral eminent obſervers, and by none more ſtrongly than by Dr. Lind of the Haſlar hoſpital, whoſe experience and abilities are entitled to the higheſt regard. "I do not know a more certain proof," ſays this reſpectable author, "of a prevailing infectious fever, than that of twenty patients in fevers *bliſtered* at night, ſixteen will next morning be entirely free from heat, head-ache, pain, and fever." (Loc. cit. chap. ii. ſect. 1.) And he denies the ſtimulating effect of bliſters in contagious fevers, and affirms that, "according to the nurſes' phraſe, the patient generally *received a cool* from the *bliſter*." (Ibid.) Theſe encomiums, however, are very far from being corroborated by general experience, or by the authority of many able phyſicians; on the contrary, the teſtimony of the majority tends to prove, that little is to be expected from bliſters in fevers unaccompanied by local affections. We have ſeen numerous inſtances in which large bliſters had been applied between the ſhoulders in the early periods of fever: but we never witneſſed any marked effect, either good or bad, in thoſe caſes. Like the local blood-letting, however, they are decidedly beneficial in relieving local pains and congeſtions; and every practitioner has experienced their utility, when the brain, ſtomach, lungs, &c. have been thus affected. Sir John Pringle obſerves, that bliſters were only of ſervice in the gaol fever, when the patient was threatened with an inflammation of the brain. "Bliſters, before *uſeleſs*, became then of ſervice:" and in the ſynocha, or inflammatory fever, he was led by experience to confine their uſe to thoſe caſes where the head-ache was conſiderable, which they ſeldom failed to relieve. In fevers attended with coma or delirium they are often employed with advantage, being applied over the ſhaven ſcalp; for the nearer they are applied to the part affected, they are the more powerful in giving relief, like all other local remedies.

Dr. Cullen was likewiſe a ſtrong advocate for the uſe of bliſters in fevers; but he conſidered them as moſt beneficial in the advanced periods of the diſeaſe, "when the re-action being weaker, all ambiguity from the ſtimulant power of bliſtering is removed." We are diſpoſed to believe, however,

ever, that the ſtimulus of a bliſter is productive rather of irritation, than of ſupport to the ſinking ſyſtem ; and the inflammation thus occaſioned, when the vital powers are low, is liable to terminate in gangrene. Rubefacients are ſafer than bliſters in this ſtate of the ſyſtem, but do not ſeem to be of much benefit where there is no local affection. Sinapiſms, or muſtard poultices, are ſometimes applied to the feet, eſpecially where there is coma, or great failure of the *vis vitæ* : this, like the old practice of bleeding from the feet, probably originated in the obſolete doctrine of revulſion, and might be more efficacious, if the ſinapiſms were applied to the region of the ſtomach, or to the head.

The ſecond indication is, " to increaſe the actions that are defective." It has been ſeen, in tracing the hiſtory of the progreſs of fever, that the ſymptoms, which occur in the latter ſtages of the diſeaſe, are principally the reſult of a general failure of the vital power, or nervous energy : and that ſuch a failure is the neceſſary reſult of the previous over-excitement, and the privation of the ordinary means of ſupport, from aliment, ſleep, &c. Hence, then, the means of preventing this failure of life conſiſt partly in fulfilling the firſt indication, or diminiſhing the over-excitement, and partly in uſing thoſe remedies which tend to ſupport and increaſe the vital actions, when the ſymptoms of their failure appear. It muſt be obvious, therefore, that the early employment of ſtimulants, cordials, and tonics, (which was reſorted to by the humoral pathologiſts, in order to accelerate the *concoction* of the morbid matter ; by the diſciples of Brown, with a view to obviate debility, and by others to prevent putrefaction,) muſt be extremely pernicious. It is a practice founded on the ſame grounds as the vulgar error of the people in forcing food upon a perſon in fever. They forget that, in order to nouriſh the body, the food muſt be digeſted, converted into chyle, and aſſimilated ; but that, while the ſyſtem is incapable of performing theſe functions, the food introduced tends but to increaſe the weakneſs, by increaſing its cauſe, the febrile ſtate. In like manner, theſe practitioners no ſooner hear the name of fever, than they immediately ply the patient with wine, Peruvian bark, and various cordials, regardleſs of the period and circumſtances of the diſeaſe, and thus accelerate the debility, the conſequences of which they are moſt anxious to avoid. This treatment cannot be too ſtrongly reprobated ; eſpecially as it is ſtill adopted by many in the profeſſion, who practiſe by rote, notwithſtanding the proofs of its injurious conſequences, which experience has amply aſcertained. And it is moſt particularly to be condemned, when there are ſymptoms of conſiderable local congeſtion, eſpecially in the head.

When, however, the means of moderating the excitement, in the former ſtages of the fever, have been omitted, or have failed to terminate the diſeaſe, and the ſymptoms of exhauſtion and defective action begin to appear, it then becomes requiſite to adminiſter thoſe remedies which poſſeſs a ſtimulant power over the actions of the arterial and nervous ſyſtems. Of the medicines which ſupport and increaſe the actions of the animal body, thoſe which are poſſeſſed of ſtrong ſenſible qualities, and excite an obvious and immediate action, are denominated *ſtimulants* ; and thoſe which ſlowly, and by repeated exhibition, increaſe the power and force of theſe actions, or the *tone* of the moving parts, have been called *tonics*. Of the former claſs are wine, ſpirits, volatile alkali, the æthers, &c. ; of the latter are the bark of cinchona, caſcarilla, and other vegetable bitters, the metallic ſalts, and oxyds of iron and zinc, &c. Now, as the operation of the latter is comparatively ſlow, they are leſs uſeful in the late ſtages of continued fever than the articles of the former claſs. The principal tonic medicine that has been employed in continued fever is the cinchona, or Peruvian bark ; which has probably been given in theſe fevers, in conſequence of its ſucceſs when adminiſtered in *the intervals between* the paroxyſms of intermittents. Between this operation, however, and the cure of a continued febrile ſtate, it is obvious that there is not much analogy ; and experience has evinced accordingly, that the practice is not beneficial ; but that, on the contrary, it more frequently increaſes the ſymptoms of continued fever, and that its uſe is moſt likely to be detrimental, eſpecially when the tongue remains foul, the pulſe frequent, and the ſkin not yet become ſoft, cool, and moiſt. Dr. Fordyce has accurately deſcribed the conſequences which we have occaſionally witneſſed from the exhibition of the bark, even when the favourable remiſſion of the ſymptoms ſeemed to juſtify its uſe. " The relaxations which began to take place in the diſeaſe have been much diminiſhed, the pulſe has become more frequent in the morning, the head-ache more conſiderable, the ſkin drier, the tongue covered with a thicker fur, the coſtiveneſs greater, if the patient was not thrown into a purging, the oppreſſion upon the præcordia greater, and likewiſe the difficulty of reſpiration greater. On the following evening the head has been alſo much more affected, that is, the confuſion and delirium have been much more conſiderable, and the patient altogether worſe than he probably would have been, if no remedy whatever had been exhibited, and there has been leſs chance of criſis in the fever, and it has been longer of being worn out." (Third Diſſert. part ii. p. 148.) Where there are marks of congeſtion in the head, lungs, or other viſcera, the adminiſtration of bark is at all times to be deprecated. In a word, the moſt accurate experience has taught us, that the cinchona, eſpecially in ſubſtance, is ſeldom beneficial, and often injurious, in continued fever of any kind ; and that it is moſt uſeful in reſtoring the ſtrength in the convaleſcent ſtate, when the ſymptoms of fever have altogether diſappeared. The only caſes in which we have ſeen any advantage from it, are thoſe in which there is an obvious remiſſion and exacerbation, eſpecially at tertian periods ; a form which we have ſometimes obſerved the continued fever of this country to aſſume.

A great variety of ſtimulant remedies have been employed for the purpoſe of obviating debility in the late periods of continued fever ; of theſe *wine* is generally the moſt grateful, and not leſs efficacious than moſt of thoſe which have been recommended. But this, we believe with Dr. Gregory, has been often given in too large quantities, to the amount of two or three bottles in the day. We have certainly ſeen the ſtrength rouſed by powerful ſtimuli in great quantity ; but we have alſo ſeen this new excitement immediately followed by a fatal inflammatory condition of the brain. Perhaps a pint in the day may be generally ſufficient. When wine cannot be procured, cyder, porter, or ſpirits diluted with water, ſweetened and acidulated, are tolerable ſubſtitutes. Dr. Cullen was of opinion that the laſt mentioned compound and opium produced all the effects of wine : but opium does not appear to ſupport the pulſe like wine. With reſpect to opium, it is generally inadmiſſible while any conſiderable excitement exiſts, and eſpecially when the ſkin is hot and dry, the tongue very foul, the bowels bound, and marks of congeſtion in the head, or elſewhere, appear : under theſe circumſtances it neither diminiſhes reſtleſſneſs, nor tends to induce ſleep ; but, on the contrary, it increaſes the watchfulneſs, and diſturbs the mind with exceſſive and frightful dreaming, increaſes the delirium, and the febrile heat and thirſt. When the ſkin is moiſt and cool, and the head but ſlightly affected; when the tremors, ſubſultus of the tendons, or other ſpaſmodic affections manifeſt themſelves; when the bowels are exceſſively relaxed, and the evacuations watery; opium may be uſefully employed. Under the ſame circumſtances camphor is frequently adminiſtered as a ſtimulant: but it may be juſtly doubted, as Dr. Fordyce has obſerved, whether the very ſmall doſe contained in what is called the camphor mixture, uſually given, produces any decided effect: ſince much larger quantities have been given without any ſenſible operation. Muſk, caſtor, and other ſubſtances of powerful odour, have been often given in the laſt ſtage of fever: but the effects have been differently repreſented by different practitioners, ſome believing them to be very effectual ſtimulants, while others have deemed them almoſt inert. Dr. Gregory conſiders them as no farther active, than by their ſtrong impreſſion on the ſenſes, and much leſs efficacious antiſpaſmodics than wine and opium. The *ſerpentaria*, or ſnake-root, *contrayerva*, and other cordial and aromatic vegetable ſubſtances are often adminiſtered with advantage. It muſt be remembered, however, that where there are marks of conſiderable congeſtion of the brain, all powerful ſtimulants, which will tend to augment that condition, will ultimately fail to produce ſtrength; but, on the contrary, will increaſe the moſt dangerous ſymptoms of the diſeaſe.

Much has been ſaid relative to the prevention of putrefaction in the laſt ſtages of infectious fevers. This, however, as chiefly the reſult of extreme proſtration of ſtrength, is principally obviated by the means of ſupport already pointed out. Theſe marks of putrefactive changes exiſt principally in the excretions of the patient; which it is important to remove, as their preſence ſeems to augment the depreſſion of the vital powers: hence the utmoſt attention to cleanlineſs is requiſite, and clean air, if we may ſo ſpeak, or air free from the noxious exhalations, admitted by a conſtant ventilation, contributes to ſupport the patient. The putrid ſordes contained in the ſtomach or bowels are often evacuated with great advantage, where that can be effected by gentle means, which do not contribute to farther exhauſtion. With a view to *correct* the putreſcency of theſe contents of the alimentary canal, various antiſeptics have been recommended, eſpecially the mineral acids. That theſe acids, eſpecially the vitriolic or ſulphuric, which has been principally employed, are ſometimes uſeful, cannot perhaps be queſtioned; but it is probable that their adminiſtration was ſuggeſted upon the principle of being *chemically* antiſeptic to dead animal matter. A chemical explanation of the operation of a medicine on the *living* body is ſomewhat ſuſpicious; and Dr. Fordyce has remarked, that no antiſeptic can be applied in that proportion to the living ſolid, as would be requiſite to prevent putrefaction in dead animal matter. (Loc. cit. part ii. page 172.) Theſe acids, however, tend to quench thirſt, and to ſettle the ſtomach, and are grateful to the patient.

Dr. Gregory is in the habit of concluding his lectures on the ſubject of fever by ſtrongly cautioning his pupils *not to do too much* to patients labouring under the diſeaſe; for he juſtly averred that, in many caſes, little more would be requiſite, after the proper evacuations at the commencement, than cool drink, and the antiphlogiſtic regimen already pointed out. And this is unqueſtioanably true of fevers not occaſioned by a virulent contagion, and where no conſiderable local congeſtion occurs; in which caſe it becomes us to watch rather than to be active. This, however, will ſeldom ſatisfy a patient, or his friends; and hence the buſtling miſchievous empiric is often preferred to the experienced obſerver, as Sydenham, who attributes ſome of the worſt ſymptoms occaſionally to the "nimia medicorum diligentia," feelingly laments. "Sed, quod dolendum omnino eſt, ægrorum quamplurimi, haud ſatis gnari, quod perinde ſit medici peritè quandoque *nihil agere*, atque alio tempore efficaciſſima adhibere remedia, probitatis atque fidei fructum hunc capere nolunt, ſed vel negligentiæ vel ignorantiæ id imputant, cum empiricorum inſulſiſſimus quilibet medicamenta medicamentis adjicere æque novit, ac ſolet magis quam medicorum prudentiſſimus." (Sydenham, Opera, ſect. v. cap. 6.)

Diviſion of Fevers.—Having diſcuſſed the nature, cauſes, and cure of fever in general, it remains for us to notice the various forms of the diſeaſe, which have been diſtinguiſhed by particular appellations. From the earlieſt periods of medical hiſtory, a great number of names have been applied to the varieties of febrile diſeaſe, which, as they were often deduced from hypothetical notions, reſpecting the nature and cauſe of the fever, often mere indications of the violence or abſence of particular ſymptoms, and often very vague in their ſignification, have tended to introduce much confuſion into the writings of phyſicians on this ſubject. The majority of the names, which have been thus invented, are applicable to the ſame fever; at leaſt to a fever ariſing from one and the ſame ſource; whence, it has been juſtly remarked by Dr. Lind, that phyſicians, who have had the moſt frequent opportunities of ſeeing numerous patients in fevers, have always found great difficulty in arranging their caſes under the common appellations, and that the attempt has frequently led them into abſurdities. (On Fevers and Infections, chap. ii. ſect. 2.) For to the ſame fever the terms putrid, petechial, malignant, miliary, nervous, bilious, typhous, verminous, &c. are often equally applicable. It is obvious, however, that accidental ſymptoms of local affection, or the accidental violence or mildneſs of any particular ſymptom, do not mark a fundamental change in the nature of the diſeaſe, and are therefore not the proper grounds for multiplying names, which tend to confound diſorders that are eſſentially the ſame, and therefore to miſlead us in our practice.

The leaſt ambiguous diviſion, which is now generally adopted, is into three orders, of *intermitting*, *remitting*, and *continued* fevers; which are again diſtinguiſhed by their leading ſymptoms. The intermitting fevers are thoſe which occur in diſtinct paroxyſms, or fits, in the intervals between which there is a complete *apyrexia*, or abſence of all febrile ſymptoms; this is termed an *intermiſſion*. In the remitting fevers, which alſo conſiſt of repeated paroxyſms, there is no entire intermiſſion between the paroxyſms, but only a conſiderable abatement or *remiſſion* of their violence; the return of a new paroxyſm, however, being generally marked by chillineſs, and ſome other ſymptoms of a cold ſtage. By *continued* fever is underſtood, a fever which goes on day after day, without any intermiſſion or decided remiſſion of the ſymptoms; not in an uniform progreſs, however, but with an obvious aggravation or *exacerbation* of the ſymptoms of a hot ſtage, once in the twenty-four hours, and generally in the evening. Moſt of the ancient and modern writers, indeed, down to the time of De Haen and Cullen, have deſcribed a continued fever, proceeding in one uniform and unvarying tenor, without exacerbation or abatement of any ſymptom, in a word, conſiſting of one lengthened paroxyſm: this they denominated a *continent* fever, in contradiſtinction from the *continued* fever, juſt deſcribed. By the Latin writers the former is called febris *continens*, the latter febris *continua*; by the Greeks the former was denominated πυρετος συνοχος, *ſynochus*; the latter πυρετος συνεχεες, *ſynechees*. By ſome writers, again, the *continent* fever is called continued, and what we now underſtand by continued fever is called *continued-remittent*. Our countryman, Morton, whether through miſtake or deſign is not evident, has reverſed the common acceptation of the terms, (as has been juſtly remarked by Burſerius, Inſt. vol. i. § 194. and by Selle, in his Rudim. Pyretologiæ,) and deſcribes the *continent* fevers, or συνεχεες, as remittent. (See Morton, Pyretologia.) De Haen, however, and Cullen, denied altogether the exiſtence of a continent fever, without periodical exacerbation, as it never occurred to them in the courſe of a long experience; and their opinion is now generally admitted as correct. Burſerius and Selle maintain the ancient doctrine.

The confuſion which has enveloped this ſubject does not, however, end here. For Dr. Cullen, Burſerius, and others, who have ſtill farther reduced the orders of fevers to two only, *viz.* intermittent, and continued, (deeming the *remittent* fevers different only in degree,) have nevertheleſs widely diſagreed in their arrangement of the latter. Cullen has claſſed the remittents with the intermittent fevers, conſidering the remiſſion as a leſſer intermiſſion; while Burſerius has placed them with the continued fevers, conſidering it as a greater exacerbation and abatement: ſo that we find the ſame identical diſeaſes among the continued fevers in the writings of Burſerius, which are placed among the intermittents of Dr. Cullen. The arrangement of Dr. Cullen, however, would ſeem to be the moſt correct; firſt, becauſe the intermiſſion and remiſſion more nearly accord in their phenomena; and, ſecondly, becauſe both theſe fevers ariſe in general from the influence of marſh effluvia.

We ſhall now proceed to enumerate the principal appellations of fever which are to be found in the writings of phyſicians; referring for the full explanation of the majority of them to their places in the alphabet, as more conſiſtent with the nature of a dictionary. See alſo FEBRIS; where the Latin and Greek names, for which we have no correſponding Engliſh terms, are enumerated.

FEVER, *Acute*, a term of indefinite application; ſometimes uſed to denote idiopathic fever, and ſometimes indicating a fever with violent ſymptoms, whether idiopathic, or ſymptomatic of local inflammation.

FEVER, *Ardent*, *Febris ardens* of the Latins, the ſame with the *cauſus*, καῦσος, of the Greeks, ſignifies thoſe forms of fever in which the heat in the early ſtage is exceſſive. The words are from *ardeo*, and καῦω, *I burn*. The terms have been variouſly applied to intermittent, remittent, and continued fevers, in which this ſymptom prevailed. The yellow fever of hot climates is the moſt *ardent* fever with which we are acquainted. (See FEVER, *yellow*.) The word ardent is nearly ſynonymous with *inflammatory*. See Sennertus de Febribus, lib. ii. cap. 12.

FEVER, *Bilious*, a term applied to the autumnal fevers, whether idiopathic, as the remitting fever, and thoſe continued fevers in which there is a conſiderable diſcharge of bile, or to cholera, and dyſentery. (See Pringle on Diſeaſes of the Army, part ii. chap. 1. and part iii. chap. 4.) Hippocrates conſidered all autumnal epidemics as originating from a corruption of the bile, and the term has been often uſed, perhaps, upon his authority, without any evidence of a morbid ſtate of this fluid. In hot climates and ſeaſons, however, there is generally a tendency to ſuperabundance of the bilious ſecretion; and the *yellow* fever, which is ſo named on account of the bilious tinge of the ſurface, may be conſidered as an example of bilious fever in its moſt violent form.

FEVER, *Catarrhal*. See CATARRH.

FEVER, *Contagious*, is a term applicable to any febrile diſeaſe which is propagated by contagious effluvia, as meaſles, ſcarlet-fever, &c.; but when the term is uſed alone, by modern writers, it is generally underſtood as applying to *typhus*, or the common contagious fever of temperate climates. See TYPHUS.

FEVER, *Continent*, and *continued*; theſe terms have been explained above. See *Diviſion of Fevers*.

FEVER, *Depuratory*. See DEPURATORY.

FEVER, *Diary*. See DIARIA, and EPHEMERA.

FEVER, *Dyſenteric*, ſometimes uſed as ſynonymous with *dyſentery*; but Sydenham ſpeaks of a dyſenteric fever which prevailed during and after the continuance of an epidemic dyſentery in the year 1669, in which the true ſymptoms of dyſentery, the frequent dejections and teneſmus, did not appear; the term, therefore, is almoſt a ſoleciſm. (See his works, ſect. iv. cap. 5.)

FEVER, *Ephemeral*. See EPHEMERA.

FEVER, *Epidemic*. See EPIDEMIC.

FEVER, *Erratic*, a variety of intermittent fever, conſtituting the fourth genus, of the third order, of the claſs of fevers, in the noſology of Sauvages; and defined as conſiſting of fevers, "which occur in ſimilar paroxyſms at a longer interval than four days, or altogether of an uncertain type:" the intervals mentioned are *quintan*, or of five days; *ſeptan*, or of ſeven; *octan*, *nonan*, and *deciman*. But Dr. Cullen conſiders all theſe as modifications of tertian or quartan intermittents. (See Sauvages, claſs ii. genus 12. Cullen Synopſ. Noſol. claſs i. genus 1.) The laſt ſpecies of Sauvages is erratica *vaga*, the paroxyſms of which occur at uncertain and irregular intervals. See ERRATIC.

FEVER, *Eruptive*, any fever accompanied by an eruption on the ſkin; it is the ſame with *exanthema*; which ſee.

FEVER, *Eryſipelatous*. See ERYSIPELAS.

FEVER, *Hectic*. See HECTIC.

FEVER, *Hoſpital*, is the typhus, or contagious fever, ſo named, becauſe it frequently occurs in crowded hoſpitals. See TYPHUS.

FEVER, *Goal*, the ſame fever occurring in crowded priſons.

FEVER, *Inflammatory*, a term ſometimes uſed to denote that ſpecies of febrile diſeaſe which is ſecondary, or ſymptomatic of local inflammation; ſuch as pleuriſy, *enteritis*, or inflammation of the bowels, &c. In this ſenſe ſir John Pringle employs it, when, ſpeaking of the diſeaſes of an army, he ſays, "upon firſt taking the field, as well as during the winter, pleuriſies and peripneumonies are the moſt common forms of the inflammatory fever." (Part iii. chap. 1.) But more commonly the term is uſed to denote that form of idiopathic fever in which the ſymptoms of the hot ſtage are ſevere, and are not ſucceeded by the ſymptoms of extreme debility, which characterize typhus. In this ſenſe, the epithet *inflammatory* is put in oppoſition to the term *nervous*, which applies to the varieties of the latter. "Sometimes we can perceive no part more affected than another," ſays ſir John Pringle, "and only ſome general inflammatory ſymptoms: the diſtemper is then called ſimply an *inflammatory* fever, though probably ſome of the more indolent parts may at this time be affected with inflammation." (Loc. cit.) Dr. Cullen has applied the term *ſynocha* to this modification of fever, not anxious to employ the appellation according to the ancient acceptation of the term, but relying on his definition for conveying a clear notion of the diſeaſe. The ſynocha is that ſpecies of fever in which "the heat of the body is greatly augmented; the pulſe frequent, ſtrong, and hard; the urine high-coloured; and the ſenſorial functions little diſturbed." (Cullen, Synopſ. Noſol. Meth.

claſs i. gen. 4.) Under this definition it correſponds with the *ſynocha non putris*, and *continua non putrida*, of ſeveral authors, and the (abſurdly named) *ephemera plurium dierum*, or diary fever of ſeveral days, of others. (See Sennert. De Febrib. lib. i. cap. 6. Boerhaave, 728.) Such diviſions, however, cannot be regarded as accurate, or as diſcriminating forms of fever eſſentially different in their nature; for, in fact, a pure *ſynocha*, or fever with no other but inflammatory ſymptoms, is ſcarcely ever met with, as we have already remarked; nor is a purely oppoſite, or *typhous* fever, which is characterized only by ſymptoms of proſtration of ſtrength; almoſt every continued fever being inflammatory, or marked by ſome degree of excitement in the beginning, and nervous or typhoid, *i. e.* marked by debility in the latter ſtages. This conſtitutes an intermediate *genus*, which Dr. Cullen has called *ſynochus*. Thus the *cauſus*, or *febris ardens* of the ancients, and the *yellow fever* of modern times, is characterized by the higheſt excitement in its firſt ſtage, but is perfectly typhoid in the laſt.

The ſymptoms of the *ſynocha*, or inflammatory fever, as it is commonly deſcribed, are as follows. The depreſſion of ſtrength, which precedes and accompanies the attack, is not ſo great as in contagious fever, and the cold ſtage is more frequently abſent, and leſs marked. The pulſe, even in the cold ſtage, is ſeldom ſmall or very frequent; after the heat commences it becomes full, rapid, and, as it has been termed, vibrating; ſtill, however, its frequency is leſs than in thoſe fevers in which debility prevails. The reſpiration is frequent, hurried, generally oppreſſed, and attended with a dry cough. The heat is greater than in other continued fevers, and although burning to the feeling of a byſtander, it does not excite that pungent or acrid ſenſation which is obſerved in the ſevere caſes of typhus. Dr. Moore remarks, ſpeaking of the latter, "on preſſing the ſkin of the patient a ſenſation of a peculiar penetrating heat remains on the hand for ſome minutes after; whereas, the heat communicated by the ſkin of a patient in the inflammatory fever is more tranſient." (See his Medical Sketches.) Dr. Huxham, as well as Pringle and others, has remarked the "peculiar biting heat" in malignant fevers, and obſerves that Queſnay calls it "la chaleur *d'acrimonie*," and very juſtly diſtinguiſhes it from la chaleur *d'inflammation*. The ſenſation in truth is as different as touching a very hot piece of dry wood, and dipping your finger into tepid ſpirit of hartſhorn. The head-ache in inflammatory fever is generally conſiderable, accompanied with throbbing of the temples, and noiſe in the ears: the face is full and florid, and the eyes inflamed, and incapable of bearing the light. The depravation of the ſenſes, however, is leſs frequent than in fevers with debility, nor is delirium a common ſymptom; but when it does occur in ſynocha, it riſes to a degree which, from the debilitated ſtate of the ſyſtem, we ſcarcely ever meet with in typhus: the patient becomes frantic, and is with difficulty retained in bed. This conſtitutes the delirium *ferox* of authors. (See DELIRIUM.) When the delirium is obſtinate in ſynocha, we have reaſon to ſuſpect an inflammatory affection of the brain, which there is ſtill more reaſon to dread, if the patient be oppreſſed with coma. In truth, between this form of diſeaſe, and inflammation of the brain, the diagnoſis is difficult, if there be any eſſential difference. The ſecreting powers are more completely ſuſpended than in moſt caſes of typhus; the ſkin, mouth, and throat are dry, and the mucus covering the tongue becomes foul and viſcid; the urine is high-coloured, and the bowels coſtive. In a word, it is obvious that the inflammatory fever is chiefly characterized by a higher degree of the ſymptoms of the hot ſtage of fever.

When ſynocha proves fatal within a few days of its commencement, (which, if it ever happens, is a rare occurrence,) the pulſe, it is ſaid, does not become weak or intermitting before death; the patient ſeems to be carried off by the violence of the excitement. When the diſeaſe continues for a longer time, however, and the remiſſions are at all evident, the pulſe during theſe (although the fever has not yet aſſumed the form of typhus) becomes weak and languid, the patient appearing to be exhauſted by the foregoing paroxyſm; which is renewed, however, in a ſhort time, with all its former violence, or even ſtronger marks of excitement. The hæmorrhagies, which frequently occur in inflammatory fever, are generally from the noſe, ears, lungs, rectum, (if the patient be ſubject to the hæmorrhoids,) or from the uterus, and are almoſt always favourable; the blood diſcharged has the healthy appearance, except that the coagulum is frequently covered with the buffy coat. Hæmorrhagies from the upper parts of the inteſtines, kidnies, urethra, ſkin, eyes, &c. are rarely, from the two laſt perhaps never, obſerved in inflammatory fever.

Such are the ſymptoms of well-marked ſynocha; they vary in different caſes from thoſe juſt enumerated, to the mild febrile ſymptoms attending a common catarrh or ephemera. After they have continued for ſome time, if they do not terminate the patient's life, they always, at leaſt in this country, begin to be changed to thoſe of typhus; ſo that the whole diſeaſe is a ſynochus. The proportional duration, as well as violence of theſe reſpective ſtages of the diſeaſe, is different in different caſes; and proves an endleſs ſource of variety: but the ſymptoms which follow the ſtate of increaſed excitement are the moſt dangerous as well as the moſt varied part of the fever.

The principal indication in the cure of inflammatory fever, it muſt be evident, is that which we have ſtated above as the *firſt* indication, in the general cure of fever, (ſee FEVER, *Method of Cure*,) *viz.* "to diminiſh exceſſive action." The means of fulfilling this indication, by the antiphlogiſtic regimen, and evacuant medicines, in other words, by removing or diminiſhing all ſources of irritation, and by diminiſhing the quantity of the circulating fluids, have been detailed at length, and need not here be repeated. The higher the degree of inflammatory diatheſis, the more requiſite will it be to employ active evacuation, at an early period of the fever, and there will be the leſs hazard of carrying it to an injurious degree. In this country, however, as we have already ſtated, ſuch a degree of ſynocha is ſeldom ſeen, as requires, or is benefited by general blood-letting. In the ardent, or yellow fever of tropical climates, the inflammatory excitement is more rapid and more ſevere, and the activity of the antiphlogiſtic practice muſt be neceſſarily greater. (See Wilſon on Febrile Diſeaſes.) See FEVER, *yellow*.

FEVER, *Intercurrent*, a denomination given by Sydenham and others to thoſe forms of fever which conſtantly occur *ſporadically*, that is, independent of the particular epidemic ſeaſon, or of the reigning contagion.

FEVER, *Intermittent*, a fever which occurs in diſtinct fits or paroxyſms, with an interval of health, or complete abſence of fever, between them: from the ſhivering which commences the fit, the diſeaſe has been called *ague*, which ſee; and according as the fit recurs, every day, every alternate day, or once in three days, it has been termed a *quotidian*, a *tertian*, or a *quartan* ague. See theſe words below.

FEVER, *Inteſtinal*, a term applied by ſome writers to thoſe varieties of continued fever in which there is much diarrhœa, with fœtid ſtools, &c. pain of the belly, diſtenſion, or other ſymptoms of abdominal diſorder. Other authors have uſed the epithets *gaſtric* and *meſenteric* with the ſame intention: and the febres *ſtercorales* and *excrementoſæ* of others are the ſame. This multiplication of names is altogether uſeleſs, ſince they do not imply any difference in the eſſential nature of the fevers, and it gives riſe to great confuſion in medical language.

Fever, *Lenticular*, the ſame with *petechial*. See below.

Fever, *Malignant*, a vague and improper term generally applied to fevers of a contagious origin, with ſymptoms of extreme proſtration of ſtrength, petechiæ, hæmorrhagies, fœtid diſcharges, &c.; in a word to typhus, in its worſt forms; and alſo to ſcarlet fever in its moſt ſevere modifications, the plague, and other dangerous epidemics.

Fever, *Miliary*, a modification of common fever, accompanied with an eruption of ſpots not larger than millet ſeeds. See Miliary *eruption*.

Fever, *Milk*, a fever affecting puerperal women, and accompanied with diſtenſion of the mammæ. See Milk-*Fever*.

Fever, *Morbillous*, *Febris morbilloſa*, a term given by Sydenham, perhaps with the ſame impropriety as in the caſe of *dyſenteric* fever, (ſee above,) to a fever occurring during the prevalence of epidemic meaſles, but without the eruption, or with very little of it. See Measles.

Fever, *Nervous*, a name given by ſome writers to all the varieties of fever, accompanied with debility, in contradiſtinction to thoſe which are characterized by arterial ſtrength, which they call *inflammatory*. But Dr. Huxham, and after him many other phyſicians, have appropriated the term nervous to a particular form of fever with debility, which goes through a long and ſlow courſe, unattended by the exceſſive excitement of inflammatory fever, on the one hand, or by the extreme proſtration of typhus on the other. At the ſame time, as it is accompanied by great loſs of muſcular powers and mental inactivity, without the marks of putreſcency in the fluids diſcharged, it was ſuppoſed to be a diſeaſe of the "animal ſpirits," or nervous fluid, and not of the blood; whence the term *nervous* was adopted. Dr. Huxham's deſcription is conſidered as a very maſterly example of medical hiſtory, and we ſhall give the outline nearly in his own words.

The patient at firſt grows ſomewhat liſtleſs, and feels ſlight chills and ſhudders, with uncertain ſudden fluſhes of heat, and a kind of wearineſs all over, like what is felt after great fatigue. This is always attended with a ſort of heavineſs and dejection of ſpirit, and more or leſs of a load, pain, or giddineſs of the head; a nauſea and diſ-reliſh of every thing ſoon follows, without any conſiderable thirſt, but frequently with urging to vomit, though little but inſipid phlegm is brought up. Though a kind of lucid interval of ſeveral hours ſometimes intervenes, yet the ſymptoms return with aggravation, eſpecially towards night. The head grows more heavy or giddy, the heats greater, the pulſe quicker but weak, with an oppreſſive kind of breathing. A great torpor, or obtuſe pain and coldneſs, affects the hinder part of the head frequently, and oftentimes a heavy pain is felt on the top, along the coronary ſuture; this, and that of the back part of the head, generally attend nervous fevers, and are commonly ſucceeded by ſome degree of delirium.

In this condition the patient often continues for five or ſix days, with a heavy, pale, ſunk countenance, ſeeming not very ſick, and yet far from being well; reſtleſs, anxious, and commonly quite void of ſleep, though ſometimes very drowſy and heavy; but although he appears to thoſe about him actually to ſleep, he is utterly inſenſible of it, and denies that he doth ſo. The pulſe, during all this time, is quick, weak, and unequal, ſometimes fluttering, and ſometimes for a few minutes ſlow, nay, intermitting; and then, with a ſudden fluſh in the face, immediately very quick, and perhaps ſoon after ſurpriſingly calm and equal; and thus alternately. The heats and chills are as uncertain and unequal, ſometimes a ſudden colour and glow appear in the cheeks, while the tip of the noſe and ears is cold, and the forehead at the ſame time in a cold dewy ſweat. Nay, it is very common, that a high colour and heat appear in the face, when the extremities are quite cold. The urine is commonly pale, and often limpid, frequently of a whey colour, or like vapid ſmall beer, in which there is either no manner of ſediment, or a kind of looſe matter, like bran, irregularly ſcattered up and down in it. The tongue at the beginning is ſeldom or never dry or diſcoloured, but ſometimes covered with a thin whitiſh mucus; at length indeed it often appears dry, red, and chapped, or of the colour of pomegranate rind; but this moſtly at the cloſe of the diſeaſe; yet, however dry the tongue and lips ſeem, the patient ſcarcely ever complains of thirſt, though ſometimes of a heat in the tongue.

About the ſeventh or eighth day, the giddineſs, pain, or heavineſs of the head become much greater, with a conſtant noiſe in it, or *tinnitus aurium*, which is very diſturbing to the ſick, and frequently brings on a delirium. The load on the præcordia, anxiety, and faintneſs grow much more urgent, and the patient often falls into an actual deliquium or fainting; eſpecially if he attempts to ſit up; coldiſh ſweats ſuddenly come on in the forehead, and on the backs of the hands, (though at the ſame time there is too much heat in the cheeks and the palms,) and as ſuddenly go off. If the urine now grows more pale and limpid, a delirium is certainly to be expected, with univerſal tremors and ſubſultus tendinum. The delirium is ſeldom violent, but as it were a confuſion of thought and action, the ſick muttering continually to themſelves, and faultering in their ſpeech; ſometimes they awake only in a hurry and confuſion, and preſently recollect themſelves, but forthwith fall into a muttering dozy ſtate again.

The tongue grows often very dry at the height of the fever, eſpecially in its middle part, with a yellowiſh liſt on each ſide, and it trembles greatly when the ſick attempt to put it out. When the tongue at this time grows more moiſt, and a copious ſpitting comes on, it is always a very good ſign; but where a difficulty of ſwallowing, continual *gulping*, or choaking in the throat ſupervene, it is a very dangerous ſymptom, eſpecially if attended with any degree of hiccup. Frequently profuſe ſweats pour forth all at once about the ninth, tenth, or twelfth day, commonly coldiſh or clammy on the extremities; oftentimes very thin ſtools are diſcharged, both the one and the other are generally colliquative and very weakening. However, a warm moiſture of the ſkin is generally ſalutary, and a gentle diarrhœa frequently carries off the delirium and comatoſe diſpoſition.

Now nature ſinks apace, the extremities grow cold, the nails pale or livid, the pulſe may be ſaid to tremble and flutter, rather than to beat, the vibrations being ſo exceedingly weak and quick, that they can ſcarcely be diſtinguiſhed; though ſometimes they creep on ſurpriſingly ſlow, and very frequently intermit. The ſick become quite inſenſible and ſtupid, ſcarcely affected by the loudeſt noiſe or the ſtrongeſt light; though at the beginning ſtrangely ſuſceptible of the impreſſions of either. The delirium now ends in a profound coma, and that ſoon in eternal ſleep. The ſtools, urine, and tears run off involuntarily, and denounce a ſpeedy diſſolution, as the vaſt tremblings and twitching of the nerves and tendons are preludes to a general convulſion, which at once ſnaps off the thread of life. In one or other of theſe ways are the ſick carried off, after having languiſhed for fourteen, eighteen, or twenty days, nay ſometimes much longer.

All perſons grow deaf and ſtupid towards the end of the diſeaſe, ſome extremely deaf, though too quick and apprehenſive in the beginning, inſomuch that the leaſt noiſe or light greatly offended them. Many, from their immoderate fears, ſeem to hurry themſelves out of life, where little danger was apparent at the beginning: nay, ſeveral will not ſuffer themſelves to ſleep, from a vain fear of dozing quite away; and others from the vaſt hurry, anxiety, and confuſion which they are ſenſible of in it, or at awaking. Where the deafneſs ends in an impoſthume of the ear, it is generally a good ſymptom; and ſo it is when a *parotis* ſuppurates, or a large puſtular angry eruption breaks out about the lips and noſe.

The nervous fever attacks perſons of delicate conſtitution, who have ſuffered great evacuations, a long dejection of ſpirits, immoderate watching, ſtudy, or fatigue, as well as thoſe who have uſed much crude unwholeſome food and drink, or have been long confined in damp foul air, or expoſed to other cauſes of debility.

It is obvious that, in this ſpecies of fever, there is no opportunity of uſing ſtrong meaſures, eſpecially great evacuations, either by bleeding, or active purging, nor is the cold affuſion admiſſible, where the heats are moderate, partial, and tranſient. A very mild emetic or gentle laxative may be adviſeable in the early ſtage of the fever; as a little rhubarb, Epſom ſalt, manna, &c. But Dr. Huxham affirms, "if you give any thing *draſtic*, be aſſured your patient will rue for it, and you will repent it." Moderate diaphoretic medicines, with a well regulated diluent, but nutritious regimen, are the remedies principally applicable to this form of fever. This regimen itſelf, judiciouſly managed, Dr. H. remarks, "will go a great way in the cure, aſſiſted by well timed and well applied bliſters, and a due care to keep the patient as quiet as poſſible both in body and mind." He rejects ſtrong opiates, as commonly pernicious; but where the lowneſs and dejection are very conſiderable, allows of a little more ſtimulating plan; as the uſe of camphor, caſtor, and ſaffron, with thin wine whey, or gruel with a little wine; and as the diſeaſe advances, a little chicken broth, ſago and wine, &c.; the wine being eſpecially ſerviceable where profuſe colliquative ſweats occur. As no violent meaſures can be adopted in this fever, with a view to haſten its termination, the principal treatment neceſſarily conſiſts in ſupporting the ſtrength, without adding much to the excitement; for which purpoſe a gentle cordial diaphoretic regimen is requiſite, eſpecially towards the decline of the diſeaſe. There is ſeldom any very marked criſis; and time only ſeems, in general, to wear off the fever. A gentle diarrhœa is ſometimes of manifeſt ſervice, indeed, towards the end of the complaint, and the patient is always moſt eaſy, when in a gentle perſpiration; but when theſe diſcharges are great, they are never advantageous; but on the contrary ſink the ſtrength of the patient extremely. There is no evacuation of a more favourable portent, than a pretty free ſalivation without *aphthæ*; where this happens, Dr. Huxham obſerves, "with a kindly moiſture of the ſkin, I never deſpair of my patient, however weak and ſtupid he may ſeem; indeed, the deafneſs many times makes the ſick at the cloſe of the diſtemper appear much leſs ſenſible than they really are; not but that many, under theſe circumſtances, eſcaping the grave, degenerate into mere idiots." (See Huxham on Fevers, chap. vii. Manningham on the Febricula.) The diſeaſe, above deſcribed, is the *typhus mitior* of Dr. Cullen's claſſification.

FEVER, *Peſtilential*, a fever which ſpreads rapidly and extenſively, and is deſtructive to numbers, whether typhus, the plague, ſcarlet fever, &c. See EPIDEMIC, and PLAGUE.

FEVER, *Petechial*, called alſo *peticular*, *puncticular*, and *lenticular*, is a term applied to typhus, or other fevers, in which the purple ſpots, reſembling flea-bites, and denominated *petechiæ*, *peticulæ*, &c. appear upon the ſkin. Theſe ſpots are conſidered as marks of malignancy and putreſcency, as above mentioned, in the deſcription of the ſymptoms of the advanced ſtage of continued fever. See PETECHIÆ, and PURPURA.

FEVER, *Puerperal*, or *child-bed* fever, a fever which occurs within a few days after parturition, and is connected with an inflammation of the *peritoneum*, or membrane lining the cavity of the abdomen; hence its noſological name of PERITONITIS *puerperarum*, which ſee: alſo PUERPERAL *fever*.

FEVER, *Purple*, the ſame with *petechial*, (ſee above,) ſo denominated from the ordinary colour of the petechiæ, which, in the language of the nurſes, are called the *purples*. See PURPURA, and PETECHIÆ.

FEVER, *Putrid*, a term applied to all the forms of fever, whether typhus, remittent fever, ſcarlet fever, the plague, yellow fever, &c. in which there is extreme proſtration of ſtrength, with black and offenſive diſcharges, hæmorrhages, and purple ſpots; with what propriety will be diſcuſſed under the head PUTRID *diſeaſes*, which ſee.

FEVER, *Quartan*, and *quotidian*, appellations of intermittent fever, when the fit occurs every third day, or every day in ſucceſſion. The word *quartan*, ſignifying *fourth*, might appear to be erroneouſly applied; but phyſicians reckon the day on which a diſeaſe commences the *firſt*, and conſequently the third day *after* this is the *fourth* of the diſeaſe; in continuing the calculation, therefore, the day of every ſucceſſive paroxyſm is twice reckoned, *viz.* as the fourth of the preceding period, or cycle, and the firſt of the ſucceeding cycle. In like manner, the intermittent, which occurs on the alternate days, is denominated a *tertian*. The common people, however, denominate the *quartan* a *third* day ague, and the *tertian* a *ſecond* day ague, not being acquainted with the more complicated medical calculation. See AGUE.

FEVER, *Remittent*, a fever conſiſting of periodical increaſe and abatement, but without an interval of freedom from the ſymptoms, as in the intermittent. See REMITTENT.

FEVER, *Rheumatic*, a term applied to rheumatiſm, when accompanied by a general febrile condition, and which is then more commonly and correctly termed *acute* RHEUMATISM, which ſee.

FEVER, *Semi-tertian*, that form of remittent fever in which there is daily exacerbation and remiſſion, (ſee FEBRIS *amphemerina*,) but on alternate days the exacerbation commences with rigors, or great chillineſs and ſhivering; as if a tertian were joined with an amphemerine fever. This is the *hæmitritæus* of the Greek writers: and the *Amphimerina hæmitritæus* of Sauvages. (Noſol. Method, claſs. ii. genus 6. ſpecies 7.)

FEVER, *Ship*, is the typhus occurring in crowded veſſels. See TYPHUS.

FEVER, *Scarlet*, a fever of the exanthematous or eruptive claſs, which, like the ſmall-pox, meaſles, &c. is propagated by a ſpecific contagion, and occurs but once during the life of the individual. It is characterized by a cloſe efflorescence, of a ſcarlet colour, appearing on the ſurface of the body, or within the mouth and fauces, uſually on the ſecond day of fever, and terminating in about five days, but without certainty of a criſis to the fever. Being a diſeaſe, obſerved only by the moderns, we have no claſſical appellation for it; and the noſologiſts have adopted a barbarous term, firſt applied to it by Britiſh writers, namely, *ſcarlatina*, from the *ſcarlet* colour of the raſh which accompanies it. Dr. Heberden calls it *Febris rubra*.

The *ſcarlet fever* occurs under three different forms or varieties: there is alſo a fourth form of diſeaſe, originating from the ſame contagion, namely, the ulcerated ſore throat, which, being unaccompanied by the ſcarlet raſh, cannot with propriety receive the ſame denomination. The three varieties, firſt mentioned, are 1. The fever, with the effloreſcence only, and no affection of the throat, which is commonly a mild diſeaſe, and has been termed ſcarlatina *ſimplex*: 2. The fever and effloreſcence with an accompanying ſore throat, or *angina*, a more ſevere diſorder, which has been denominated ſcarlatina *anginoſa*: and, 3. The ſame combination, in which the fever aſſumes a typhoid type, *i. e.* is marked by great proſtration of ſtrength, a gangrenous diſpoſition in the ulcerations, fœtid diſcharges, &c. and has been called ſcarlatina *maligna*. The fourth modification of the diſeaſe has been called the putrid ſore throat, the malignant ulcerated ſore throat, *angina maligna*, *cynanche maligna*, &c. We ſhall briefly deſcribe the concourſe of ſymptoms under each of theſe modifications of this diſeaſe, which, in its malignant forms, has at different times raged like a plague, and carried off multitudes.

I. The ſcarlatina *ſimplex*. This form of the diſeaſe conſiſts merely of the raſh, and a moderate degree of fever for three or four days, not being, like the other ſpecies, attended with any local ſwelling, inflammation, or ulcer. The firſt ſymptoms are general debility, nauſea, and ſlight ſucceſſive ſhiverings, terminated at length by conſiderable heat and thirſt. On the ſecond day numerous ſpecks, or minute patches of a vivid red colour, appear about the face and neck; within twenty-four hours a ſimilar effloreſcence is diffuſed over the ſurface of the body, likewiſe in the noſtrils, on the inſide of the lips, cheeks, and eye-lids, over the tongue, palate, and the whole fauces. Theſe internal parts being red, the effects of the diſeaſe upon them do not perhaps attract attention, till the high ſcarlet fluſh be produced. The eruption on the ſkin is at firſt compoſed of innumerable red points, which ſpread into a diffuſe redneſs on the third day, and the effloreſcence becomes almoſt continuous on the limbs and cheeks. Several papulæ, or pimples, are ſcattered on the back of the hand, breaſt, arms, and lower extremities, producing a roughneſs, like the *cutis anſerina*. On the trunk of the body the effloreſcence is ſeldom univerſal, but in patches, or forming a ſort of net-work, like veſſels injected with wax. On the loins and nates, and within the flexures of the joints, the ſcarlet colour is moſt ſtrong and general; and in thoſe ſituations it alſo remains the longeſt. The raſh is always leſs florid in the morning than at night, its colour being higheſt on the third and fourth evening. On the fifth day it begins to decline in colour; on the ſixth its appearance is very indiſtinct, and it is wholly gone by the end of the ſeventh. Between the fourth and fifth day there is often a ſcattered eruption of miliary veſicles on the temples, neck, breaſt, and ſhoulders. On the fifth day a ſlight ſcurfineſs ſometimes appears on the ſame parts; but a more general ſeparation of the cuticle takes place on the eighth and ninth days, large pieces of the cuticle ſometimes coming off entire, eſpecially from the hands, fingers, and feet, a new cuticle having been previouſly formed underneath.

The pulſe, during the eruptive ſtage of ſimple ſcarlatina, is uſually very quick and feeble. The tongue exhibits on its upper ſurface a whitiſh fur, through which the elongated papillæ extend their ſcarlet points; the ſides of the tongue are of a darker red colour. The urine is clear, and of a bright ſtraw colour. The face is conſiderably tumefied. There is uſually great reſtleſſneſs, with a ſenſe of itching or tingling in the ſkin, and often ſlight delirium. Theſe ſymptoms continue with more or leſs violence from three to ſeven days. A few patients eſcape without fever, pain, or any particular uneaſineſs.

This diſeaſe, although now known to ariſe from a diſtinct ſpecies of contagion, has been conſidered by many authors as a variety of the *meaſles*, and, as the two diſeaſes reſemble each other, ſo as to be occaſionally miſtaken, we ſhall recapitulate the diagnoſtic characters, as pointed out by Dr. Willan.

1. The effloreſcence in ſcarlet fever generally appears on the ſecond day; in the meaſles it is ſeldom viſible till the fourth. 2. It is much more full and ſpreading in the former than in the latter diſeaſe, and conſiſts of innumerable points and ſpecks under the cuticle, intermixed with minute pimples, in ſome caſes forming continuous, irregular patches, in others coaleſcing into an uniform fluſh over a conſiderable extent of ſurface. In the meaſles the raſh is compoſed of circular dots, partly diſtinct, partly ſet in ſmall cluſters or patches, and a little elevated, ſo as to give the ſenſation of roughneſs when a finger is paſſed over them; theſe patches are ſeldom confluent, but form a number of creſcents, or ſegments of circles, with large intervening portions of cuticle, which retain their uſual appearance. The colour of the raſh is alſo different in the two diſeaſes, being a vivid red in the ſcarlatina, like that of a boiled lobſter's ſhell; but in the meaſles a dark red, with nearly the hue of a raſpberry. 3. During their febrile ſtage, the meaſles are diſtinguiſhed by an obſtinate harſh cough, with expectoration of a tough acrimonious phlegm, by an inflammation of the eyes and eye-lids, with great ſenſibility to light, by an increaſed diſcharge from the lachrymal gland, ſneezing, &c. The ſcarlet fever is alſo frequently attended with a cough, and with redneſs of the eyes from an extenſion of the raſh to the tunica albuginea, circumſtances which render the diſtinction between this complaint and the meaſles particularly difficult, if other ſymptoms be not clear and deciſive. On minute examination, however, it will be generally, perhaps always found, that the cough in ſcarlatina is ſhort and irritating, without expectoration; that the redneſs of the eye is not attended with intolerance of light, that the ciliary glands are not affected; and that, although the eyes appear ſhining and watery, they never overflow. 4. When the raſh appears on the third or fourth day, being ſcattered, and of a dark ſhade of colour, as frequently happens in the ſecond and third form of ſcarlatina, the diſeaſe may be diſtinguiſhed from meaſles by the appearances in the throat, by the rigidity of the muſcles of the neck, and other peculiar ſymptoms hereafter to be deſcribed.

For the *cure* of ſcarlatina ſimplex, it ſeems only requiſite to keep patients in a moderately cool and equable temperature, in clean open apartments; to preſcribe light diet, without animal food; and to give cooling liquors for drink. When there is no morbid appearance or ſenſation in the throat, our chief care ſhould be to prevent needleſs applications; ſince, according to Sydenham's obſervation, "none die of this diſorder except from a too great officiouſneſs in the practitioner." It is but nominally a diſeaſe, he ſays, unleſs the patient is impriſoned in bed, and medicines are poured in "nimis doctè et ſecundum artem;" then "morbus ſtatim intenditur, et æger non raro nulla alia de cauſa, quam nimia medici diligentia, ad plures migrat." (Sect. vi. cap. 2.) We wiſh that this were popularly underſtood; for, we have already remarked, when concluding the article Fever in general, that friends and nurſes will not be content without more *deciſive* proofs of the learning and art of the doctor, whoſe moſt difficult taſk is, therefore, to prevent their active interference in ſuch caſes, by ſeeming to be active himſelf.

II. Scarlatina *anginoſa*, or *ſcarlet fever with ſore throat*, is more ſevere than the preceding. In this ſpecies of the diſeaſe there is ſuperadded to the fever and effloreſcence a conſiderable ſwelling of the tonſils, velum pendulum palati, and uvula, accompanied with a florid redneſs of their whole ſurface, often terminating in numerous ſlight ulcerations. The primary febrile ſymptoms are in this ſpecies the ſame as in the former, but more violent. The affection of the throat ſometimes begins with the fever, at other times is not perceptible till the ſcarlet effloreſcence has arrived at its height; moſt frequently it is felt when the raſh appears, and increaſes and declines with it. A ſudden ſenſation of ſtiffneſs in the muſcles of the neck, and lower jaw, takes place at the beginning of the diſeaſe. On the ſecond day of fever the throat is rough and ſtraightened, the voice becomes hoarſe, and deglutition is performed with pain and difficulty. Theſe ſymptoms are attended on the ſecond, third, and fourth day, with nauſea, vomiting of bile, head-ache, delirium, reſtleſſneſs, and great heat, with a feeble fluttering pulſe, a quick reſpiration, and extreme languor or faintneſs. On examining the throat there appears a conſiderable enlargement of the tonſils, and a florid redneſs of their ſurface, which extends over the palate and the poſterior part of the throat. The tongue alſo aſſumes a high red colour, and the papillæ over its whole ſurface are greatly elongated.

In ſome caſes no further change is obſervable in the fauces, neither do the appearances above-mentioned continue beyond the fifth or ſixth day: no deep or conſiderable ulcer forms in the tonſils. Slight ſuperficial ulcerations are very frequent, and more eſpecially at the latter end of the year. They occur at an early period of the diſeaſe, as on the ſecond or third day, ſometimes later. The formation of them is preceded by a very quick and unequal pulſe, with lowneſs and great inquietude. Small white patches are then viſible over the pendulous part of the palate and the tonſils; at the ſame time, the red colour in thoſe parts becomes darker in ſome places than in others, ſo that the whole ſurface has a peculiar ſpeckled appearance. Soon afterwards, fiſſures or excoriations take place at the centre of the white patches, which are almoſt immediately covered with whitiſh ſloughs. When theſe are numerous, the throat is conſtantly clogged with a large quantity of tough viſcid phlegm: hence the difficulty of ſwallowing is increaſed, and much pain is felt upon preſſure externally applied. The ſloughs are in ſome caſes removed about the fifth or ſixth day, at the decline of the effloreſcence; in other inſtances they continue to the eighth day, or even later; and when they ſeparate, partial excoriations remain, which may, however, be readily healed.

The effloreſcence, in this form of ſcarlet fever, differs in a few particulars from that deſcribed under the head of ſcarlatina ſimplex. 1ſt. It does not appear ſo early in the diſeaſe, but is often delayed to the third day. 2dly. It does not ſo conſtantly extend over the ſurface of the body, but comes out in ſcattered patches on the back, ſides, neck, and breaſt, or about the joints. 3dly. It ſometimes wholly vaniſhes the day after its appearance, and re-appears partially at uncertain times. Hence, 4thly, the whole duration of it is longer than in ſcarlatina ſimplex. Theſe variations are moſt frequent during the autumnal and winter months, when the diſeaſe is in general moſt ſevere.

During the ſtate of extreme debility, which uſually ſucceeds the *ſcarlatina anginoſa*, ſome patients are affected with anaſarcous ſwellings of the face and hands, but more eſpecially of the lower extremities. The ſwelling becomes conſpicuous about the eighth or tenth day from the diſappearance of the raſh, and continues for two or three weeks. In caſes exhibiting a very full and vivid effloreſcence, the anaſarca takes place more frequently, and to a greater degree. When the throat is much ulcerated, and the raſh not extenſive, and when no deſquamation of the cuticle ſucceeds, dropſical ſwellings rarely occur. Occaſionally, though very rarely, effuſions of ſerum into the abdomen, or thorax, or the ventricles of the brain, take place. An enlargement of the parotid glands happens frequently in adults, and continues a long time without ſuppurating. Children, at every period of the diſeaſe, are liable to tumours both of the parotid and ſub-maxillary glands, ſometimes ending in tedious and painful abſceſſes. With theſe they have, during the latter ſtage of the complaint, ulcerations at the corner of the mouth, ſtrumous ophthalmia, ſwelling of the upper lip, and purulent diſcharges from the ears, ſometimes accompanied with deafneſs: they are alſo ſubject to puſtules or ſmall ulcerations of the tongue, which prove troubleſome for ſome days, but without any ſerious conſequences.

During every epidemic ſcarlet fever many caſes occur in which the effloreſcence is confined to the throat and mouth, there being no appearance of a raſh on the ſkin: but the febrile ſymptoms, vomiting and delirium, continue violent for ſeveral days. A crimſon colour of the throat is perceptible often before the fever commences; in the courſe of which numerous ſmall ſpecks of ulceration are formed on the tonſils, &c. and become, in many places, confluent, when the increaſed ſecretion of phlegm, the tumour, pain, and difficulty of ſwallowing, occaſion great diſtreſs. This complaint ſeems peculiar to adults, and is evidently a ſpecies of ſcarlatina, becauſe it affects ſome individuals of large families, while the reſt are labouring under other forms of the diſeaſe, and becauſe it is capable of communicating, by infection, all the varieties of it. Perſons who have previouſly gone through the ſcarlatina anginoſa experience, while converſant with the ſick, very uneaſy ſenſations in the throat; they remain, however, free from fever, although the ſwelling and inflammation of the tonſils be conſiderable.

The *cure* of *ſcarlatina anginoſa* requires a more active adminiſtration of remedies. Although blood-letting has been recommended by Morton, De Haen, and others, the experience of our later writers on this ſubject coincides in deeming it injurious. Dr. Willan ſays, wherever it had been employed great depreſſion and faintneſs were the immediate conſequences, the pulſe becoming more weak and frequent, and often irregular. And Dr. Withering diſcountenances even local bleeding. "Sometimes, where the fiery redneſs of the eyes, and the ſtate of delirium ſeemed to demand the application of leeches to the temples," he obſerves, "I have ſeen them applied, but never with any good effect."

Emetics are recommended by all the beſt writers on this diſeaſe, among whom, indeed, there is very little difference of opinion on the ſubject. "In the very firſt attack," ſays Dr. Withering, "a vomit ſeldom fails to remove the diſeaſe at once: if the poiſon has begun to exert its effects upon the nervous ſyſtem, emetics ſtop its further progreſs, and the patients quickly recover. If it has proceeded ſtill farther, and occaſioned that amazing action in the capillaries which exiſts when the ſcarlet colour of the ſkin takes place, vomiting never fails to procure a reſpite to the anxiety, the faintneſs, and delirium." "In autumn, when the throat was more affected, when the tumefaction of the fauces was ſuch that the patients could not ſwallow, but with the utmoſt difficulty: when the peripneumonic ſymptoms threatened ſuffocation, and bleeding was ineffectual, an emetic opened the gullet, and unloaded the lungs, ſo that deglutition became eaſy and reſpiration free. But it is neceſſary to add, that a vomit only ſufficiently ſtrong to evacuate the contents of the ſtomach is by no means adequate to theſe effects. The vomit muſt be powerful, and, in ordinary caſes, repeated once in forty-eight hours; in thoſe with more urgent ſymptoms daily; and in the worſt caſes twice in twenty-four hours. The patients never fail to expreſs the relief they find after the operation, and the phyſician ſoon diſcovers it in the countenance and pulſe. As to the form of the emetic, the practitioner may vary it as he pleaſes; but I generally combine tartar emetic in ſolution with ipecacuanha powder, that I may be more certain of their full effect on the ſtomach, and avoid the danger of their acting as a purgative. I alſo give them in much larger doſes than uſual, in order to ſecure a certain violence of action upon the ſyſtem." (Withering on Scarlet Fever, page 75-8.) Dr. Ruſh recommends this repetition of vomiting, but he alſo "gave calomel in moderate doſes in every ſtage of the diſorder." Dr. Willan agrees with theſe phyſicians, in the propriety of adminiſtering emetics, but has never found it neceſſary to repeat them ſo often as Dr. Withering has adviſed.

With reſpect to *purgatives*, Dr. Withering, it is obvious from the above quotation, conſidered them as dangerous; and Dr. Willan affirms, that they "have nearly the ſame debilitating effect as blood-letting. They are indeed very ſeldom neceſſary;" he adds, "for though a few patients may, on the firſt day, be afflicted with bilious vomiting and diarrhœa, the ſtate of the bowels is more uniform than in other febrile complaints." Nevertheleſs, he thinks the occaſional ſtimulus of a ſmall doſe, as two or three grains, of calomel, very uſeful. Dr. Binns expreſſes an acknowledgment to a brother practitioner, "for his removal of a prejudice againſt laxatives in the early ſtage of the diſeaſe, imbibed from various authors, and confirmed by the dreadful conſequences I had ſeen when a diarrhœa came on in this fever. By his perſuaſion ſmall doſes of calomel and other laxatives were occaſionally given; and ſo far from producing injury, I believe, that by evacuating the acrid matter, which is often ſwallowed, they had a tendency to prevent excoriations of the inteſtinal canal, and the conſequent diarrhœa which I dreaded." (See Willan on Cutaneous Diſeaſes, part iii. p. 357.) Dr. Hamilton of Edinburgh has, however, ſhewn us that ſuch prejudices were completely unfounded, and that moderate purgatives of calomel and rhubarb, or jalap, in the early ſtages of ſcarlatina, are as beneficial as in ſimple fever; and he even conſiders them as ſuperſeding the exhibition of emetics. We believe that both the remedies are advantageouſly adminiſtered; and that a lax ſtate of the bowels, produced by medicine in the early ſtage, tends to prevent the diarrhœa of the ſucceeding periods, as Dr. Binns remarks, and as is alſo probable in common fever.

In caſes of ſcarlatina anginoſa where the throat is inflamed and ſwelled, ſo as to occaſion very painful deglutition, *bliſters* applied to the external fauces, or between the ſhoulders, afford conſiderable relief.

It is proper to enjoin the ſame adherence to the antiphlogiſtic regimen as in the ſimple form of ſcarlatina, or as mentioned under the head Fever, particularly with regard to cool air, cool drink, and light coverings; the cutaneous heat ariſes to a higher degree in this than in any other febrile diſeaſe in this country. "If the thermometer be applied to the ſurface of the body," Dr. Currie obſerves, when ſpeaking of this fever, "after the ſenſation of heat has become ſteady, the mercury will be found to riſe to 105° and 106° even in mild caſes, and in the more violent caſes to 108°, 109°, and 110°. I have known it riſe as high as 112°, the greateſt heat I ever obſerved in the human body." (See his Reports on the Effects of cold Water &c. vol. ii. p. 428.) Accordingly the experience of this excellent phyſician, as well as that of profeſſor Gregory of Edinburgh, and of ſeveral intelligent correſpondents, has aſcertained that the external application of *cold water* to the ſkin is the moſt certain and effectual method of removing this diſeaſe. (See Cold, *effects of, as a remedy.*) In this caſe, as in that of idiopathic *fever*, already deſcribed, the *cold affuſion* actually terminates the diſeaſe, when applied before the appearance of the efflorescence, and the cold waſhing, at ſubſequent periods of the diſeaſe, while the ſkin remains hot and dry, invariably diminiſhes all the febrile ſymptoms, and gives great relief to the feelings of the patient, as we have witneſſed in numerous caſes. Dr. Stanger, when ſpeaking of the ſame general waſhing of the body, among the children of the Foundling Hoſpital, 71 of whom went through the ſcarlet fever, remarks, that "its effects in cooling the ſkin, diminiſhing the frequency of the pulſe, abating thirſt, and diſpoſing to ſleep, were very remarkable. Finding this application ſo highly beneficial," he adds, "I employed it at every period of the fever, provided the ſkin were hot and dry." (See Dr. Willan's treatiſe, above quoted, p. 360.) With what ſucceſs the cold affuſion was employed by Drs. Currie and Gregory, in completely annihilating ſcarlet fever in its commencement, in their own children, will be remarked with pleaſure by the readers of Dr. Currie's ſecond volume, p. 442, and 435. While this remedy is uſed, Dr. C. obſerves, cold water and lemonade ſhould be uſed as drinks, and the bowels opened, if neceſſary, by calomel. "If left to myſelf I uſe no other means." We can add, that we have ſeen ſeveral caſes, in which the patients ſpeedily recovered from a ſmart attack of the diſeaſe, in which the cold waſhing, by means of a ſponge, repeated from time to time as the heat was great, and a doſe of calomel, were the only remedies employed.

We have before ſtated, that the effects of cold, applied to the ſkin, when there is exceſſive heat, and action of the cutaneous capillaries, is the moſt effectual mode of inducing *ſweating*, (ſee Cold,) which, whether as a cauſe or a conſequence and ſign of the reduction of fever, has been generally an object of the practice of phyſicians. Many of them endeavour, in the firſt ſix days of ſcarlet fever, to excite perſpiration by antimonials, camphor, aromatics, dulcified ſpirits, and volatile alkali ſaturated with vinegar or juice of lemons. But Dr. Willan juſtly remarks, that before the decline of the efflorescence, ſuch remedies and oppreſſive coverings, for the moſt part, fail to produce their uſual effects, and often increaſe the heat, anxiety, and reſtleſſneſs, which they were intended to relieve; and that before that decline he never ſucceeded in the endeavour to excite perſpiration, yet perſpiration is the almoſt certain reſult of the external uſe of cold water, properly employed.

The mineral acids have been found ſerviceable in ſcarlatina anginoſa, and acidulated gargles are generally uſeful, where the throat is much affected, and ſeem to carry off the virus with which the ſaliva is tainted, and thus to prevent the irritation of the bowels, which it occaſions when ſwallowed. The uſe of bark in the firſt days of ſcarlatina anginoſa is now given up by the majority of practitioners as detrimental; but it is generally admitted that, at the decline of the efflореſcence, if the fever alſo declines, and is not ſucceeded by a cough, the bark, mineral acids, wine, and nutritious diet, obviate the debility and oppreſſive languor, which remain after the diſeaſe, and contribute to prevent the acceſſion of dropſy. (See Willan, loc. cit.)

III. The ſymptoms of the *ſcarlatina maligna* on the firſt day, according to the author juſt quoted, are nearly the ſame as in the ſcarlatina anginoſa; but ſome of the following peculiarities are afterwards obſervable; 1. A ſmall, indiſtinct, and irregular pulſe, a brown or black incruſtation of the tongue, teeth, and lips; 2. A dull redneſs of the eyes, a dark red fluſhing of the cheeks, deafneſs, delirium, or coma alternating with fretfulneſs and violence: 3. Breath extremely fetid; a rattling and laborious reſpiration, partly occaſioned by a thick tough phlegm clogging the fauces; a conſtriction of the jaws, and painful deglutition; a fulneſs and livid colour of the neck, with retraction of the head: 4. Ulcerations on the tonſils and adjoining parts, covered with dark ſloughs, and ſurrounded by a livid baſe: 5. An acrid diſcharge from the noſtrils, cauſing ſoreneſs, or chops, and even bliſters, about the noſe and lips, the fluid being at firſt thin, but afterwards thick and yellowiſh: 6. The raſh is uſually faint, excepting in a few irregular patches; and all of it preſently changes to a dark or livid red colour; it appears late, is very uncertain in its duration, and often intermixed with purple ſpots, or petechiæ. In ſome inſtances the raſh ſuddenly diſappears a few hours after it is formed, and comes out again at the expiration of a week, continuing two or three days.

Patients who withſtand the violence of the firſt attack of *malignant* ſcarlatina have nevertheleſs to ſtruggle through a ſeries of moſt untoward circumſtances, continued far beyond the uſual febrile period. The ulcerations gradually ſpread from the throat to the gullet, larynx, and wind-pipe. Violent pains of the bowels, and excoriations about the nates ſucceed; alſo hectical paroxyſms, with ſuppurations of the glands, a teizing cough, great difficulty of breathing, pains in the ſide, and a remarkable alteration in the ſound of the voice. A few recover after having been haraſſed, almoſt inceſſantly, for ſix or eight weeks. In the year 1786, when the ſcarlatina maligna was epidemic in London, more than two-thirds of thoſe affected with it died between the ſeventh and nineteenth day of the fever. The ſymptoms portending danger are, continued coma, dulneſs of the eyes, laborious breathing, diarrhœa, petechiæ, vibices, and hæmorrhagy. The degree of danger in the complaint does not depend on the greater or leſs extent of the raſh on the ſkin; the fulleſt redneſs affords no decided ſecurity, nor is the total abſence of it incompatible with a mild diſeaſe. Many patients ſink under this diſeaſe, unexpectedly, at a very early period, as on the ſecond, third, or fourth day, no ſymptoms having preceded, which could excite an apprehenſion of immediate danger. It has been thought that ſo ſudden a mortality is owing to a gangrenous ſtate of the throat, gullet, ſtomach, inteſtines, or lungs; and this opinion ſeems to be confirmed by diſſections.

In the *treatment* of *ſcarlatina maligna*, a bold and perſevering courſe of emetics, as recommended by Dr. Withering, is conſidered by Dr. Willan and others as the moſt effectual mode of obviating the ſingular malignity of this diſtemper. When adminiſtered in due time, ſays the laſt-mentioned author, they very generally prevent the tranſition from the milder to the more virulent forms of ſcarlatina, and remove the febrile ſymptoms at the earlieſt poſſible period. In dubious caſes, if powerful doſes of ipecacuanha, either alone, or combined with tartarized antimony, entirely fail to produce their uſual effects, it may be concluded that the moſt unfavourable ſtate of the diſeaſe has begun, and that the patient's ſituation is extremely dangerous. Bliſters are ſeldom uſeful in this form of ſcarlet fever, and ſometimes prove injurious. Bleeding and purging are always hurtful, according to Dr. Fothergill, Dr. Willan, and others; a ſtrong cathartic, or even the application of a few leeches to the throat, ſays the latter, has been known to produce an immediate ſinking, and ſometimes death within a few hours, in caſes which ſeemed previouſly favourable. But from the confeſſion of Dr. Binns, above noticed, we learn than unreaſonable prejudices have exiſted againſt purging, in other forms of this fever; and we cannot eaſily reconcile the encomiums on ſtrong and reiterated vomiting, with the extreme fears of moderate purging, at leaſt in the commencement of the diſeaſe.

Fumigation of the throat with nitrous acid is recommended by Dr. Willan as uſeful in keeping the throat clean, and often ſuperſeding the neceſſity of gargles; but he admits that gargles remove the viſcid and offenſive matter from the throat, and thus preſerve the ſtomach and bowels from its diſagreeable action. Thoſe prepared with contrayerva, according to the directions of Dr. Fothergill, (Treatiſe on the Ulcerous Sore-throat, p. 64.) are the moſt grateful and advantageous: and gargles of a more ſtimulating quality have been uſed with benefit. In the Weſt Indies the favourite gargle is made with capſicum or Cayenne pepper, which, though productive of much pain, is ſaid to be very efficacious. Occaſional immerſions in warm water are recommended in this form of ſcarlatina by ſome practitioners. Dr. Currie remarks that the affuſion of cold water is ſcarcely applicable to the ſcarlatina purpurata, and that the tepid affuſion makes little impreſſion upon it. Dr. Willan has obſerved conſiderable advantage from the application of warm vinegar and brandy to the limbs, and to the greater part of the body.

When emetics have not been exhibited at a proper period, it becomes neceſſary, as the diſeaſe advances, to direct cordials, wine, opium, Peruvian bark, mineral acids, &c. according to the circumſtances of the caſe. In this point, almoſt all authorities, foreign and Britiſh, coincide. The diſeaſe is then to be treated as other fevers of extreme debility, or malignancy, as it has been termed, which the gangrenous tendency of the ulcerations, as well as the other ſymptoms, manifeſtly indicate.

IV. In the *ulcerated ſore throat*, which affects adults without any efflореſcence on the ſkin, emetics, given early, according to Dr. Willan, prove of great advantage, and the treatment recommended in the ſcarlatina anginoſa will be found effectual. Gargles, whether acid or detergent, if very ſharp, or if injected forcibly enough to remove the ſloughs, occaſion much pain, and often protract the diſeaſe. Dr. Wall, Dr. Johnſtone, Dr. Ruſh, and others, recommend the inhalation of the vapour of myrrh and vinegar. Dr. Willan is of opinion, that Dr. J. Carmichael Smyth's mode of fumigation, by pouring heated oil of vitriol on powdered nitre in a proper veſſel, is intitled to a preference. The refreſhing antiſeptic vapour, he ſays, detached by this proceſs, and circulated through the room, preſently clears the patient's throat, and at the ſame time removes the fœtor both of the breath and perſpiration. (Loc. cit. p. 368.)

It is truly ſingular, that the ſlighteſt of all eruptive fevers, and the moſt violent, the moſt fatal diſeaſe known in this country, ſhould rank together and ſpring from the ſame origin. Experience, however, has decided, that the ſimple ſcarlet fever, the ſcarlatina anginoſa, the ſcarlatina (or angina) maligna, and the ſcarlet ulcerating ſore-throat without the effloreſcence on the ſkin, are merely varieties of one diſeaſe. That all of them proceed from the ſame ſource of contagion is evident; becauſe under the ſame roof, in large families, ſome individuals have the diſeaſe in one form, ſome in another, about the ſame period. According to the ſtate of the air, the ſoil, climate, or ſeaſon of the year, one form predominates over all the reſt, and gives the general character to every epidemic ſcarlatina. Hence ariſe the various accounts and opinions reſpecting it, which are to be found in medical writers. Dr. Currie, however, remarks, "that the varieties of ſcarlatina are, in fact, not greater than the varieties of the ſmall-pox, to which they bear a very ſtrict analogy." (Reports, vol. ii. p. 422.) It is now underſtood, that the ſcarlet fever is liable to attack the ſame individual but once in his life; an occaſional exception only occurring in this, as in the ſmall-pox, meaſles, and other eruptive fevers. (See Dr. Binns' account, in Dr. Willan's Treatiſe, p. 283.) Dr. Withering ſays, "I have never yet ſeen an inſtance of the ſame perſon having the ſcarlet fever twice, and I believe it to be as great an improbability as a repetition of the ſmall-pox." (p. 53.)

The *ſcarlet fever* ſpreads rapidly by contagion, eſpecially among children, (adults are not very ſuſceptible of its influence,) and the ſymptoms often commence on the third or fourth day, and the eruption appears on the fifth or ſixth, after expoſure to the contagion. Not only does the contagion extend itſelf rapidly, but when it once finds its way into large families, ſchools, &c. it is with great difficulty arreſted in its progreſs, even by keeping the infected ſeparate from the reſt, by ſtrict attention to ventilation, and to cleanlineſs throughout the houſe. (See CONTAGION.) This was ſtrongly exemplified in the year 1803, in the ſeminary founded by the quakers at Ackworth, in which, notwithſtanding the active adoption of theſe meaſures, under the judicious management of Dr. Binns, 171 perſons were affected with ſcarlatina, and the diſeaſe continued there upwards of four months. (See the whole account in Dr. Willan's Treatiſe before quoted, p. 380, *et ſeq.*) Nevertheleſs, theſe meaſures of prevention are adviſeable in all ſimilar inſtances, and in ſmaller academies than that of Ackworth they have been found effectual, when carefully purſued. Dr. Haygarth relates an inſtance, in which thirty-ſeven boarders in the family of a clergyman at Cheſter were preſerved from the infection, brought to the ſchool by one boy, by immediate ſeparation of the latter. "My patient's chamber was ſituated in the middle of the houſe," Dr. Haygarth obſerves, "at the landing of the firſt pair of ſtairs. All the ſcholars went cloſe paſt this door ſeveral times a day. The rules of prevention were placed on the door, and rigid attention to their faithful obſervance was required. The event fully juſtified my hopes. Though all the thirty-ſeven ſcholars remained in the ſame houſe and family during the whole diſeaſe, yet not one of them was infected." At this time Wincheſter, and ſeveral other large ſchools in England, ſent home and diſperſed their ſcholars, on account of this diſeaſe, which had alarmingly ſpread among them. (See Dr. Haygarth's letter to Dr. Percival, p. 81. See alſo Dr. Withering on Scarlet Fever, p. 67. and Dr. Blackburne on the ſame, p. 21.) All theſe writers give a caution againſt the uſual practice, on the appearance of the diſeaſe, of haſtily diſperſing the ſcholars, who may, after returning home, diffuſe contagion in their reſpective families and neighbourhoods. As we deem this ſubject of high public importance, we ſhall make no apology for tranſcribing the active meaſures which were adopted, under the ſuperintendance of Dr. Blackburne, with ſucceſs in a large academy.

"In a numerous ſchool, near town, where the ſcarlet fever had infected ſeveral young gentlemen, in conſequence of one of them being ſuffered to aſſociate with his ſchool-fellows, in a few days after his recovery from the complaint, which he had brought with him from home, it was effectually extinguiſhed, and was attended with no unpleaſant conſequences, by adopting the following means. When it became evident that the convaleſcent had infected the ſchool, he was withdrawn, and apartments allotted to him completely ſeparated both from the healthy and the ſick: to which apartments, it will be ſeen, the ſick were removed after a certain period of convaleſcence. The infected were then conveyed to an adjoining houſe, and the doors, which communicate between it and the bed rooms of the ſchool, were cloſed up, to preclude the poſſibility of any intercourſe. The ſick were there attended by nurſes, the regular ſervants of the family being kept entirely from them; and to prevent effectually the progreſs of any farther miſchief, not only their linen, but even their knives and forks, and plates, &c. were appropriated ſolely to their uſe; and nothing belonging to them was ſuffered to enter the houſe, where the healthy ſtill remained. One of the family, who was neceſſarily called to ſuperintend the management of the ſick, went at no time during the illneſs near the ſchool, from an apprehenſion of conveying the infection, but confined herſelf to the care of the invalids. The ſchool-room, dining-hall, and all the bed-rooms, ſuppoſed to be infected, were immediately cleared out, and nothing but the bare walls left; they were then white-waſhed and diſtempered; the young gentlemen in the mean time occupying apartments, which were known not to be infected, and which were afterwards alſo diſtempered with the ſame colour for the ſake of uniformity. All the blankets, counterpanes, &c. throughout the houſe were ſcowered: the rooms and ſtaircaſes were ſprinkled with vinegar; the bedſteads were taken down, well ſcrubbed, and ſpunged with vinegar; and for ſome time the feather-beds were expoſed to the open air, and alſo ſprinkled with vinegar. During this period, however, and for ſeveral days, ſome, who had originally taken the infection, but had not ſhewn the ſymptoms ſo early as the others, were ſucceſſively taken ill. They were of courſe removed from the ſchool, and their bedding, clothes, &c. ſent with them to the ſick houſe. Thus, it being generally imagined, that no infection is communicated in the firſt ſtage of the complaint, it was concluded, that ſuch young gentlemen as had eſcaped in the firſt inſtance were, by the afore-mentioned precautions, now ſecured from all poſſible danger; and the event ſatisfactorily proved, that none of thoſe who fell ill in the ſchool had, at the time, infective influence. The young gentleman, who was laſt taken ill, ſhewed the ſymptoms on the eleventh day in the midſt of the ſchool, and with him it ſtopped." (See Facts and Obſervations concerning the Prevention and Cure of Scarlet Fever, &c. by W. Blackburne, M. D. 1803, p. 21. et ſeq.)

The origin of the diſeaſe in this ſchool, namely, from a convaleſcent boy, leads us to an important queſtion reſpecting the period after the ceſſation of the fever, when the patient ceaſes to carry infection about his perſon; as well as to the conſideration of the means of diminiſhing his infectious power. Dr. Willan remarks, that "in making the ſeparation here recommended, we may ſafely act on the ſuppoſition, that perſons under the influence of contagion do not communicate it till they are actually affected with the fever and effloreſcence."—He adds, "it is to be remarked, that convaleſcents from ſcarlatina, notwithſtanding

ing a minute attention to cleanlineſs and change of apparel, remain, for *two* or *three weeks*, capable of infecting perſons ſuſceptible, eſpecially children, with whom they have intercourſe. Theſe periods I have been able to aſcertain in ſeveral inſtances." (Loc. cit. page 387—8.) He therefore recommends the proceſſes adopted by Dr. Binns, for purifying convaleſcents previous to their intercourſe with the healthy, as not more than ſufficient for the purpoſe. "When the fever and ſloughs in the throat were wholly removed," ſays Dr. Binns, "the patients ſtayed a few days in the convaleſcent rooms, and had an opportunity of walking in the garden, at the front of the houſe, to clear themſelves from infection by repeated expoſure to the open air. After this they went acroſs the garden to a waſh-houſe, about equally diſtant from the fever-houſe and the ſchool, where they were entirely ſtripped, and waſhed with ſoft-ſoap, particular attention being paid to cleanſing their hair. They then put on freſh clothing, and went up to the rooms in the ſchool; being, however, kept apart for ſome time longer. Their bed and body-linen was frequently changed on their return, as it before had been in the ſick-rooms. When they had continued thus about a week, and appeared to have recovered their ſtrength, the general ablution was repeated; and after rambling in the fields for ſome hours, they were permitted to mix with the other children." (See Dr. Willan's Treatiſe, p. 383—4.)

From theſe details, the principles upon which the prevention of the ſpreading of the active contagion of ſcarlet fever may be accompliſhed will be obvious; and in order to be effectual, they muſt be purſued in the ſtricteſt and moſt rigid manner; for, as we have already pointed out, the extent to which infection is communicated through the air is extremely limited; (ſee Contagion,) and therefore a perfect ſeparation and interruption of intercourſe by perſons, clothes, utenſils, or other things, will infallibly prevent its communication. And as all the forms of the diſeaſe may be produced in the ſame family, from any one ſource of the contagion: the precautions above ſpecified ſhould be obſerved on the appearance of the ſimple ſcarlatina, as well as when our attention is called to the more dangerous forms of the diſtemper.

With reſpect to the hiſtory of *ſcarlet fever*, our limits will not allow us to enlarge greatly on this curious and intereſting part of the ſubject: we muſt content ourſelves with a brief ſketch, and refer the reader, who may be deſirous of a more comprehenſive view of the progreſs of the diſeaſe, to Dr. Willan's elaborate detail of the facts, in his treatiſe on Cutaneous Diſeaſes, to which we are indebted for much of the information contained in this article.

The ſcarlet fever does not ſeem to have been known in this country more than 150 years; for Sydenham and Morton are the firſt Engliſh writers who mention it. Sir Robert Sibbald, phyſician to king Charles II., for Scotland, ſays, in the year 1680, this diſeaſe had appeared ſo lately at Edinburgh, and was ſo little underſtood, that he could not venture to give any obſervations reſpecting it. Sydenham only mentioned the ſimple form; but Morton has deſcribed the ſymptoms of ſcarlatina anginoſa, and ſome caſes of the malignant form, which he conſidered as a variety of meaſles. (See his treatiſe De Morbillis et Febre Scarlatinâ, cap. iv—v.) During the 18th century the diſeaſe was frequently epidemic in Britain, and has been amply deſcribed by Huxham in 1734; Fothergill in 1748; Cotton at the ſame time; and ſubſequently by ſeveral other authors. On the continent of Europe, however, from a much earlier period, it has frequently raged, and ravaged towns and diſtricts, with all the virulence and fatality of a true plague. It has been deſcribed again and again, by ſucceſſive obſervers in different ſituations, as a new and unknown diſeaſe, and under a great variety of denominations.

The firſt account of ſcarlatina on record is that of Ingraſſia, a Neapolitan phyſician, about the year 1500; it was then known by the name of *Roſſalia* at Naples. (See his Treatiſe de Tumor. præter naturam, tract. i. cap. 1.) We next find the diſeaſe epidemic in Holland in 1517, in its malignant form, as deſcribed by Foreſtus; and through Lower Germany in 1565 and 6, as deſcribed by Wierus, as a peſtilential ſore-throat. A few years afterwards the ſame diſorder was epidemic at Paris, and called *by Ballonius rubiolæ*, which he carefully diſtinguiſhes from the meaſles, *morbilli:* the mortality of the diſtemper, in the autumn of 1575 was dreadful, eſpecially among children. The ſcarlet fever and ſore-throat is to be traced again in the *garrotillo* of the Spaniards, which occurred after the influenza of 1580, and remained among them forty years, ſpreading to all the ſea-ports of Italy, Sicily, and Malta, and reaching Naples in 1618, where, as in Spain, it was deſcribed as a new diſeaſe, under a variety of new appellations, and is ſaid to have deſtroyed 500,000 perſons within two years: it was particularly fatal to children. This ſtatement, however, is doubtleſs exaggerated. During this period, we find, from the writings of Sennertus, Doringius, and others, that the milder forms of ſcarlet fever prevailed in different parts of Germany; and were deſcribed under the titles of morbilli ignei, roſſalia, eryſipelata, and univerſal eryſipelas. It was again deſcribed as a new diſeaſe under the title of "febris miliaris rubra," which is ſaid to have appeared at Leipſick about the middle of the ſeventeenth century. It was alſo called "febris coccinea," and "febris purpurea," by other writers at Leipſick. The ſcarlatina ſpread through Poland in the year 1665, and has been well deſcribed by Schultzius under the denomination of "purpura epidemia maligna." (See Act. Acad. Natur. Cur. dec. i. ann. 6, 7. p. 206.) It was extremely fatal among infants and children. A few years after this it was noticed by various authors in Denmark, Holland, Switzerland, Lombardy, Bavaria, Auſtria, England, and Scotland. It raged at Berlin, under the form of ſcarlatina anginoſa, from 1694 to 1701, and has been well deſcribed by its proper title, in the Acta Med. Berolin. decad. i. vol. 2, and dec. ii. vol. 5. § 3. Its ſubſequent appearances in different parts of Germany and Italy, until the middle of the laſt century, are noticed by ſeveral writers on the febris miliaris, purpura miliaris, purpura rubra, purpura febrilis, morbilli maligni, &c. And Dr. Willan has, in another part of his work, ſtated reaſons for believing the "putrid meaſles," deſcribed by ſir William Watſon, as in fact a malignant ſcarlatina. (See Dr. Willan's Treatiſe on Cutaneous Diſeaſes, pp. 284—350. p iii.)

FEVER, *Spotted*, the ſame with *petechial*, and *purple* fever. See above.

FEVER, *Tertian*, an intermittent fever, the paroxyſms of which occur on alternate days, as explained above. See FEVER, *Quartan*.

FEVER, *Typhoid*, or *typhous*, or ſubſtantively typhus, febris *typhodes*, πυρετὸς τυφώδης, of the Greeks, the oppoſite of inflammatory fever, or fever with debility, including the nervous, contagious, malignant, and putrid fever of authors; as well as the varieties denominated, from the local circumſtances of its origin, gaol, hoſpital, and ſhip-fever; or, from the predominancy of particular ſymptoms, brain-fever, inteſtinal, gaſtric, and meſenteric fever, purple, ſpotted, petechial fever, &c. It is the ordinary fever of temperate climates, and its ſymptoms, cauſes, nature, and treatment, may be conſidered as having been diſcuſſed above, under the general head of Fever. See Typhus.

Fever, *Veſicular*, a term applied to a febrile diſeaſe, of the exanthematous claſs, which is principally characterized by an eruption of large watery veſicles; it is more commonly denominated *Pemphigus*, which ſee.

Fever, *Worm*, an appellation given by ſome writers to the febrile diſorders of children, connected, or ſuppoſed to be connected, with the irritation of worms in the inteſtines. See Infants, *Diſeaſes of*, and Worms.

Fever, *Yellow*, a name given to the endemic fever of hot climates, from the yellowneſs of the ſkin, which commonly occurs in the latter ſtage of the diſeaſe.

This fever, which has rendered the Weſt-Indian iſlands, at different periods the grave of Europeans, and has ravaged the cities of America, has been the ſubject of great difference of opinion among thoſe writers who have had an opportunity of witneſſing its phenomena: it were therefore not eaſy to decide, at a diſtance, upon the points which they have left in diſpute. We ſhall endeavour to give a ſuccinct view of thoſe facts which appear to be moſt ſatisfactorily aſcertained; beginning with the ſymptoms of the fever.

The approach of the *yellow fever* is often announced by a feeling of laſſitude, heavineſs, oppreſſion, loſs of appetite, and ſlight head-ache, which in a few hours, or on the following day, is ſucceeded by the violent ſymptoms of the diſeaſe. Sometimes, however, the attack is ſudden and violent from the firſt; the patient is ſeized with a faintneſs and giddineſs of the head, with a ſlight degree of chillineſs and horror, but never with a complete rigor or ſhivering; theſe feelings are immediately followed by a high degree of fever, an arid and ſcorching heat of the ſkin, accompanied by acute darting pains in the head and back, and often down the thighs and legs, and a ſtrong beating of the arteries, particularly of the carotid and temporal arteries; the face and neck are fluſhed and tumid, the eyes red and protruding, with a ſenſe of burning heat in the eyeballs, and the countenance is grim; great anxiety and oppreſſion are felt at the præcordia, with an intenſe burning pain at the ſtomach, and almoſt continual ſickneſs, which increaſes as the diſeaſe advances, with violent reachings, in which bilious matter is brought up, afterwards a dark coloured, and ſometimes a bloody fluid. There is extreme reſtleſſneſs, and a heavy reſpiration, with much ſighing; the pulſe is quick, generally full and ſtrong, but ſoft; in ſome caſes quick, low, and vacillating. The urine is deep coloured, and in ſmall quantity. Theſe ſymptoms continually increaſe; the reaching and vomiting become almoſt inceſſant, the anxiety exceſſive, the ſighing frequent, and the reſtleſſneſs ſuch that there is a continual toſſing, and no eaſe in any poſture, little or no ſleep, and that diſturbed, uneaſy, and without refreſhment to the ſick. Theſe ſymptoms generally continue to the third day, but ſometimes not longer than the firſt, or ſecond day, or even a few hours, and in others to the end of the fourth day, and may be conſidered as conſtituting the *firſt ſtage* of the diſeaſe.

The *ſecond ſtage* begins with an abatement of many of the preceding ſymptoms, often with a deceitful appearance of a general remiſſion of the fever. The vomiting, head-ache, and burning heat, greatly abate or nearly diſappear; the pulſe loſes its ſtrength, and falls to nearly the uſual frequency of health in many inſtances, but is always low and feeble. "Sometimes," ſays Dr. Moſeley, "in this period of the diſeaſe, the ſymptoms are ſo mild, and the patient ſo tranquil, that the diſeaſe is ſuppoſed at an end, and all means neglected, or thought unneceſſary, until the ſtorm appears that ſucceeds this fatal calm, arrayed in thoſe dreadful forms, which are characteriſtic of the concluding ſtage, and completes the cataſtrophe." (Treatiſe on Tropical Diſeaſes, page 411.) This interval, however, is often extremely ſhort, ſo that the diſeaſe paſſes at once from the inflammatory ſtage to the black vomiting. At all events, either a repetition of ſimilar violent ſymptoms ſoon takes place, accompanied with marks of greatly diminiſhed energy, or the patient ſinks at once into a comatoſe ſtate, only interrupted by vomiting of a dark coloured, porraceous fluid. The ſtomach rejects every thing; the thirſt, which in ſome is exceſſive, in others is moderate; and the ſkin is moiſtened with partial clammy ſweats. The eyes, which were before red and inflamed, now become tinged with yellow: and this yellowneſs begins to appear round the mouth, eyes, temples, and neck, and ſoon afterward diffuſes itſelf over the whole ſkin, varying in intenſity from a ſallow hue to a deeper orange tint: in many caſes, however, it is altogether abſent. The yellowneſs ſeems to uſher in the concluding and moſt fatal ſymptoms of the diſeaſe; and growing deeper coloured, as the other ſymptoms become aggravated, is the immediate forerunner of death. The laſt ſymptoms are a deep coma, with a heavy reſpiration or convulſive kind of ſighing, a low, creeping, and intermitting pulſe, delirium, and conſtant reſtleſſneſs and ſtruggling, faultering ſpeech, trembling, ſtarting of the tendons, vomiting of a black, bloody cruor, and ſtools of a ſimilar nature, hæmorrhagies or oozing of blood from the mouth and noſtrils, ſometimes from the corners of the eyes and ears, black urine, livid ſpots or blotches about the ſkin, great coldneſs of the extreme parts, muttering,—and death, either in a convulſive ſtruggle, a ſtate of torpid apathy, or ſometimes in a calm and collected reſignation of life. (See Hillary on the Diſeaſes of Barbadoes, 2d edit. p. 150. Moſeley, loc. cit. Lining, in the Edinburgh Phyſ. and Literary Eſſays, vol. ii. art. 29.)

The preceding deſcription correſponds, with the general order and manner of the diſeaſe, when the patient dies from the third or fourth to the ſeventh day. But many patients do not experience all the ſymptoms above mentioned. Some have no chillineſs at firſt, nor faintneſs, nor fluſhings in the face, and the pulſe is ſometimes deeply depreſſed, and not quick; and there are groſs habits of body, which have been attacked in damp ſituations in very ſultry weather, in whom the inflammatory period has been only of a few hours duration, and the tranſition ſo rapid, that the black vomiting, and the gangrenous condition have unexpectedly appeared, and terminated the life of the patient in twenty-four, or thirty-ſix hours. And, on the contrary, there are ſome inſtances where the diſeaſe has been protracted to the eighth, ninth, or tenth day; and others where it has never paſſed from the inflammatory ſtage; but being checked, though not extinguiſhed, it has been lengthened out, and at laſt converted into a remittent of great duration, of moſt difficult cure, and tedious recovery. (Moſeley.) In other caſes, it does not paſs through thoſe ſtages, nor put on the moſt characteriſtic ſymptoms of the diſeaſe. Speaking of the yellow fever, in December, Dr. Pinckard ſays, "Many of the ſick now fall into a ſtate of coma, and without exhibiting any other ſtriking mark of illneſs, without uttering a complaint or a groan, ſink very rapidly into the arms of death. The countenance becomes pale; the ſkin aſſumes a clay or lead-coloured hue; a ſtupor ſupervenes; the patient lies in a ſtate of tranquil inſenſibility; and without yellowneſs, or the other common marks of the fever, and in the courſe of a few days he ſleeps to wake no more!

Sometimes only a few hours complete the courſe of the diſeaſe." (Notes on the Weſt Indies, vol. iii. p. 198.) Theſe various anomalies in the fever ariſe from the different ſeaſon in which it occurs, the difference of conſtitution, and habits of life of the patients, as well as of the prediſpoſing and occaſional cauſes, the early treatment, &c.

The greateſt diſtreſs, it would appear, during all the periods of the *yellow fever*, ariſes from the ſtate of the præcordia; the burning heat, the anxiety and oppreſſion, the conſtant vomiting, the extreme ſoreneſs and uneaſineſs, complained of from the leaſt preſſure at the pit of the ſtomach, all point to that region, which, in the words of Warren, "ſeems from the beginning to be the chief ſeat and throne of the furious conqueror." (In a treatiſe on this fever addreſſed to Dr. Mead.) Hillary aſcribed this particular and uniform ſuffering about the præcordia to the vicinity of the liver and gall-bladder; but it ſeems to be attributed with more correctneſs to the ſtate of the ſtomach by others. For as Dr. Moſeley obſerves, "this viſcus ſeems to bear the chief burden of the diſeaſe, while life remains, and the principal internal veſtiges of its effects after death." He obſerves, in another place, "on inſpecting many dead bodies, I have always found ſome part or other of the ſtomach, and frequently the ſuperior part of the duodenum in a gangrenous ſtate, and never without evident marks of injury from inflammation, let the diſeaſe have been of ever ſo ſhort duration. Theſe appearances are univerſally produced by a mortal *yellow fever;* but from the appearance of the liver, and gall-bladder, though both muſt be materially affected in this diſeaſe, there is no inference to be drawn that can be depended on." (Loc. cit. p. 414.) Dr. Pinckard's obſervations accord with the preceding ſtatement; he ſays "the appearances were not preciſely ſuch, as from converſing with other practitioners, and reading a variety of authors, we had been led to expect. The ſtomach was found to be the organ which exhibited the ſtrongeſt marks of derangement. The inner coat was ſurcharged with blood, appearing very red, and at one ſpot near the upper orifice it was of a livid hue, and its texture ſo weakened, that the finger was paſſed through it by only a ſlight preſſure." (Loc. cit. vol. ii. p. 226.) This author ſtates in other parts of his book, that ſimilar appearances were obſerved in other caſes, which were examined by diſſection. (Ibid. p. 322, &c.) Dr. Ruſh, however, affirms, and from what we know of other fevers, we believe truly, that the morbid appearances of the internal parts of the body, as they appear by diſſection after death, from the yellow fever, are different in different countries, and in the ſame countries in different years; as the ſame diſeaſe during different epidemic ſeaſons aſſumes very different aſpects. From the obſervations of ſeveral phyſicians, quoted by Dr. Ruſh, it appears that the liver and gall-bladder have been often diſeaſed in the yellow fever, marks of inflammation and gangrene, and a morbid colour and conſiſtency of the bile, having been detected. The diſſections of Dr. Mitchell, Dr. Mackiltrick, Dr. Phyſick, and others, coincide in the diſcovery of inflammatory diſeaſe in the ſtomach. "The ſtomach was inflamed both on its outſide and inſide;" ſays the firſt of theſe phyſicians, "its villous coat, like that of the duodenum, was covered with fuzzy and ſlimy matter." The ſecond, after ſtating that the liver was differently affected in different caſes, ſays "the ſtomach, the duodenum, and ilium were remarkably inflamed in all caſes." The two laſt mentioned gentlemen remark, "that the ſtomach, and beginning of the duodenum, are the parts that appear moſt diſeaſed," and inflammation of the villous membrane at the pyloric end of the ſtomach extending into the duodenum, was the diſeaſe in ſome; extravaſations of blood in others; the former in thoſe who died early in diſeaſe, the latter in thoſe who died at a more protracted period. In thoſe caſes in which the brain was examined by Dr. Mitchell, "it was not affected," and the two laſt-mentioned phyſicians affirm, "that the brain in all parts has been found in a natural condition." (See Dr. Ruſh's Account of the Bilious Remitting Yellow Fever of Philadelphia, in 1793, 2d edit. pp. 114—122.) We may remark, by the way, that theſe facts are ſomewhat adverſe to the doctrine of fever, lately promulgated by Dr. Clutterbuck, on which we have animadverted above, when treating of the doctrines reſpecting the nature of *fever* in general.

The *yellow fever* has been aſſerted by ſome writers to be a new diſeaſe, the product of modern times, and even unknown till within a very recent period. We believe, however, with Dr. Moſeley, Dr. Miller of New York, and others, that it is a modification of that diſeaſe which was familiar to Hippocrates, Aretæus, Galen, and other phyſicians of antiquity, the characteriſtic ſymptoms of which have been deſcribed by them, and the prognoſtic indications well pointed out. It is, in fact, the καῦσος, *cauſus*, and *febris ardens* of the ancients, aggravated by the exceeding heat of climate. Hippocrates obſerves, in the ninth ſection of his book of Criſes, "in burning fevers (the *cauſus*,) a *yellowneſs of ſkin appearing on the fifth day*, and accompanied by hiccup, is a fatal ſymptom." The terrible ſymptom of *black vomiting* is alſo frequently mentioned by Hippocrates, and repreſented as being of fatal import. In the twelfth ſection of his *prognoſtics*, he aſſerts, that if the matter vomited be of a livid or black colour, it betokens ill. In the firſt ſection of book i. of his *Coan prognoſtics*, he enumerates black vomiting in a catalogue of the moſt fatal ſymptoms. And alſo in the fourth ſection of the ſame book, he conſiders porraceous, livid, or black vomitings, as indications of great malignancy. Theſe maxims imply the familiarity of their great author with thoſe ſymptoms which are not known except as belonging to the yellow fever. (See a Paper by Dr. Miller of New York, in the Edinburgh Med. and Surg. Journal, for July, 1807.)

This deſtructive fever has never been known to appear, except either in tropical climates, or in thoſe ſeaſons, in the more temperate climates, in which the atmoſpheric heat has for ſome length of time been equal to the tropical heat, that is, at or above 80° of Fahrenheit's thermometer. This fact, Dr. Blane aſſerts, is incontrovertibly eſtabliſhed by obſervation; for there is no inſtance, either in North America or Europe, of the yellow fever appearing, except at theſe degrees of heat, nor of its ſurviving after the atmoſphere had fallen to a lower degree of temperature. This is leſs to be wondered at in North America, where the winters are extremely ſevere, but it holds equally true at Cadiz, Malaga, Gibraltar, and other parts of Spain, where the winters are warm, and where this diſeaſe ſpontaneouſly diſappeared, in degrees of heat equal to the uſual ſummer heats in the north of Europe. (See Dr. Blane's Letter to Baron Jacobi, reſpecting the Prevention of the Yellow Fever, in the Edinburgh Journal, for October, 1807.)

It ſeems to be well aſcertained, then, that the *yellow fever* is an endemic of hot climates, or an epidemic of hot ſeaſons in other climates; and this fact will enable us to explain the hiſtory of the diſeaſe, as well as to diſpel our fears, that it may ever be brought to this country. By Dr. Moſeley it is called the "endemial cauſus" of the Weſt Indies.

It is a well known fact, that when Europeans firſt take up their reſidence in tropical climates, it is uſual for them, ſooner or later after their arrival, to undergo an attack of the endemic fever of the country. This fever of the viſitors of the Weſt Indies, in times of tranquillity, when the "new comers" are few, is termed a "*ſeaſoning fever*;" but Dr. Pinckard obſerves, "in times of war, when, from great multitudes arriving at the ſame time, its deſtructive effects are more ſtriking, it is baptized with the terrific name of *yellow fever*." This circumſtance ſerves to explain the origin of the opinion that this fatal fever is the product of modern times; when the ſyſtem of colonial war has only multiplied the victims whom it might ſacrifice. (See Notes on the Weſt Indies, vol. iii. p. 416 and 445.) The ordinary yellow fever ſeems to be juſtly conſidered by the moſt accurate obſervers as an aggravated form of the "bilious remitting fever," common to hot climates, eſpecially where a particular condition of the ſoil, or ſome other ſource of effluvia, co-operates with the heat. The natives, or old reſidents in thoſe ſituations, become habituated to the influence of theſe cauſes, and are leſs liable to be affected by this fever; and when they do ſuffer it, it is in a leſs ſevere degree. Creoles and negroes, Dr. Pinckard remarks, are not often affected with the diſeaſe, and are not ſubject to it in its continued or moſt malignant form, but when it does invade them, it more commonly aſſumes an intermittent or remittent type. Europeans, who have reſided during a period of ſeveral years in the Weſt Indies, have become in a great meaſure habituated to the climate, and have acquired a ſtate of conſtitution approaching to that of the natives; they are ſeldom attacked by the fever in its continued form; it commonly affects them in a remittent type. It is almoſt excluſively in ſtrangers, and in thoſe from a northern climate, that the diſeaſe aſſumes the malignant and *continued* form. In North America, the inhabitants, who conſtantly reſide in the moſt ſouthern ſtates, are ſeldom attacked with the fever in its more violent or continued form; while thoſe of the north-eaſt ſtates are deſtroyed by it in great numbers. In a word, it appears that perſons ſuffer the fever of hot climates in the different degrees of violence and ſeverity of form, according as they are more or leſs ſeaſoned or habituated to the temperature under which it occurs. Hence it has been properly ſuggeſted, that, in order to preſerve our troops ſent on ſervice to the Weſt Indies, they ſhould be prepared for the climate gradually; for example, by firſt letting them ſerve for a time at Gibraltar, and afterwards employing them for a year or two in the more windward iſlands, as Barbadoes and Antigua, before they were ſent to the other colonies.

Among the Europeans attacked with the ardent fever of the Weſt Indies, the diſeaſe varies according to the ſtate of the conſtitution. Thus the ſtrong and plethoric, thoſe of rigid fibre and rich blood, are the moſt liable to be attacked, and ſuffer the diſeaſe moſt violently and fatally. Hence, thoſe who perſevere in their accuſtomed ſtrong and ſtimulating diet ſuffer in like manner more ſeverely than thoſe whoſe vigour of habit is ſomewhat reduced by extreme temperance. It is obſerved that perſons are moſt frequently attacked during or after expoſure to great heat or fatigue, and to the night air, when it becomes cold and moiſt. Hence, on the one hand, thoſe employed as cooks and blackſmiths are particularly liable to be ſeized, and ſentinels, men occupied in fiſhing, and boat parties, on the other. We have before mentioned, when ſpeaking of the cauſes of *fever*, a fact related by Dr. Lind, that a boat's crew was three times deſtroyed and replaced, after going on ſhore for proviſions in the night, the whole being as often ſeized with remitting fever, on the coaſt of Africa.

This endemic *cauſus*, like the remittents of northern climates, is more particularly prevalent in ſeaſons when moiſt and marſh exhalations co-operate with great heats, or cold and damp nights alternate with hot days. Hence, in more northern climates they have occurred only in the autumnal ſeaſons, as at Cadiz in 1800, and at Malaga in 1803, and commonly at ſimilar periods in New York and Philadelphia. After inveſtigating the cauſe of an exceſſive prevalence of yellow fever in Demarara, in the month of July, Dr. Pinckard concluded that it was "probably the mere effect of the ſeaſon, reſulting from the increaſed heat of the days, the damp chillineſs of the evenings, and the offenſive miaſmata exhaled from half-expoſed mud."—"The quantity of rain that now falls is not ſufficient to cover the feculent ſediment of the numerous ditches, nor to prevent their unwholeſome vapours from riſing into the atmoſphere; and the partial ſhowers, which occur during the evening and night, by ſoftening the half-dried ſurface, favour the exhalation, while they produce a chilling dampneſs, which perhaps contributes to render the body more than uſually ſuſceptible of impreſſion. The evenings are now ſo much colder to our feelings than we have found them during the preceding months, that we have lately been able to ſit with the door ſhut, and have even thought that a blanket, during the night, might have been ſupportable." (Notes, vol. iii. p. 52.) Writing again from Demarara, in the enſuing month, (Auguſt,) Dr. Pinckard ſays, "the preſent moment may be ſaid to be the high ſeaſon of the *yellow fever*. It now rages in its utmoſt violence, and with ſorrow I remark that great numbers periſh from its malignity. Until the partial rains of the preſent period have ceaſed, and the dry ſeaſon be well ſet in, it is ſaid that we are to expect a continuance of ſickneſs, &c." (Ibid. p. 83.) In this reſpect the diſeaſe is altogether analogous to the autumnal remittents of our temperate climates, or of the warmer extra-tropical countries, when moiſture ſucceeds or alternates with warmth, as we have already mentioned, when treating of the *cauſes of fever*. We have there ſeen that moiſt weather, after heat, generally produces a remittent fever, in countries where the ſoil is favourable to the formation of miaſmata, and this is milder in its ſymptoms in the more northern and more violent in the ſouthern degrees of latitude; thus it is an ague, or a remittent of moderate ſeverity in England and Holland, but a ſevere and fatal ardent fever on the banks of the Nile and the Euphrates, after inundations have left the ground moiſt and ſlimy. On the ſhores of the Mediterranean, where Hippocrates practiſed, and frequently ſaw the yellow ſkin and black vomit of the ardent fever, Dr. Cleghorn found that the common tertian fever, when it attacked Engliſhmen, put on the uſual ſymptoms of the *yellow fever*. (On the Diſeaſes of Minorca, p. 176.) Dr. Ruſh, and other phyſicians of Philadelphia, and alſo thoſe of New York, Dr. Miller, &c. are ſatisfied that the *yellow fever*, which has appeared in thoſe cities in the autumnal ſeaſons of hot years, *originated* in thoſe cities, and was but an aggravation of the ordinary remitting fever. In Philadelphia the origin of the fever has been traced to the ſtreets adjoining the docks and wharfs; in 1793, it was more particularly attributed to the putrefaction of a large quantity of damaged coffee, which was expoſed in July on a wharf in the dock, in the vicinity of which the fever commenced. In New York, in 1805, Dr. Miller ſays, "on the whole, the low grounds on the margin of the two rivers certainly produce a chief part of the caſes." The different degrees, then, of fever originating from miaſmata, according to the heat of the climate or ſeaſon in which they occur, appear to be in the following ſcale ; 1. Common mild intermitting fever, 2. Common remitting, or bilious remitting fever, and, 3. The yellow fever. Theſe ſeem to bear the ſame relation to each other, as, 1. The ſimple continued fever. 2. The contagious typhus, or gaol-fever ; and, 3. The plague. (See Dr. Ruſh on the Fever of 1793, in Philadelphia, 2d edit. p. 178. Dr. Pinckard, loc. cit. vol. iii. p. 417. Dr. Miller, Report to the Governor of the State of New York, in the Edin. Med. and Surg. Journal, before quoted.) Dr. Miller puts the identity of the ordinary remittent fever and the *yellow fever* in a ſtrong light ; "as the materials of putrefaction, and the degrees of heat in a large city," he obſerves, "greatly exceed what is found in the adjacent country ; ſo the diſeaſe ariſing under ſuch circumſtances muſt be proportionably more malignant. The peſtilential fevers of our city differ only in grade from the bilious and remittent fevers of the country. They prevail in the ſame climates ; they come on at the ſame ſeaſon of the year ; they are chiefly diſpoſed to attack perſons of the ſame conſtitution ; they commit their ravages on the ſame organs of the body, and produce ſymptoms differing only in degree, and they decline and diſappear at the ſame ſeaſon, and under the ſame circumſtances. In the city we often ſee in the ſame family, and under equal circumſtances of expoſure, the malignant forms of peſtilence, and the mild forms of remittent fever ; and in the country, while the great maſs of caſes are uſually mild, we occaſionally meet with ſome, which exhibit the violent attack, the intenſe malignity, and the rapid diſſolution, which more frequently mark the peſtilential fevers of the city." The identity of the yellow and bilious remitting fevers is maintained, in equally ſtrong terms, by Dr. Ruſh, and twelve other phyſicians, who preſented a memorial to the governor of Pennſylvania on the ſubject. Their reaſons for this opinion are the following : 1. The ſameneſs of their origin ; both being the offspring of putrefaction. 2. The yellow fever makes its appearance in thoſe months chiefly in which the bilious fever prevails, and is uniformly checked by the ſame cauſes, *viz.* heavy rains and froſts. 3. The ſymptoms of the bilious and yellow fever are the ſame in their nature. 4. The common bilious and yellow fever often run into each other ; and the improper uſe of remedies will mutually convert them. 5. The common bilious and yellow fevers are alike contagious, under certain circumſtances of the weather, &c. 6. They mutually propagate each other. 7. And, laſtly, the yellow fever affects the ſyſtem more than once, in common with the bilious fever. (Ruſh. loc. cit. vol. v. p. 45, *et ſeq.*) Theſe reaſons are ſatisfactorily illuſtrated at ſome length.

Is the yellow fever contagious ? It might appear rather extraordinary to the general reader, that the eye-witneſſes of ſo fatal a peſtilence ſhould be at variance with reſpect to the exiſtence or non-exiſtence of contagion connected with it ; were it not recollected that a ſimilar diſagreement and diſcuſſion have occurred with regard to the contagious nature of the plague itſelf, and more particularly among the phyſicians of the 16th and 17th centuries, who had the moſt frequent opportunities of witneſſing its devaſtations. Some of the writers who contend for the identity of the yellow and remittent fevers deny the exiſtence of contagion in both : while others maintain that theſe two fevers are eſſentially diſtinct, the latter being void of contagion, and the yellow fever being propagated by contagion only. Moſt of the Weſt Indian phyſicians deny the contagion of yellow fever ; while Dr. Chiſholm, and ſeveral of the Americans, conſider the diſeaſe as generally imported and extremely contagious. We commonly find truth between the extremes. It has been well underſtood, at leaſt ſince the time of Dr. Lind, that the effluvia of human bodies, even in health, when accumulated in cloſe and crowded ſituations, become capable of exciting fever, or, in other words, become *infectious ;* and that thoſe which ariſe from the bodies of perſons labouring under febrile diſeaſes ſtill more readily become infectious, and propagate the original diſeaſe, whether idiopathic fever, dyſentery, eryſipelas, &c. (See CONTAGION.) Upon theſe grounds, it would ſeem, Dr. Ruſh and his colleagues maintain the occaſional contagious influence of both the yellow and bilious remittent fever. "In a Weſt India climate," he ſays, "where the accumulation of the effluvia from ſick people is prevented by open doors and windows, it is eaſy to conceive this (yellow) fever cannot be often propagated by contagion. Even in our own country, (Pennſylvania,) it has rarely been obſerved to be contagious in the months of July and Auguſt. But after cool weather renders it neceſſary to exclude the freſh air from ſick rooms, it is as eaſy to conceive the ſame effluvia may be ſo accumulated and concentrated, as to produce the diſeaſe in other people. In this way it was propagated in ſome inſtances during the year 1797, but by no means ſo often as in 1793, under equal circumſtances." (Med. Inq. and Obſ. vol. v. p. 37.)

The teſtimony of many other writers might be adduced, in corroboration of the fact, that *yellow fever* has been often propagated by contagion, eſpecially under the circumſtances juſt alluded to ; we ſhall content ourſelves with ſtating the following facts and obſervations. "Some late authors," ſays the veteran Dr. Wright, "who have written on Weſt India diſeaſes, have roundly aſſerted, that in tropical countries fevers are not contagious ; but whoever has had the care of crowded hoſpitals, of gaols, of ſhips of war, or of tranſports full of troops, muſt have ſeen numerous and fatal inſtances of contagion in the Weſt Indies ; more eſpecially where cleanlineſs and free ventilation have been neglected. From cauſes of this ſort a moſt fatal and deſtructive diſorder broke out in the Weſt Indies in 1793, and ſoon after in Philadelphia, *viz.* the *yellow fever*. From Dr. Ruſh's book, and from the numerous letters of my correſpondents, there remains not a doubt in my mind of the yellow fever being typhus, exalted to a great degree of virulence from climate, ſituation, and other adventitious circumſtances." (See Practical Obſervations on the Treatment of Acute Diſeaſes, particularly thoſe of the Weſt Indies, by Wm. Wright, M.D., &c. in the Med. Facts and Obſ. vol. vii. p. 6.) Dr. Chiſholm has advanced ſome ſtrong evidence to prove, that the malignant yellow fever, which Dr. Wright alludes to, was generated on board a ſhip on the coaſt of Africa (at Bulama or Boulam), and the contagion imported to Grenada ; whence it was afterwards carried to the other leeward iſlands, and to Philadelphia. We cannot here follow out the whole detail of circumſtances as given by Dr. Chiſholm ; the following are ſome of the leading facts. The ſhip Hankey ſailed from England, laden with ſtores, and upwards of 200 adventurers, for the projected colony at Boulam. The project failed, and they all lived on board during nine months on this coaſt. In this crowded veſſel a malignant fever broke out, and deſtroyed three-fourths of the crew, leaving only the mate and two ſeamen to navigate the ſhip when ſhe ſailed. Four men were put on board from ſhips of war at St. Jago to aid in navigating her to the Weſt Indies. On the third day after leaving St. Jago, the men they procured from the ſhips of war were ſeized with the fever, and two of the four died; the remaining two were put on ſhore at Grenada and St. Vincent in a wretched ſtate. No method was taken to purify or ventilate the ſhip, or the clothes, bedding, &c. From the period at which the Hankey arrived at Grenada, *viz.* the 18th of February, 1793, Dr. Chiſholm dates the commencement of the deſtructive yellow fever, the progreſs of which he deſcribes in the following manner. A captain Remington was the firſt perſon who viſited the Hankey after her arrival in St. George's bay. He went on board the evening after ſhe anchored, and remained three days, at the end of which time he left St. George's, and proceeded in a coaſting veſſel to Grenville bay, where his own ſhip lay. He was ſeized with the malignant fever on the paſſage; and the violence of the ſymptoms increaſed ſo rapidly, as on the third day to put an end to his exiſtence. The crew of the Defiance were the next who ſuffered by viſiting this ſhip; the mate, boatſwain, and four ſailors went on board the day after her arrival; the mate remained either on deck or in the cabin, but the reſt went below, and ſtayed all night there. All of them were immediately ſeized with the fever, and died in three days. The mate was alſo taken ill, but, probably from his having been leſs expoſed to the virulence of the infection, he recovered. The crew of the ſhip Baillies, from the ſame imprudent civility or curioſity, were the next who ſuffered. Theſe communicated the infection to the ſhips neareſt them; and it gradually ſpread from thoſe neareſt the mouth of the Carenage, where the Hankey for ſome time lay, to thoſe at the bottom of it; not one eſcaping in ſucceſſion, whatever means the captains took to prevent it. Had the diſeaſe ariſen from the exhalations from the Lagoon, or the mangroves around that piece of water, it muſt have originated of courſe among the ſhips in the inner part of the harbour, Dr. Chiſholm remarks, and its progreſs would have been outward towards the mouth of the Carenage, and not inward towards the bottom of the harbour. In the ſhort ſpace of time from the beginning of March to the end of May, 200 of about 500 ſailors, who manned the ſhips of the regular trade, died of this fever. About the middle of April the diſeaſe began to appear on ſhore. The firſt houſe in which it ſhewed itſelf was ſituated cloſe to the wharf, and the infection was evidently introduced, Dr. C. ſays, by a negro wench, who took in ſailors' clothes to waſh; it extended to every individual of the family, a few negroes excepted. Among the troops, it firſt appeared in that part of the garriſon quartered neareſt to where the Hankey lay. One of the officers viſited the ſhip, and with two or three ſoldiers who rowed his boat, remained on board ſome time. The conſequence of this imprudence was fatal to himſelf almoſt immediately after; and in a little time to many of the men; the officers and men were ſucceſſively ſeized, but it proved fatal only to recruits who had lately joined. (See an Eſſay on the Malignant Peſtilential Fever, introduced into the Weſt Indian Iſlands from Boulam, on the coaſt of Guinea, as it appeared in 1793, 4, 5, and 6, interſperſed with obſervations and facts, tending to prove that the epidemic exiſting at Philadelphia, New York, &c. was the ſame fever introduced by infection from the Weſt India iſlands, &c. by C. Chiſholm, M.D., &c. vol. i.) How far the latter part of the ſtatement in the title page is proved, we cannot pretend to decide.

Dr. Blane has ſtated a circumſtance, very clearly ſhewing the propagation of *yellow fever* by contagion. "The prevalence of yellow fever being limited by a determinate range of atmoſpheric heat," he ſays, "and alſo by a certain degree of purity of air, many people of the beſt underſtandings, who either did not know, or had not maturely conſidered the whole facts, have contended that it is not of an infectious nature. The doubts reſpecting this are founded on arguments ſimilar to what have been employed in ſupport of the paradoxical opinion entertained by ſome authors, even of our own times, that the plague itſelf is not contagious. The infection of both may be aptly compared to the ſeeds of vegetables, or the eggs of animals, which require a nice concurrence of certain degrees of heat, moiſture, reſt, nutriment, &c. to animate them. Infectious matter has, by a very appropriate metaphor, been termed the *ſeeds* of the diſeaſe; and by a ſimilar propriety of expreſſion, it has been ſaid, that a certain *nidus* is neceſſary to give it effect. The *nidus* of the yellow fever is a given range of atmoſpheric heat, and a certain concentration and corruption of animal effluvia, but equally indiſpenſable. It would be too tedious to enumerate the various proofs, derived from my own obſervation, and the teſtimony of others, in proof of the infectious nature of yellow fever; I ſhall content myſelf with citing one, taken from my letter to Mr. King, miniſter of the ſtates of America to this court, who applied to me on this ſubject in the year 1798. On the 16th of May, 1795, the Thetis and Huſſar frigates captured two French armed ſhips from Guadaloupe, on the coaſt of America. One of theſe had on board ſome men ill of the yellow fever; and out of fourteen hands ſent from the Huſſar to navigate and take care of her, nine died of this fever before ſhe reached Halifax, on the 28th of the ſame month, and the five ſurvivors were ſent to the hoſpital ſick of the ſame diſtemper. Part of the priſoners were ſent on board the Huſſar; and though care was taken to ſelect thoſe ſeemingly in perfect health, the diſeaſe ſpread rapidly in that ſhip, ſo that near one-third of the whole crew was more or leſs affected with it." (Letter to Baron Jacobi, before quoted.)

Theſe facts, and many others that might be adduced, leave no doubt, we apprehend, that a *contagious yellow fever* often exiſts; which may be, in ſome inſtances, the remitting bilious fever rendered infectious by the cloſe, crowded, and unventilated ſituation of the patients; and, in others, the ordinary *typhus*, ſhip or hoſpital fever, aggravated by the influence of a hot climate on the European conſtitution, or at leaſt on a conſtitution habituated to cold in the winter, as in the inhabitants of North America. At the ſame time, it cannot be queſtioned, that the bilious remitting fever, which is endemic in hot climates, is not ordinarily a contagious diſeaſe. (See Lind on Fevers and Infection, chap. ii. ſect. 5.) The advocates for the univerſally infectious nature of the yellow fever, when it has appeared as an epidemic and peſtilential diſeaſe, have attempted to lay down the diagnoſtics of the remittent and the epidemic, but, it appears to us, with little ſucceſs. They admit of the yellowneſs in both, of the black vomit, and of petechiæ in both; (ſee Chiſholm, loc. cit. vol. i. chap. 6, 7. Dr. Currie of Philadelphia, quoted by Dr. Ruſh, loc. cit.) but an occaſional difference in the degrees of ſeverity can ſcarcely be conſidered as marking an eſſential difference in the two diſeaſes. The name of *yellow* fever has, indeed, led ſome phyſicians to ſuppoſe that a yellow colour of the ſkin was eſſential to this fever; but this miſtake has been pointed out by Drs. Moſeley, Ruſh, Pinckard, and others. "The yellowneſs of the ſkin," Dr. Moſeley obſerves, "like the black vomiting, is not an invariable ſymptom of this fever; thoſe who are fortunate enough to recover ſeldom have it; and many die without its appearance. Beſides, the yellowneſs alone leads to nothing certain; it may ariſe from an inoffenſive ſuffuſion of bile." (On Tropical Diſeaſes, p. 399.

See alſo Dr. Pinckard's notes, &c. vol. ii. p. 227. Dr. Ruſh, loc. cit. p. 238.) As thoſe who have been daily occupied in the midſt of the devaſtation of the yellow fever have diſagreed as to the mode of its propagation, it is impoſſible to decide, at a diſtance, in what inſtances it was combined with contagion, or when it was the reſult of the ſeaſon and miaſmata only. It would ſeem, however, that while the probability of infection ariſing in the cloſe and crowded parts of a large city, when a fever is by any means introduced, is very great; the actual progreſs of the fever of Philadelphia, for inſtance, appears to favour the notion of an exiſting contagion. (See an Account of the Fever of Philadelphia, in 1793, by Matthew Carey.)

The violence and rapidity of the ſymptoms of yellow fever render the *prognoſis* extremely difficult and uncertain: no particular ſymptom affords any accurate prognoſtic; and it is only from attention to the general ſtate of the patient, or the reſult of a combination of all the ſigns, that any idea of what the event may be is to be obtained. The ſtate of the eyes, the change of voice, the general aſpect of the countenance, and the degree of torpor or inſenſibility of the ſyſtem, afford the moſt important information. Dr. Chiſholm remarked, "that the longer the ſymptoms of the inflammatory diatheſis continued, provided their violence was not progreſſive, the event became more favourable; and, on the contrary, that when the ſudden diſappearance of theſe was immediately ſucceeded by a ſeeming ſtate of apyrexia, the worſt ſymptoms, ſuch as coma, delirium, clammy cold ſweats, vibices, and death, might be ſoon expected. In the firſt caſe, the patient was gradually thrown into an agreeably warm and univerſal diaphoreſis; irritability of ſtomach ceaſed; the eyes became more lively; and, in a little while after, the ſigns of returning health were evident." (Chiſholm, loc. cit. chap. v.)

Dr. Ruſh preſents us with the following combinations of ſymptoms, as indicating a more or leſs favourable iſſue of the diſeaſe.

Signs of moderate danger.—1. A chilly fit accompanying the attack of the fever. The longer this chill continues, the more favourable. 2. The recurrence of chills every day, or twice a day, or every other day, with the return of the exacerbations of the fever. A coldneſs of the whole at the above periods without chills, a coldneſs with a profuſe ſweat, cold feet and hands with febrile heat in other parts of the body, and a profuſe ſweat without chills, or coldneſs, are all leſs favourable ſymptoms than a regular chilly fit, but they indicate leſs danger than their total abſence during the courſe of their fever. 3. A puking of *green* or *yellow* bile on the firſt day of the diſeaſe is favourable. A diſcharge of black bile, if it occur on the *firſt* day of the fever, is not unfavourable. 4. A diſcharge of green and yellow ſtools. It is more favourable if the ſtools are of a dark or black colour, and of a fœtid and acrid nature, on the firſt or ſecond day of the fever. 5. A ſoftneſs and moiſture on the ſkin, in the beginning of the fever. 6. A ſenſe of pain in the head, or a ſudden tranſlation of pain from internal to external parts of the body, particularly to the back. An increaſe of pain after bleeding. 7. A ſore mouth. 8. A white or a yellow tongue. 9. An early diſpoſition to ſpit freely, whether excited by nature, or the uſe of mercury. 10. Blood becoming ſizy, after having exhibited the uſual marks of great morbid action in the blood-veſſels. 11. Great and exquiſite ſenſibility in the ſenſe of feeling coming on near the cloſe of the fever.

Signs of great danger.—1. An attack of the fever, ſuddenly ſucceeding great terror, anger, or the intemperate uſe of venery. 2. The firſt paroxyſm coming on without any premonitory ſymptoms, or a chilly fit. 3. A coldneſs over the whole body, without chills for two or three days. 4. A ſleepineſs on the firſt and ſecond days of the fever. 5. Uncommon paleneſs of the face, not induced by blood-letting. 6. Conſtant or violent vomiting without any diſcharge of bile. 7. Obſtinate coſtiveneſs, or a diſcharge of natural or white ſtools. 8. A diarrhœa towards the cloſe of the fever. 9. A ſuppreſſion of urine. It is moſt alarming when without pain. 10. A diſcharge of dark-coloured and bloody urine. 11. A cold, cool, dry, ſmooth, or ſhining ſkin. 12. The appearance of a yellow colour in the face on the firſt or ſecond day of the fever. 13. The abſence of pain, or a ſudden ceſſation of it, with the common ſymptyms of great danger. 14. A diſpoſition to faint upon a little motion, and fainting after loſing but a few ounces of blood. 15. A watery, glaſſy, or brilliant eye. A red eye on the fourth or fifth day of the diſeaſe: it is more alarming if it become ſo after having been previouſly yellow. 16. Imperfect viſion, and blindneſs in the cloſe of the diſeaſe. 17. Deafneſs. 18. A preternatural appetite, more eſpecially in the laſt ſtage of the fever. 19. A ſlow, intermitting, and ſhattered pulſe. 20. Great reſtleſſneſs, delirium, and long continued coma. 21. A diſcharge of coffee-coloured or black bile from the ſtomach after the fourth day of the fever. (Ruſh. Med. Inq. &c. vol. v. p. 129—133.)

The *methods of cure* adopted in the *yellow fever* have been very diſſimilar, and not very ſucceſsful, on the whole. That the practice purſued in different countries, and in the ſame country at different times, muſt be diſſimilar, if judiciouſly choſen, cannot be doubted; for the ſame diſeaſe, when epidemic at different periods, and under different circumſtances of climate, conſtitution of the people, ſeaſons, &c. is wont to aſſume very different characters, and to demand a correſponding difference of treatment. It has been too much the practice with medical men to preſcribe for the *name* of a diſeaſe, neglecting the varieties of type and character which it puts on; but it is ſufficient to mention the modifications of ſmall-pox and ſcarlet fever, to prove the error of ſuch ſweeping rules of treatment. Between the mild diſtinct ſmall-pox, and the virulent confluent ſmall-pox, there is hardly any analogy (in a practical view): and between the ſimple ſcarlet fever, which is ſcarcely a diſeaſe, if the buſy hand of art does not interfere with it, and the peſtilential ſcarlet fever with the malignant ulcerated ſore throat, the practical difference is as wide as poſſible: yet they are the ſame diſeaſe, originating from the ſame poiſon. In like manner, the *yellow fever*, when it occurs as a remittent among the natives or long inhabitants of hot climates; as a more ſevere remittent or continued fever, among the emigrants from northern latitudes, or the people of countries where a tropical degree of heat is only caſual; or as combined with a typhoid contagion: in all theſe caſes it aſſumes a form varied in point of ſeverity and fatality; not to mention the varieties of the ſame form, according to the different epidemic conſtitution, as the phraſe is, the cauſe of which we cannot explain. Thus, in one epidemic ſeaſon the inflammatory ſymptoms, or morbid excitement may run high; in another the ſucceeding failure of the vital powers may be more prevalent, &c. Perhaps a conſideration of theſe circumſtances, and of the different hypothetical notions which individuals adopt, may enable us to explain both the diſſimilarity, and the general want of ſucceſs, in the treatment of yellow fever, unleſs the cathartic and mercurial treatment may be excepted.

Two oppoſite modes of practice have been purſued in this fever; the one dictated by an opinion that the diſeaſe was highly putrid, and the other that it was of a highly inflammatory nature. Other practitioners again have, to a certain degree, combined theſe plans, inſtituting moderate evacuations in the firſt ſtage, as on the firſt or ſecond day of the fever, and afterwards ſupporting the vital powers by bark, wine, laudanum, and aromatic tonics; not to mention the exhibition of mercury, ſo as to excite ſalivation, which others have employed. The practice ſuggeſted by the notion that yellow fever is of a highly putrid nature, *viz.* the uſe of bark, wine, and other cordials, from the moment the diſeaſe was ſeen, ſhall be firſt briefly noticed, and diſmiſſed as a baneful mode of treatment, which has been happily exploded by practitioners in general.

Dr. Chiſholm remarks, that, "from the hiſtory of the diſeaſe it will not appear extraordinary that practitioners ſhould have recourſe to bark very early in it; and before they become ſufficiently acquainted with its true nature and peculiarities. The ſuddenneſs of the changes, and the apparent ſinking of the vital powers, a few hours after the acceſſion of the fever, naturally incline us to conſider it as a diſeaſe wherein tonics and antiſeptics, with the whole tribe of cordials, could alone be uſeful. But *no indication can be more fallacious* than this; and innumerable inſtances occurred of the fatal conſequences of adopting it. The uſe of the bark in the violent caſes of the malignant peſtilential fever, immediately after the operation of the evacuating medicines, was hurtful in the extreme, &c." (Loc. cit. vol. i. p. 365.) Dr. Ruſh affirms, that, "had the whole materia medica been ranſacked, there could not have been found any three medicines more oppoſite to the diſorder than bark, wine, and laudanum. In every caſe in which I preſcribed bark it was offenſive to the ſtomach. Wine was nearly as diſagreeable as the bark to the ſtomach, and equally hurtful. I tried it in every form, and of every quality, but without ſucceſs: it was either rejected by the ſtomach, or produced in it a burning ſenſation. Laudanum has been called by Dr. Moſeley "a fatal medicine" in the yellow fever. In one of my patients, who took only fifteen drops of it, without my advice, to eaſe a pain in his bowels, it produced a delirium, and death in a few hours." (Med. Inq. and Obſ. vol. iii p. 298, *et ſeq.*) At the commencement of the deſtructive epidemic of 1793 in Philadelphia, Dr. Ruſh uſed this plan fully, until his want of ſucceſs compelled him to turn his attention to other meaſures. "I had recourſe to a gentle vomit of ipecacuanha on the firſt day of the fever, and to the uſual remedies for exciting the action of the ſanguiferous ſyſtem: I gave bark in all its uſual forms, of infuſion, powder, and tincture. I joined wine, brandy, and aromatics with it. Finding them all ineffectual, I attempted to rouſe the ſyſtem by wrapping the whole body, agreeably to Dr. Hume's practice, in blankets dipped in warm vinegar. None of theſe remedies appeared to be of any ſervice; for although *three* out of *thirteen* recovered of thoſe to whom they were applied, yet I have reaſon to believe that they would have recovered much ſooner, had the cure been truſted to nature." (Ibid. p. 193.) Dr. Ruſh, having requeſted the advice of a Weſt Indian phyſician, accidentally at Philadelphia, was recommended to add the cold affuſion to the large adminiſtration of bark; but the bark was offenſive to the ſtomach, or rejected by it in every inſtance. The affuſion of buckets full of cold water frequently upon the ſick was grateful, and produced relief in ſeveral caſes, by inducing a moiſture on the ſkin. But *three* out of *four* of the patients thus treated died: ſome phyſicians loſt all their patients, and whole families were ſwept off, where theſe medicines were uſed.

In a word, this early uſe of ſtimulant medicines is in this, as we believe in all other fevers, decidedly prejudicial. And, although ſeaſon and climate vary all diſeaſes, we are diſpoſed to apply ſtill more generally Dr. Ruſh's obſervation, when he ſays, "without fear of being refuted, I will notwithſtanding aſſert, that the proper remedies for this fever, at all times, and in all places, in its *firſt* ſtage, *muſt be* evacuations." (Ibid. p. 335.)

The ſucceſs which Dr. Ruſh, and many others upon his ſuggeſtion, experienced from commencing the cure by evacuations, eſpecially *purging*, was remarkable; and we cannot but enter into the heartfelt gratification of this diſtinguiſhed phyſician, when, in the forlorn ſtate of ignorance as to the means of alleviating the diſtreſſes of his fellow citizens, in the commencement of a raging peſtilence of unexampled fatality in that city, he was accidentally directed to an uſeful remedy; and in his note-book of the 10th of September wrote the following: "Thank God! out of one hundred patients whom I have viſited, or preſcribed for this day, *I have loſt none.*" This remedy conſiſted of a combination of calomel and jalap, employed as a ſpeedy *purgative*, in the doſe of ten grains of the former with fifteen of the latter: "even this doſe was ſlow and uncertain in its operation. I then iſſued three doſes, each conſiſting of fifteen grains of jalap and ten of calomel; one to be given every ſix hours until they procured four or five large evacuations. The effects of this powder not only anſwered, but far exceeded my expectations. It perfectly cured *four* out of the firſt *five* patients to whom I gave it, notwithſtanding ſome of them were advanced ſeveral days in the diſorder." (Ibid. p. 201.) The ſucceſs of this remedy was communicated to the College of Phyſicians, and the plan was immediately adopted by ſeveral phyſicians with a great and decided ſuperiority over all other means hitherto employed. Large families were altogether recovered by it. From this moment Dr. Ruſh gained a great acceſſion of buſineſs, and the demand for the purging powders became greater than could be eaſily ſupplied. Together with this evacuation, Dr. Ruſh employed other means of abſtracting exceſs of ſtimulus from the ſyſtem: theſe were blood-letting, cool air, cool drinks, low diet, and applications of cold water to the body. By theſe meaſures Dr. Ruſh publicly aſſerted that a greater proportion than ninety-nine out of a hundred of all who applied to him on the firſt day of the diſorder, before the 15th day of September, were cured. And others were in a ſimilar manner ſucceſsful. "Dr. Pennington aſſured me," he ſays, "on his death bed, that he had not loſt one out of forty-eight patients whom he had treated agreeably to the principles and practice I had recommended. Dr. Griffiths triumphed over the diſeaſe in every part of the city, by the uſe of what were called the new remedies. My former pupils ſpread, by their ſucceſs, the reputation of purging and bleeding wherever they were called." Not only is the general ſucceſs of this plan of treatment thus ſhewn; but it is farther evinced by the great confidence which was excited in it. "Twenty men," ſays Dr. Ruſh, "employed conſtantly in putting up this medicine, would not have been ſufficient to have complied with all the demands which were made on me for it. Hundreds who were in health called or ſent for it, as well as the ſick, in order to have it in readineſs, in caſe they ſhould be ſurpriſed by the diſorder in the night, or at a diſtance from a phyſician."

It is ſufficient here to have ſtated theſe facts; we muſt leave the reader, who is anxious to learn the objections, which were urged againſt this practice, and the confutation of them, which Dr. Ruſh has added, to refer to his book.

With reſpect to the propriety of clearing the bowels at the commencement of *yellow fever*, by *cathartics*, the moſt experienced and intelligent practitioners agree, although they differ as to the extent to which this evacuation ſhould be carried. Dr. Hillary is ſatisfied with the uſe of a glyſter, or very gentle laxative; and Dr. Chiſholm is of opinion, that it is never neceſſary to excite a larger diſcharge by ſtool, than is barely ſufficient to remove the acrid and offenſive humours from the ſtomach and bowels; "and from the wonderful aptitude of the perſons of the ſick, in the malignant peſtilential fever, to ſink into an irremediable ſtate of debility, under alvine evacuation carried beyond this, I have conſidered it unjuſtifiable, in every reſpect, to adopt ſuch practice." It is probable, indeed, that the nature of the epidemic in the Weſt Indies was ſuch as to bear ſevere evacuation, even in its commencement, with leſs ſafety than the epidemic of Philadelphia. "Some practitioners in the Weſt Indies I find," ſays Dr. Chiſholm, "have adopted the plan of Dr. Ruſh, but by no means with the wonderful ſucceſs he has attributed to it. The hoſpitals have afforded, I fear, but too many proofs of its diſaſtrous conſequences in a hot climate. In the year 1796, at Fort Royal, where the malignant peſtilential fever was epidemic, many of the practitioners gave calomel and jalap in the manner recommended by Dr. Ruſh, and conſequently excited a moſt profuſe diſcharge. The event was, however, very different from the ſtatement of Dr. Ruſh; for the mortality among the inhabitants was very great; ſome ſhips were entirely ſtripped of their crews, and many loſt more than one half. I am well aſſured, that five out of ſix periſhed on this occaſion of the whole ſeized with this dreadful malady. A hypercatharſis was induced, under which the ſick immediately ſunk." (Vol. i. p. 169.) Although the plan, which was ſucceſsful in North America, might be too violent within the tropics, when carried to the ſame extent, it would ſeem, however, that the *principle* was uſefully applied, and that Dr. Chiſholm himſelf, notwithſtanding his favourite object of exciting mercurial action in the ſyſtem, adopted the principle in a great meaſure. His firſt practice conſiſted of clearing the bowels by neutral ſalts and antimony; on the re-appearance of the diſeaſe, in 1794, he gave calomel alone, "repeating it till the inteſtinal canal was cleared of its contents;" and he afterwards increaſed its activity by the addition of jalap, or any other purgative medicine of quick operative effect. "The great rule, in ſhort," he affirms, "is to empty the inteſtinal canal as ſpeedily and as completely as poſſible, ſo as to prepare it for the reception and abſorption of mercury." Whatever be the mode of *reaſoning* on the ſubject, it is obvious that, in point of *fact*, this practice is eſſentially the ſame, except in degree and extent, with that of Dr. Ruſh; and we may therefore conclude, that *purging*, in the attack of *yellow fever*, has been found the moſt efficient remedy that has hitherto been employed.

Dr. Chiſholm, however, adminiſters the calomel with a view to its influence on the conſtitution as a mercurial, not merely as an evacuant; but it is obvious that, in the quantity in which he employs it, it muſt produce conſiderable evacuation in general. "My mode of uſing the *calomel*," he ſays, "after the re-appearance of the malignant peſtilential fever in 1794, was to give *ten grains*, either alone, or with an equal or a double quantity of *jalap*, to an adult patient as ſoon as poſſible after I ſaw him. This generally acts as an evacuant in the degree required, about an hour or two after it is given. At the end of three hours I repeated the doſe of calomel. At the end of three hours more, the ſame quantity is given, adding opium or not, as the preceding doſes have acted. In this manner ten grains of calomel were given every three hours, till the ſalivary glands became affected, which generally happened in leſs than twenty-four hours from the commencement of the treatment, if it was faithfully conducted. The effect of the medicine, given in this manner, may be perceived after the third doſe in general; the patient becoming calmer, leſs reſtleſs, leſs anxious; his ſkin being ſofter, and poſſeſſed of an agreeable heat; the ſtomach being perfectly retentive, however irritable it might have been before; and the eyes recovering their former luſtre and ſenſibility. When at length ſalivation takes place, the patient is left free from diſeaſe, with a moderate warm moiſture on his ſkin; and very ſoon after ſigns of returning health are indicated by calls for food, &c. The recovery of ſtrength is proportionally rapid to that from diſeaſe; nor is it at all neceſſary to have recourſe to bark, or any other medicine whatever; a circumſtance truly gratifying both to the patient and the phyſician, in a diſeaſe wherein nature revolts at the very idea of it. There are circumſtances, however," Dr. Chiſholm candidly adds, "in which the utmoſt difficulty is experienced in obtaining this effect from calomel; and others in which the candid practitioner muſt acknowledge its inſufficiency." (Loc. cit. vol. i p. 253.) Dr. Chiſholm declares, that the ſucceſs attending this practice exceeded his moſt ſanguine expectation; "ſo great, indeed, was it, that I did not loſe a ſingle patient in whoſe caſe it was puſhed to the full extent:" (ibid. p. 352.)

In the ſubſequent occurrences of the epidemic in Philadelphia, *viz.* in 1794, 5, and 7, Dr. Ruſh employed the mercurial remedies, ſo as to produce *ſalivation*, with great advantage. He endeavoured to excite it early in all thoſe caſes which did not yield immediately to bleeding and purging. "I was delighted," he ſays, "with its effects in every caſe in which I uſed it. Theſe effects were as follow: 1. It immediately attracted and concentrated in the mouth all the ſcattered pains of every part of the body. 2. It checked a nauſea and vomiting. 3. It gradually, when it was copious, reduced the pulſe, and thereby prevented the neceſſity of further bleeding or purging. I wiſh it were poſſible to render the uſe of this remedy univerſal in the treatment of malignant fevers. It is a rare occurrence for a patient, that has been ſufficiently bled and purged, to die after a ſalivation takes place." "I loſt but two patients in our late epidemic in whom the mercury excited a ſalivation. One of them died from the want of nurſing; the other by the late application of the remedy." (See Ruſh's Medical Inquiries and Obſ. vol. iv. p. 93, and vol. v p. 117.)

The good effects of *purging* and of *ſalivation*, ſpeedily excited in the *yellow fever*, appear, then, to reſt upon ſtrong evidence; for beſides their perſonal experience, both Dr. Ruſh and Dr. Chiſholm have adduced the teſtimony of ſeveral other practitioners, in whoſe hands the adminiſtration of theſe remedies was attended with a ſimilar ſucceſs.

The evidence, with reſpect to the advantages of *blood-letting*, is ſomewhat more contradictory: Dr. Ruſh, and ſeveral other phyſicians of Philadelphia, conjoined bleeding with the purging plan, and their ſucceſs is ſtated to have been generally great. Dr. Ruſh affirms that "blood-letting, when uſed early on the firſt day, frequently ſtrangled the diſeaſe in its birth, and generally rendered it more light, and the convaleſcence more ſpeedy and perfect." But he admits that where it "had been omitted for three days, in acute caſes, it was ſeldom uſeful;" nay, he even ſays, "I am not ſure that it ever ſhortened the duration of the fever, where it was not uſed within a few hours from the time of its attack." (Med. Inq. and Obſ. vol. iii. p. 266 & 7.) Yet he mentions numerous inſtances in which the benefit was moſt decided, and has deſcribed at length the obvious advantages which generally reſulted from it. He does not however recommend it indiſcriminately; the repetition of the operation, and the quantity of the blood to be drawn, muſt be regulated by the obſervation of the phyſician. Dr. Chiſholm conſidered the evacuation as invariably pernicious in the yellow fever of the Weſt Indies in his firſt publication. In his ſecond, he ſays, "with a trifling modification, it is the opinion I now hold, after again ſeeing the diſeaſe, and after becoming acquainted with the ſentiments on it of the moſt judicious Weſt India practitioners, I am ſatisfied, that when it is poſſible to ſee the ſick in this diſeaſe at the period of its acceſſion; that when theſe are young robuſt men, immediately from England, or any other country poſſeſſing a ſimilar climate; that when the temperature of the weather is ſuch as ſeems moſt to favour the propagation of the diſeaſe; and that, when the prediſpoſing cauſes have been ſuch as have a tendency to accelerate the motion of the fluids and to give riſe to other unequivocal ſigns of an inflammatory diſpoſition; then one plentiful bleeding may, undoubtedly, be of infinite ſervice. But when moſt of theſe circumſtances are abſent; and when, conſequently, no juſt indication for the employment of this remedy can be formed, I conſider the uſe of it as a wanton abuſe of confidence, and as inevitable deſtruction to the patient. This obſervation may be extended to the yellow remittent fever without limitation; for in it the means of unqualified depletion are fully as pernicious as thoſe of repletion, or thoſe which ſerve to maintain or augment the vigour and tone of the body." He attributes the freedom of Dr. Ruſh's practice to the difference of climate, the greater tendency to local inflammations, and the other circumſtances above mentioned. But the teſtimony of Dr. Jackſon, Dr. Moſeley, Dr. Pinckard, and others, tends to prove the ſalutary effects of *early* bleeding, even in the yellow fever of the Weſt Indies. (See Dr. Robert Jackſon on the Fevers of Jamaica, Drs. Moſeley and Pinckard, as before quoted.) It cannot be queſtioned, however, that, generally ſpeaking, this remedy is principally beneficial at the very onſet of the diſeaſe: and that when its vigour is abating the practice muſt be miſchievous, and accelerate the malignant ſymptoms. Dr. Ruſh admits, that even an active purgative, given after the *fifth* day, has been hurtful.

On the whole, it ſeems to be demonſtrable, that the treatment of the *yellow fever* has been moſt ſucceſsfully conducted upon the principles which we have laid down for the cure of *fever* in general; namely, by a ſteady ſyſtem of withdrawing all ſtimuli, internal and external, at the commencement, *i. e.* by the antiphlogiſtic plan, purſued with a vigour proportionate to the violence and fatality of the diſeaſe: and that ſtimulants and cordials are pernicious, if given early, and nearly unneceſſary at the later periods, where the proper evacuations have been adopted in the beginning.

For the ſame reaſon which ſuggeſts the propriety of diminiſhing internal ſtimuli by evacuations, the *diet* muſt be light and liquid, and the *drink* cold and diluent. All ſolid animal food is to be forbidden for many days after the intire cure of the fever; as the indulgence of the appetite too ſuddenly in that way is the cauſe of numerous relapſes. A weak vegetable diet, with fruits, ſhould be ſtrictly adhered to. The drink ſhould be thin and diluent; ſuch as cold water, toaſt and water, lemonade, tamarind or raw apple-water, or weak balm and camomile tea, where the ſtomach is affected with ſickneſs. The ſubacid drinks were preferred in moſt caſes, Dr. Ruſh ſays, as being not only moſt agreeable to the taſte, but becauſe they tended to correct, by mixture, the acrid qualities of the bile. All theſe drinks may be taken in the early ſtage of the diſorder. In the convaleſcent ſtage of the fever, and in ſuch of its remiſſions, or intermiſſions, as are accompanied by great langour in the pulſe, wine whey, porter and water, and brandy and water, may be taken with advantage.

Upon the ſame principle of withdrawing ſtimulus and irritation, *cool freſh air*, and cleanlineſs, are very beneficial. Cool air is equally proper, Dr. Ruſh obſerves, whether the arterial ſyſtem is depreſſed, or whether it ſhewed in the pulſe a high degeee of morbid excitement; and is only improper where a chillineſs attends the diſeaſe.

Cold bathing, or affuſion of cold water upon the ſkin in the hot ſtage of the yellow fever, has been found extremely beneficial; Dr. Ruſh found its employment advantageous under the ſame circumſtances as Dr. Currie recommended it. (See COLD, and FEVER above.) Dr. Chiſholm and Dr. Jackſon affirm that the cold affuſion is moſt effectually uſed in a manner ſomewhat ſimilar to the practice of the American Indians, and of the Ruſſians, *viz.* by a ſucceſſion of alternate warm and cold bathing. The patient being firſt immerſed in a warm bath, and then removed, while the ſenſation of the heat is ſtill upon him, a bucket of cold water is thrown over his naked body. Dr. Jackſon recommends this practice after evacuation by blood-letting has been employed, and Dr. Chiſholm affirms that evacuating medicines are advantageouſly uſed at the ſame time. The local applications of cold have been often very ſucceſsful in removing local ſymptoms, ſuch as head-ache, delirium, irritability of ſtomach, &c. Cold water, or a ſolution of ſalts, ſuch as the muriate of ammonia, or of ſoda, applied by means of cloths repeatedly ſoaked in them to the head, and pit of the ſtomach, have often quieted exceſſive action in thoſe parts, and thus afforded material relief. Cold water injected into the bowels by way of clyſter has produced ſimilar reſults; and bathing the feet in cold water has frequently had the agreeable effect of relieving the head, the oppreſſion at the præcordia, and the general heat. Dr. Ruſh affirms that cold water thus applied to the feet very certainly diminiſhes the frequency of the pulſe, and mentions an experiment, in which the pulſe, in the courſe of a few minutes, was reduced 24 ſtrokes, and became ſo weak as hardly to be perceptible. (Loc. cit. vol. iii. p. 288.—Chiſholm, vol. i. p. 390.)

With regard to the employment of *bliſters* in the yellow fever there is the ſame contradiction of ſentiment, as to their uſe, among the phyſicians of our climate in fevers in general. Dr. Chiſholm, both upon his own obſervation and the teſtimony of others, affirms that bliſters were never of any uſe, at any period of the diſeaſe, or to whatever part of the body they were applied, not even in relieving head-ache, or other local ſymptoms; while Dr. Ruſh, like Dr. Lind, conſiders them of great ſervice, when applied to any part of the body, but particularly to the crown of the head. In his ſubſequent publications, however, he expreſſes himſelf rather leſs favourably of their utility, and limits their good effects to a particular juncture, which he calls the *bliſtering point*, and which, in bilious fevers, he ſays, is generally circumſcribed within eight and forty hours; for "when applied in a ſtate of great arterial action, they do harm: when applied after that action has nearly ceaſed, they do little or no ſervice." (See Med. Inq. and Obſ. vol. iii. p. 291. iv. 95. and v. 122.) We are very ſceptical as to the operation of bliſters in fever, except in relieving local congeſtion.

After the reduction of the morbid action of the blood-veſſels, by means of the remedies which have been mentioned, no other tonic is neceſſary than a nouriſhing and gently ſtimulating diet, and change of air. The beſt authors coincide in ſtating that, contrary to what occurs in moſt febrile diſeaſes, bark and wine were not only uſeleſs or abſolutely hurtful, but were generally loathed and rejected by the convaleſcents. The diet which is generally moſt agreeable to the palate, as well as the lighteſt and moſt nouriſhing, conſiſts of ſago, panada, and arrow root, prepared with Madeira wine, and ſpice, with oyſters, eggs, and malt liquors, which the patients reliſh greatly. The convaleſcence from the yellow fever is generally rapid, but in ſome caſes it is very ſlow. As long as the patient remained in the infected room or houſe, Dr. Chiſholm remarks, although all the ſymptoms of the diſeaſe had diſappeared, the progreſs of his recovery was remarkably ſlow, and more eſpecially when bark had been employed in the treatment, without the previous uſe of deobſtruents, and the appropriate antiphlogiſtic. A change of air and ſituation became adviſeable from the moment that ſigns of convaleſcence appeared ; and the purer the atmoſphere, and the more elevated the ſituation to which the patient was removed, the more rapid was his acquiſition of ſtrength.

Prevention of Yellow Fever.—As thoſe perſons, who were in the higheſt ſtrength and vigour of health, and who were not relaxed and enfeebled by long reſidence in hot climates, or by a low diet, were the moſt frequently attacked by the *yellow fever*, when it was epidemic, both in the Weſt Indies and in America ; ſo a ſyſtem of diet and regimen, which was conducive to a diminution of plethora, was the moſt effectual means of preſerving individuals from being attacked by the diſeaſe. Dr. Ruſh recommended his fellow citizens to reduce their diet during the prevalence of the epidemic. He lived ſparingly himſelf upon tea, coffee, milk, and the common fruits, and garden vegetables of the ſeaſon, with a ſmall quantity of ſalted meat and ſmoaked herring. His drinks were milk and water, weak claret and water, and weak porter and water. "I ſheltered myſelf," he ſays, "as much as poſſible from the rays of the ſun, and from the action of the evening air, and accommodated my dreſs to the changes in the temperature of the atmoſphere. By ſimilar means, I have reaſon to believe many hundreds eſcaped the diſeaſe who were conſtantly expoſed to it. There appears to be no combination of climate and miaſmata that can reſiſt the good effects of abſtinence or depleting medicines, in preventing or moderating an attack of this fever." (Med. Inq. and Obſ. vol. v. p. 39.) He recommended alſo to the people, beſides a diet of milk and vegetables, cooling purges to be taken once or twice a week, and moderate blood-letting to all ſuch as were of a plethoric habit : and he adviſed them to avoid heat, cold, labour, and every thing elſe that could excite the contagion (which he knew to be preſent in all their bodies) into action. (Ibid. vol. iii. p. 295—297.) The advice of Celſus, during the prevalence of peſtilence, is very comprehenſive ; "vitare fatigationem, cruditatem, frigus, calorem, libidinem, multoque magis ſe continere." But it is a mortifying conſideration, Dr. Chiſholm remarks, that few of our countrymen can be prevailed upon to ſubmit to the deprivation of any gratification ; which, if within their ability to purchaſe, is very generally and very pertinaciouſly reſorted to. The comparative ſecurity from, and leſs mortality of, the yellow fever in the French and Spaniſh than in the Engliſh iſlands in the Weſt Indies, have been juſtly attributed to the more temperate habit of the people. When the peſtilential fever raged at Grenada, Dr. Chiſholm obſerves that the French inhabitants remained almoſt totally exempt from it. Among them, animal food and ſtrong liquors were very moderately uſed ; their diet being chiefly compoſed of vegetables, and ſmall acid red wine. The ſame author, indeed, remarks, "during the prevalence of peſtilence, I am inclined to think, from a variety of facts, that abſtinence from every ſpecies of ſtrong liquor, wine itſelf not excepted, is more conducive to the maintenance of health, than any other dietetic regulation whatever. It is an eſtabliſhed fact, that water-drinkers either eſcaped the malignant peſtilential fever altogether, or had the diſeaſe in a remarkably mild degree. On the other hand, many inſtances occurred of free livers receiving the infection in the morning, and having the attack of the fever after a plentiful repaſt of animal food and wine in the following night." (Chiſholm, loc. cit. vol. ii. p. 49.) In ſhort, the fact, that extreme temperance, and even evacuations in thoſe that are plethoric, when in hot climates, is the moſt certain to eſcape the diſeaſes peculiar to thoſe countries, and eſpecially the *ſeaſoning*, or yellow fever, is now aſcertained beyond all queſtion. Dr. Moſeley ſays, "the Engliſh drink more wine and ſpirits than the French : the French more than the Spaniards ; and *we calculate the mortality of each by this rule.* The Spaniards live to great ages in the plains of St. Jacques, &c. in St. Domingo, partly from the ſalubrity of the air, but chiefly from their ſobriety." (On Tropical Diſeaſes, p. 53.) And he affirms, that, while the inflammatory diatheſis of the body remains, (as it will with ſome people, who migrate to hot climates, for many years,) "thoſe who uſe water for their common drink, will never be ſubject to troubleſome nor dangerous diſeaſes." (Ibid. p. 51.)

The queſtion relative to the contagious or non-contagious nature of the *yellow fever*, above noticed, is not a matter of mere curioſity and ſpeculation, but of the greateſt practical importance, with a view both to individual and to public ſafety. The means to be adopted for the prevention of the ſpreading of the epidemic muſt neceſſarily be very different, if it ariſe from imported contagion, and if it be of domeſtic origin. Thoſe means which afford ſecurity in either caſe muſt be uſeleſs, and therefore virtually detrimental in the other. Should the fever be the reſult of imported contagion in its origin, the uſual methods of quarantine, and fumigation, &c. of goods, ſhips, and perſons, muſt be reſorted to. (See CONTAGION, PLAGUE, and QUARANTINE.) But the beſt writers attribute the *yellow fever* to the miaſmata and putrid exhalations from various domeſtic ſources ; and we have underſtood that by diminiſhing theſe ſources of the peſtilence, Philadelphia has been much leſs ſubject to its occurrence in the uſual ſeaſon. In the memoir of the thirteen phyſicians above alluded to, the governor of Pennſylvania is informed, and the information is ſupported by accompanying documents, that the epidemic fever was derived from the following circumſtances, which are ſtated more in detail by Dr. Caldwell. Theſe are, 1. Putrid exhalations from the docks and wharfs, the ſtreets, ſewers, gutters, cellars, privies, dirty yards and alleys, ponds, and collections of filth in the neighbourhood of the city ; and alſo 2. The foul and noxious air emitted from the holds of ſhips. Of the origin of theſe fevers from the putrid exhalations, ariſing within and around Philadelphia, Dr. Caldwell and others have ſtated much evidence ; (ſee Med. & Phyſ. Memoirs, containing, among other ſubjects, a particular Inquiry into the Origin and Nature of the late Peſtilential Epidemics of the United States. By C. Caldwell, M. D. Philadelphia, 1801,) and the correctneſs of attributing the origin of theſe fevers to ſuch cauſes, is farther ſtrengthened by our knowledge of the connection of remittent and peſtilental fevers in London,

don, and the other large cities of Europe, in ſimilar ſeaſons, with a filthy condition of the ſtreets and houſes, and a bad arrangement of the ſewers, gutters, &c. See EPIDEMIC. (See alſo Dr. Heberden, jun. on the Increaſe and Decreaſe of Diſ. Lond. 1801, and the Annual Med. Regiſter, vol. i. for 1808.) With reſpect to the ſecond ſource of fevers, *viz.* the foul air of ſhips, Dr. Ruſh has adduced ſome ſtrong evidence of its occurrence in ſhips, containing eſpecially vegetable matters in a ſtate of putrefaction. In 1797 the yellow fever firſt appeared on board a veſſel at one of the wharfs, and in the neighbourhood, affecting a great number of perſons at the ſame time: this ſhip had in her hold a quantity of prunes, almonds, olives, capers, &c., in a putrid ſtate, and emitted a moſt offenſive ſmell, after ſhe had diſcharged her cargo, which was perceived by perſons ſeveral hundred yards from the wharf where ſhe was moored. At Tortola, Dr. Ruſh ſtates, a fever was produced, in June 1787, from noxious air generated from a few buſhels of potatoes, which deſtroyed the captain, mate, and moſt of the crew in a few days. Some rotted bags of pepper on board a French Indiaman produced the yellow fever, in June 1793, at Bridgetown: "all the white men, and moſt of the negroes, employed in removing this pepper, periſhed with the yellow fever, and the foul atmoſphere affected the town," where it proved fatal to many of the inhabitants. Several other facts, of a ſimilar nature, are mentioned, and Dr. Ruſh adds, that this ſource of yellow fever in warm climates is ſo well known, and ſo generally admitted, that Dr. Shannon, a late writer, in enumerating its various cauſes, expreſsly mentions "the putrid effluvia of a ſhip's hold." Theſe facts not only lead to the certain means of preventing one of the ſources of the yellow fever, but ſerve to explain the reaſons why ſailors are ſo often its firſt victims, and why, from this circumſtance, the origin of the diſeaſe has been ſo haſtily aſcribed ſolely to importation.

Under theſe impreſſions as to the origin of the yellow fever, Dr. Ruſh, Dr. Caldwell, and the others who addreſſed the governor of Pennſylvania, recommended the following means of prevention, 1. A continuance of the laws for preventing the importation of the diſeaſe from the Weſt Indies, and other parts of the world where it uſually prevails. 2. A removal of all thoſe matters from the ſtreets, gutters, cellars, gardens, yards, ſtores, vaults, ponds, &c. which, by putrefaction in warm weather, afford the moſt frequent remote cauſe of the diſeaſe in America. 3. "We moſt earneſtly recommend the frequent waſhing of all impure parts of the city in warm and dry weather; a meaſure which we conceive promiſes to our citizens the moſt durable exemption from bilious fevers of all kinds, of domeſtic origin. 4. To guard againſt the frequent ſource of yellow fever from the noxious air of the holds of ſhips, we recommend the unlading all ſhips, with cargoes liable to putrefaction, at a diſtance from the city, during the months of June, July, Auguſt, September, and October. To prevent the generation of noxious air in the ſhips, we conceive every veſſel ſhould be obliged by law to carry and uſe a ventilator, &c." They add, "It has been by adopting meaſures, ſimilar to thoſe we have delivered for preventing peſtilential diſeaſes, that moſt of the cities in Europe, which are ſituated in warm latitudes, have become healthy in warm ſeaſons, and amidſt the cloſeſt commercial intercourſe with nations and iſlands, conſtantly afflicted with thoſe diſeaſes. The extraordinary cleanlineſs of the Hollanders was originally impoſed upon them, by the frequency of peſtilential fevers in their cities. This habit of cleanlineſs has continued to characterize thoſe people, after the cauſes which produced it have probably ceaſed to be known." (Ruſh, Med. Inq. & Obſ. vol. v. p. 54, *et ſeq.* Caldwell, loc. cit. Chiſholm, vol. ii. chap. 1.)

Beſides the denominations of fever above explained, ſeveral others are to be found, eſpecially among the older medical writers, which, however, require no notice here, as they are improperly applied, and are not uſed at preſent. Such are *arthritic, aſthmatic, hyſteric, chlorotic, ſcorbutic, fever,* &c. See ARTHRITIS, ASTHMA, HYSTERIA, &c.

FEVER-WARD, *Fever-houſe*, or *Fever-hoſpital*, wards or houſes ſet apart for the reception of *typhus*, or contagious fever.

The country is indebted to Dr. Haygarth, formerly of Cheſter, now of Bath, (1809,) for the ſuggeſtion of theſe admirable inſtitutions. It had been obſerved by Dr. Lind of the Haſlar hoſpital, that the infectious diſtance of common contagious fever was ſmall; or, in other words, that the effluvia from the bodies of perſons labouring under *typhus* were incapable of infecting thoſe in health, at a greater diſtance than a few feet, and that in a pure atmoſphere, or well ventilated room, the effluvia were ſo much diluted and weakened, as to be no longer capable of communicating the diſeaſe. Hence the inference, which Dr. Haygarth proved by the teſt of experiment, that by ſeparating thoſe perſons, labouring under contagious fever, from others in the ſame hoſpital, or by appropriating wards to this diſeaſe, the contagion might be prevented from ſpreading in theſe crowded receptacles of the ſick; and ſecondly, that by having ſuch wards, or ſeparate hoſpitals, for the reception of fever, conſtantly open for the admiſſion of patients, eſpecially in crowded towns, or in epidemic ſeaſons, whole families might be at once preſerved from the contagion by the removal of the firſt perſon infected into them; and that thus the contagion of typhus might be exterminated. Upon this principle, ſuch fever-wards were opened in the hoſpital at Cheſter, and in that of Liverpool, and ſubſequently ſeparate hoſpitals have been eſtabliſhed in many of the large towns in England and Ireland; firſt at Mancheſter, then at Cork, Waterford, Dublin, Leeds, London, &c. Theſe were happily named, we believe by Dr. Ferriar of Mancheſter, "Houſes of Recovery;" a denomination conveying leſs alarm to the prejudiced and ignorant, than that of peſt-houſe, or fever-houſe, and by which they are now generally deſignated. Theſe inſtitutions are not only calculated to preſerve the crowded population of large towns from the fatal effects of epidemic fevers, but to diffuſe the maxims of cleanlineſs and ventilation, which are inculcated in the habitations of the poor, whence patients are removed; and alſo to diſprove thoſe falſe and pernicious notions, reſpecting the general diffuſion of contagion in the air, which are too widely prevalent even among the unlearned part, *i. e.* the majority of the profeſſion. See HOUSE *of Recovery*; under which head we ſhall ſtate more fully the principles upon which theſe inſtitutions have been eſtabliſhed, as well as the ſucceſsful reſult of their practice, and the regulations under which they are conducted. (See alſo CONTAGION.) Haygarth on the ſmall-pox, and his Letter to Dr. Percival reſpecting the ſuppreſſion of contagion.—An excellent Collection of Papers on the ſubject of a ſimilar eſtabliſhment at Newcaſtle. Alſo Dr. Ferriar's Med. Hiſtories and Reflections. The Reports of the Houſe of Recovery at Dublin, Cork, London, &c.

FEVER, in the *Veterinary Science*, is a diſorder to which horſes are very ſubject from a variety of cauſes. The ſymptoms which denote the horſe to be afflicted with a fever are great reſtleſſneſs, by reaſon of which he ranges from one end of the rack to another, beating of the flanks, redneſs and inflammation of the eyes, a parched and dry tongue; his breath is hot, and of a ſtrong ſmell; he loſes his appetite, and nibbles his hay without chewing it, and is frequently ſmelling to the ground; he dungs often, but little at a time; and his dung is uſually hard, and in ſmall pieces; he ſometimes ſtales with difficulty, and his urine is highly coloured; he is always craving for water, and drinks often, but little at a time; and his pulſe beats full and hard, fifty ſtrokes and more in a minute. The firſt part of the cure is bleeding; and the quantity, if the horſe is ſtrong and in good condition, ſhould be two or three quarts: then give him four times a day a pint of the following infuſion; take baum, ſage, and camomile flowers, each a handful; an ounce of liquorice root, ſliced, and three ounces of nitre; and pour on theſe ingredients two quarts of boiling water: when cold, ſtrain it off, and ſqueeze into it the juice of two or three lemons, and ſweeten it with honey; or an ounce of nitre mixed into a ball with honey may be given thrice a day inſtead of the drink, and waſhed down with any ſmall liquor. The horſe's diet ſhould be ſcalded bran in ſmall quantities, or dry bran ſprinkled with water, or a handful of picked hay may be put into his rack. His water ſhould be a little warmed, and given to him often and in ſmall quantities; his covering ſhould be moderate. If the horſe refuſes to feed, in a day or two more blood ſhould be taken away, and the drinks continued, to which may be added two or three drams of ſaffron. If his dung continues hard and knotty, a clyſter may be given, prepared by boiling two handfuls of marſhmallows, one of camomile flowers, and an ounce of fennel-ſeed, in three quarts of water, till it be reduced to two, and adding to the ſtrained liquor four ounces of treacle and a pint of linſeed oil or any common oil. This clyſter ſhould be repeated every other day; and on the intermediate day the following drink may be given: take of cream of tartar and of Glauber's ſalts, of each four ounces; diſſolve them in barley-water, and add an ounce or two of lenitive electuary, or a dram or two of powder of jalap. By purſuing this treatment the horſe will begin to recover; and nothing more will be found neceſſary than to give him gentle exerciſe in the air, and plenty of clean litter in the ſtable.

There is another fever to which horſes are ſubject, more dangerous than the former: this is a ſlow fever attended with great depreſſion; the horſe is ſometimes inwardly hot and outwardly cold, and at other times hot all over; his eyes appear moiſt and languid; his mouth is continually moiſt, ſo that he has no inclination to drink, and he is ſatisfied with very little. He eats little, moves his jaws in a feeble looſe manner, and grates his teeth; his body is commonly open, his dung ſoft and moiſt; his ſtaling irregular, ſometimes little, and at other times profuſe, and his urine pale, with little or no ſediment. Theſe fevers are attended with a running at the noſe, and the matter diſcharged is of a reddiſh or greeniſh duſky colour, and of a conſiſtence like glue. About three pints of blood ſhould be firſt taken away, and bleeding repeated according to the ſtrength and fulneſs of the horſe, the degree of his cough, or any tendency to inflammation. After this the nitre drink already preſcribed may be given, with the addition of an ounce of ſnake-root, and three drams of ſaffron and camphor diſſolved in a little ſpirit of wine.

The horſe's diet ſhould be ſcalded or ſprinkled bran, and the beſt hay, with which he ſhould be fed by hand, as he ſometimes cannot lift up his head to the rack. Drinking plentifully will greatly contribute to dilute the blood; but if the fever ſhould increaſe, balls of contrayerva root, myrrh, and ſnake-root, powdered, of each two drams; ſaffron, one dram; mithridate or Venice treacle, half an ounce, mixed with honey, ſhould be immediately given twice or thrice a day, with two or three horns of infuſion of ſnake root ſweetened with honey; to a pint and a half of which may be added half a pint of treacle water or vinegar; if theſe balls produce no ſenſible effect, let a dram of camphor or caſtor be added to each of them; or the following drink may be ſubſtituted in their ſtead for ſome days: take a dram of camphor diſſolved in one ounce of rectified ſpirit of wine; then gradually pour on a pint of diſtilled vinegar warmed, and give it at two doſes. If the horſe ſhould be coſtive, recourſe muſt be had to clyſters or the opening drink; and if he purges to a conſiderable degree, diaſcordium may be added to his drinks inſtead of the mithridate. The operation of medicines in this diſeaſe is much promoted by plentiful drinking; the horſe's ſtaling ſhould be reſtrained when it is conſiderable and weakening, by proper aſtringents, or by mixing lime-water with his drinks; and when he is remiſs in this reſpect, and ſtales ſo little as to occaſion a ſwelling of his body and legs, two or three of the following balls may be given at proper intervals, with a decoction of marſhmallows ſweetened with honey: take of ſal prunella or nitre, one ounce; juniper-berries and Venice turpentine, of each half an ounce; and make theſe ingredients into a ball with oil of amber. If with this treatment the horſe's ſkin feels kindly, his ears and feet are moderately warm, his eyes briſk and lively, his noſe becomes clean and dry, his appetite increaſes, he lies down well, and ſtales and dungs regularly, there is a fair proſpect of a ſpeedy recovery; but he ſhould be fed ſparingly, and his diet ſhould be light, and increaſed by degrees as he gains ſtrength.

If the fever ſhould intermit, give an ounce of Jeſuit's bark in the interval of the fits, and repeat it every ſix hours till the horſe has taken four or ſix ounces. (Bartlet's Farriery, and Farmer's Dictionary.)

Mr. White, in his "Compendium of the Veterinary Art," diſtinguiſhes only two kinds of fever, the one, an idiopathic or original diſeaſe, and termed *ſimple*; the other dependent upon external inflammation, and juſtly denominated *ſymptomatic* fever. The former does not occur ſo frequently as the latter, nor is it by any means ſo formidable in its appearance. The ſymptoms are ſhivering, ſucceeded by loſs of appetite, dejected appearance, quick pulſe, hot mouth, and ſome degree of debility; the horſe is generally coſtive, and voids his urine with difficulty. The diſeaſe is alſo often accompanied with quickneſs of breathing, and in a few caſes with pain in the bowels, or ſymptoms of colic. As ſoon as a horſe is attacked with this diſeaſe, Mr. White adviſes, that he ſhould be bled freely; and in caſe of coſtiveneſs, to give a pint of caſtor oil, or the oil of olives, and to inject a clyſter of warm water-gruel. The following drink he has found to be a very uſeful laxative; take of Barbadoes aloes powdered, 3 drams, prepared kali $1\frac{1}{2}$ dram, caſtor oil 4 oz. to 6 oz. ſimple mint-water and pure water, of each, 4 oz.; theſe ingredients ſhould be mixed and will ſerve for one doſe. After the operation of the laxative, the fever powder is to be given once in twelve hours, and continued until it has produced conſiderable diuretic effect. Mr. White has given ſeveral formulæ for preparing this powder, *e. g.* 1. Powdered nitre, 1 oz. and camphor, and tartarized antimony, of each, 2 drams; or, 2. Powdered nitre, 1 oz. and unwaſhed calx of antimony, 2 drams; or, 3. Antimonial powder, 3 drams, and camphor, 1 dram; either of theſe to be mixed for one doſe. Warm water and maſhes are to be adminiſtered frequently in ſmall quantities, warm cloathing, frequent hand-rubbing, and a liberal allowance of litter are alſo neceſſary. And when the fever runs high, it is adviſeable to inſert rowels about the cheſt and belly, in order to prevent the recurrence of internal inflammation. When the diſeaſe appears to be going off, the horſe looking more lively, and his appetite returning, let him be led out for a ſhort time in ſome warm ſituation, and give now and then a malt maſh for recovering his ſtrength.

The *ſymptomatic* fever is generally occaſioned by high feeding, cloſe ſtables, and want of proper exerciſe; in ſome caſes it is cauſed by a ſudden tranſition from a cold to a hot temperature. This kind of fever is not preceded by ſhivering, like the ſimple fever; nor is it ſo ſudden in its attacks, except when it is occaſioned by great and long continued exertion. In this caſe the complaint aſſumes a very dangerous appearance in its earlieſt ſtage. The ſymptoms which this fever has in common with the ſimple fever, are loſs of appetite, quick pulſe, dejected appearance, hot mouth, and debility; and if to theſe be joined difficulty of breathing, and quick working of the flanks, with coldneſs of the legs and ears, the cauſe of it may be concluded to be an inflammation of the lungs. If the horſe hang down his head in the manger, or lean back upon his collar with the appearance of drowſineſs, the eyes appearing watery and inflamed, it is probable that the fever depends upon an accumulation of blood in the veſſels of the brain, and that the ſtaggers are approaching; in this caſe, however, the pulſe is not always quickened, but ſometimes has been found unuſually ſlow. When the ſymptoms of fever are joined with a yellowneſs of the eyes and mouth, an inflammation of the liver is indicated. If an inflammation of the bowels be the cauſe, the horſe is violently griped. An inflammation of the kidnies will alſo produce fever, and is diſtinguiſhed by a ſuppreſſion of urine, and an inability to bear preſſure upon the loins. When the fever ariſes from inflammation of the bladder, the horſe is frequently ſtaling, voiding only very ſmall quantities of urine, with conſiderable pain. Extenſive wounds, and particularly thoſe of joints, will alſo produce ſymptomatic fever. In all caſes of this kind, the eſſential remedies are copious and early bleeding, with rowels and bliſters. (See INFLAMMATION.) In caſes of ſymptomatic fever it will generally be neceſſary to take away four or five quarts of blood at the firſt bleeding; and even ſix quarts have been taken away with manifeſt advantage.

Some modern writers on farriery have deſcribed another kind of fever, termed putrid or typhus, in which bleeding is extremely injurious. On this ſubject Mr. White makes the following obſervations. The grand characteriſtic of fever he conceives to be an unuſually quick pulſe, *i. e.* from ſeventy to one hundred in a minute; a peculiar kind of ſenſation which it gives to the finger, as if it were ſtruck ſharply by the vibration of a cord; and at the ſame time a feebleneſs, or ſmallneſs, quite different from the gradual ſwell of the healthy pulſe. When a horſe labours under conſiderable debility, either from hard work, want of ſufficient food, or other cauſes, except fever, the pulſe is more or leſs languid or weak, ſometimes ſlower, and ſometimes a little quicker than uſual; nevertheleſs, it ſwells gradually, and does not give that ſenſation which phyſicians term "hardneſs," and which has been already deſcribed. Simple debility, or weakneſs, is diſtinguiſhed from fever by other circumſtances: the mouth and tongue are in their natural ſtate; the horſe readily ſweats; and when the weakneſs is conſiderable, the ears and hind legs will feel rather cold, and his flanks generally move quicker than uſual. If blood be drawn, it will be found very different from that of a horſe labouring under fever or inflammation. Though bleeding in ſuch caſes is extremely injurious, a mild laxative is uſeful, unleſs the dung be ſofter, and is more copious than natural; and if there be a deficiency of urine, or any difficulty in voiding it, a diuretic, compoſed of camphor and nitre, ſhould be given. After the laxative, tonics, with a nutritious diet, and good grooming or nurſing, generally reſtore the animal in a ſhort time to health. This diſeaſe is ſometimes miſtaken for fever, and treated improperly. Several caſes have occurred where debility ſucceeded the inflammatory commencement, and rendered bleeding, and ſometimes purging alſo, highly improper: and perhaps, ſays Mr. White, ſuch caſes have been miſtaken by ſome writers for the *typhus*, or low putrid fever; or others may have copied their deſcription of it from that given by authors on human diſeaſes. In caſes of ſimple debility, the following medicines have been found very beneficial, giving the laxative in the firſt place, if the horſe be coſtive, or even if the bowels be in a natural ſtate; during its operation, however, it is adviſeable to give ſtrong gruel inſtead of bran maſhes. The *laxative* is prepared by mixing, for one draught, Barbadoes aloes, 3 dr.; powdered canella, 1½ dr.; prepared kali, 1 dr.; and mint-water, 8 oz. The *tonic* is compoſed of yellow Peruvian bark, 6 dr.; caſcarilla, 1 dr.; powdered opium, ¼ dr.; prepared kali, 1 ſcr.; with ſyrup enough to form a ball for a doſe. It is often found neceſſary to increaſe the proportion of bark, and ſometimes of the other ingredients; but when the horſe becomes coſtive, the opium muſt be omitted, the moſt proper food on theſe occaſions is good ſweet oats, and the beſt hay, given frequently in ſmall quantities. The horſe ſhould be allowed to drink frequently, and his exerciſe ſhould be very moderate. If he become coſtive, a clyſter, or even a mild laxative, may be given.

FEVER, *Epidemic*, or *Diſtemper of Horſes*, generally appears in the form of a violent *catarrh*, or cold; the firſt ſymptoms are cough, heavineſs of the head, the eyes often watery, or a little inflamed; ſometimes there is a quickneſs of breathing: and the inflammation of the membrane which lines the noſe, throat, and windpipe, is often ſo conſiderable as to cauſe a difficulty in ſwallowing; and the pulſe is generally quicker than uſual. Without recurring to the proper remedies, weakneſs enſues, and conſiderable fever takes place; the appetite goes off; the cough and quickneſs of breathing increaſe, and debility is ſo great, that the animal ſtaggers in his walk. The noſe diſcharges offenſive matter; and after lingering for ſome time, the horſe dies from a conſumption.

When an epidemic happens, horſes ſhould be carefully watched; and on the firſt appearance of any ſymptoms of the diſeaſe, the animal ſhould be bled moderately, unleſs he is in low condition, or previouſly exhauſted by hard work, old age, or unwholeſome food. After bleeding, give the following laxative, *viz.* Barbadoes aloes, 2 dr.; tartarized antimony, 1 dr.; firſt mixed with about four oz. of warm water, and then add 4 oz. of caſtor oil; the whole to be given as a doſe: let the horſe's diet conſiſt of bran maſhes, ſweet hay, and a very ſmall quantity of oats. A relapſe ſhould be prevented by good nurſing, and giving every day a doſe of ſome antimonial preparation, of which, that which reſembles Dr. James's fever powder is the beſt. But when the inflammatory ſymptoms are at firſt violent, when there is a quickneſs of breathing, ſoreneſs of the throat, and diſtreſſing cough, a bliſter to the throat is neceſſary; and unleſs weakneſs forbids, bleeding even to three quarts is proper. A laxative is always beneficial at firſt, if the bowels be not too open; after which, the antimonials with nitre is to be given daily. Warm cloathing, and frequent hand-rubbing to the legs, are uſeful; but a cloſe ſtable is injurious. The horſe ſhould be turned looſe into a large ſtall; and if a diſcharge from the noſe appear, let it be encouraged by cauſing the vapour of warm water to paſs through the noſtrils, and cloathing the head and ears. When the diſeaſe, from being neglected, or improperly treated at firſt, becomes alarming, and the weakneſs is conſiderable, nothing but tonic medicines and a nutritious diet can do any good.

Fever, in *Mythology*, one of the Roman divinities, who had a temple on Mount Palatine, mentioned by Cicero. Valerius Maximus ſays that ſhe had others, into which they carried the remedies uſed in diſeaſes. On one monument ſhe is called the "Holy Fever."

Fever-*Root*, in *Botany*. See Trioſteum.

Fever-*Weed*. See Eryngium.

FEVERFEW. See Matricaria.

Feverfew, *Baſtard*. See Parthenium.

Feverfew, in the *Materia Medica*, the parthenium of Dioſcorides, has been very generally employed ſince his time for medical purpoſes. In natural affinity it ranks with camomile and tanſy, and its ſenſible qualities ſhew it to be nearly allied to them in its medicinal character. According to Bergius its virtues are tonic, ſtomachic, reſolvent, and emmenagogue. It has been given ſucceſsfully as a vermifuge, and for the cure of intermittents; but its uſe is moſt celebrated in female diſorders, eſpecially in hyſteria: whence it is ſuppoſed to have derived the name "Matricaria." Its ſmell, taſte, and analyſis prove it to be a medicine of conſiderable activity: ſo that we may ſay with Murray, "Rarius hodie præſcribitur quam debetur."

The leaves and flowers communicate by infuſion their ſtrong ſmell and bitter taſte to water and rectified ſpirit. The watery infuſions, inſpiſſated, leave an extract of conſiderable bitterneſs, and which alſo diſcovers a ſaline matter both to the taſte and by throwing up to the ſurface ſmall cryſtalline effloreſcences in keeping: the peculiar flavour of the matricaria exhales in the evaporation, and impregnates the diſtilled water, on which alſo a quantity of eſſential oil is found floating. The quantity of ſpirituous extract, according to Cartheuſer's experiments, is only about $\frac{1}{6}$th the weight of the dry leaves, whereas the watery extract amounts to near one-half. Lewis. Woodville.

FEVERSHAM, in *Geography*. See Faverſham.

FEUGEROLLES, a town of France, in the department of the Rhône and Loire; 5 miles S. of St. Etienne.

FEUILLANS, in *Eccleſiaſtical Hiſtory*, an order of religious clothed in white, and going bare-foot, who live under the ſtrict obſervance of the rule of St. Bernard.

The name was occaſioned by a reform of the order of Bernardius, firſt made in the abbey of Feuillans, a village in France, five leagues diſtant from Thoulouſe, by the ſieur Barriere, who eſtabliſhed it about the year 1580.

It was approved of by pope Sixtus V. and the popes Clement VIII. and Paul V. granted it its particular ſuperiors. King Henry II. founded a convent of Feuillans in the Fauxbourgh St. Honoré at Paris in 1587.

There are alſo convents of nuns who follow the ſame reform, called Feuillantes; the firſt of which was eſtabliſhed near Thoulouſe in 1590.

FEUILLE *de Scie*, in *Heraldry*, expreſſes that an ordinary, as a feſſe, pale, or the like, is indented only on one ſide; becauſe it then looks like the leaf of a ſaw, as the French phraſe imports.

FEUILLEA, in *Botany*, named by Linnæus in honour of Father Louis Feuillée; ſee Feuillée. Linn. Gen. 523. Schreb. 690. Juſſ. 397. (Nhandiroba; Plum. Gen. t. 27.) Claſs and order, *Dioecia Pentandria*. Nat. Ord. *Cucurbitaceæ*? Juſſ.

Gen. Ch. Male, *Cal.* Perianth of one leaf, bell-ſhaped, rounded at the baſe, ſpreading in the upper part, cut half way down into five ſegments. *Cor.* of one petal, wheel-ſhaped; limb cut half way down into five convex, rounded ſegments; the centre cloſed with a double ſtar, whoſe rays are alternately longer and ſhorter, regarding the courſe of the ſun. *Stam.* Filaments five, awl-ſhaped; anthers two-lobed, roundiſh. There are five compreſſed incurved filaments, ranged alternately with the ſtamens.

Female, *Cal.* Perianth as in the male, but with the germen at its baſe. *Cor.* as in the male; the central ſtar furniſhed with five heart-ſhaped plates. *Piſt.* Germen inferior; ſtyles five, thread-ſhaped; ſtigmas heart-ſhaped. *Peric.* Berry very large, ovate, obtuſe, fleſhy, three-celled, with a woody coat, encompaſſed by the calyx. *Seeds* ſeveral, orbicular, compreſſed, oblique.

Eſſ. Ch. Male, Calyx five-cleft. Corolla five-cleft. Stamens five, with five alternate barren filaments.

Female, Cal. and Cor. as in the male. Styles three. Berry hard, three-celled. Seeds orbicular.

Obſ. The above characters, copied from Linnæus, appear to have been taken by him entirely from Plumier's figure, except that the deſcription of the fruit was partly borrowed from Marcgrave. We have ſeen the ſeeds, ſent from Jamaica by the name of Antidote Cocoon, which appellation is mentioned in Browne's Jamaica, p. 374; and as they agree with Plumier's figure above quoted, we are ſo far right as to the genus.

With regard to the ſpecies, whether one or two, they are to be known from Plumier and Marcgrave only.

1. F. *cordifolia*. Linn. Sp. Pl. ed. 1. 1013. Plum. Ic. t. 209. "Leaves heart-ſhaped, angular." (Nhandiroba ſcandens, foliis hederaceis anguloſis; Plum. Gen. 20.) Native of the Weſt Indies, or South America. *Stem* climbing, furrowed. *Leaves* alternate, ſtalked, heart-ſhaped, acute, with three or five ſlight angles, entire, ſmooth on both ſides, reticulated with numerous veins, dark green above, rather paler beneath. *Stipulas* none. *Tendrils* axillary, ſolitary, ſimple, about as long as the leaves. *Flower-ſtalks* axillary, either with reſpect to the leaves or the tendrils, compound, alternately branched, many-flowered. Our deſcription is taken from Plumier's figure, aſſiſted by a leaf gathered by himſelf.

2. F. *trilobata*. Linn. Sp. Pl. ed. 1. 1014. Plum. Ic. t. 210. "Leaves with three (or five) lobes." (Ghandiroba, vel Nhandiroba Braſilienſibus; Marcgr. Braſil. 46, cum ic. Sloane Jam. v. 1. 200.) Native of Braſil and Jamaica, in woods and hedges. This appears to differ from the former chiefly in the form of its *leaves*, which are deeply three-lobed, the lateral lobes being moreover generally elongated at the baſe into two other ſhorter more obtuſe lobes. In colour, texture, and habit, they appear, by an original ſpecimen, to agree preciſely with the former. The *infloreſcence* is ſo different in Plumier's, t. 210, that we apprehend ſome miſtake. It there conſiſts of a few ſolitary flowers, from the boſoms of ſmall leaves on a lateral branch. Yet this is not altogether diſſimilar to Marcgrave's figure.

Linnæus ſeems to have been led by Browne to unite the two in Sp. Pl. ed. 2, by the name of *F. ſcandens*; but he again ſeparated them in his Syſt. Veg. He very erroneouſly confounded with the latter his own *Trichoſanthes punctata*, Sp. Pl. 1432, as well as the *Trichoſanthes* of Browne's Jamaica, 354, two plants as unlike each other as they are to either of the *Feuilleæ*. As great a miſtake exiſts in his ſon's herbarium, where, under the name of *F. triloba*, is found the *Modékka* of Rheede Hort. Malab. v. 8. 39. t. 20. This belongs to a genus hitherto not defined by ſyſtematic botaniſts, though mentioned by Juſſieu, for future conſideration, under *Paſſiflora*. Linnæus in his ſecond Mantiſſa, 336, ſtrangely confounds it with *Convolvulus paniculatus*. We have a ſpecies or variety of *Modékka* from Sierra Leone, gathered and aſcertained by Dr. Afzelius, which flowered in September 1793, in the ſtove of the late Lady Amelia Hume, where we gathered and fully deſcribed it. This very plant, which was a male, bore ſome ſimple heart-ſhaped leaves, like thoſe of *O'relamodékka*, Hort. Malab. t. 23, with others that were variouſly lobed, moſtly three-lobed, like t. 20. See alſo t. 21. Such a variation, in a plant ſo much allied in natural affinity to *Feuillea*, may juſtify the union of its two ſuppoſed ſpecies into one. S.

FEUILLE'E, Louis, in *Biography*, a Franciſcan friar, of the order of minims, celebrated as a botaniſt and natural philoſopher, was born at Mane in Provence, in 1660. He travelled to the weſtern coaſt of South America, inveſtigating the natural productions of New Spain and the neighbouring iſlands, from the year 1707 to 1712. He had previouſly viſited Carthagena, and the iſland of Martinico, in 1703 and 1704. Theſe, with ſeveral other voyages, the number and courſe of which are not exactly recorded, he accompliſhed under the patronage of Louis XIV. by whom he was penſioned and greatly encouraged. The king cauſed an obſervatory to be built for him at Marſeilles, in which town Feuillée, worn out with his labours, died in 1732, aged 72. He is ſaid to have been of that modeſt ſimple character, which beſt becomes an eccleſiaſtic and a true philoſopher. Nevertheleſs, he was excited to a conſiderable degree of reſentment againſt Monſieur Frezier, a rival philoſopher and naturaliſt, ſent out likewiſe by Louis XIV., whom he criticiſes at ſome length, in a rather contemptuous ſtyle, in the preface to the Journal of one of his voyages.

Feuillée publiſhed "Journal des Obſervations phyſiques, mathematiques, & botaniques, faites par l'ordre du Roi, ſur les côtes orientales (occidentales) de l'Amerique meridionale, & dans les Indes occidentales, depuis l'année 1707 juſques en 1712," Paris 1714, in two vols 4to. with numerous plates. This is a circumſtantial and exact work, written with no elegance of ſtyle, but valuable for ſolid information upon all the ſubjects announced in its title, with various incidental matter beſides. What relates to Peru makes a principal part of theſe volumes. The deſcriptions of plants occupy 62 pages at the end of the ſecond, accompanied by 50 very tolerable plates, in which Linnæus confided for his definitions of ſeveral ſpecies, without ſeeing ſpecimens, a meaſure he rarely adopted. But it does not appear that Feuillée was one of thoſe writers who, having been found to have miſled him, cauſed him, in the preface to his *Species Plantarum*, to declare againſt that practice in future, "non viſas plantas heic omiſi, toties eluſus ab auctoribus." The reputed medical virtues of the plants met with laudable attention from Feuillée, and are always added to his botanical deſcriptions. Haller remarks that he firſt eſtabliſhed the genus *Epipactis* in this work, and he certainly deſcribes ſome ſpecies ſtill unknown to us, not only of that genus, but ſeveral others. (See Epipactis.) The magnificent *Flori-pondio (Datura arborea)* was here firſt made known to botaniſts.

He publiſhed another quarto volume, with a ſimilar title, in 1725, in the preface to which he cenſures Frezier, as above-mentioned. The appendix, of 71 pages, with 50 plates, deſcribes many extremely intereſting plants of Chili, among which are the firſt deſcribed *Calceolariæ*, the Sweet Potatoe, *Convolvulus Batatas*, whoſe flower is ſcarcely known but from this figure, the *Buddlæa globoſa*, now ſo common, as well as the equally common, but tranſcendently elegant, *Fuchſia coccinea*.

Theſe 100 botanical plates were, according to Haller, republiſhed at Nuremberg in 1756 and 1757, in two vols 4to., with a German tranſlation of their deſcriptions.

The original drawings of Feuillée, many of which were never publiſhed, remain in the *Bibliothêque Nationale* at Paris. They are very rudely coloured, and without any pretenſions to the ſkill of a painter. Whatever merit of that kind, ſlight as it is, can be diſcerned in his plates, is entirely owing to the engraver. S.

Feuille'e, *La*, in *Geography*, a town of France, in the department of the Lower Seine; eight miles W. of Gournay.

FEULEN, a town of Germany, in the principality of Culmbach; ſix miles S.E. of Culmbach.

FEUQUIERES, Anthony de Pas, *Marquis of*, in *Biography*, was deſcended from a family diſtinguiſhed in arms, and born in 1648. He, following the ſteps of his anceſtors, became noted for acts of heroiſm and military proweſs. His conduct in the campaign in Germany, in 1688, obtained for him the rank of marechal-de-camp. For the part which he took in ſeveral actions in Piedmont, he roſe, in 1693, to the rank of lieutenant-general. This was the higheſt promotion he obtained; and he felt moſt ſeverely the ſlight put on him, as he thought, in paſſing him over when others were appointed marſhals of France. He became the enemy of all contemporary commanders, whoſe conduct was rigidly ſcrutinized by Feuquieres. He diſcovered, and enumerated, twelve capital blunders which the French generals had committed at Blenheim. He publiſhed the reſult of his enquiries and criticiſms on the generals employed by Lewis XIV., in a work entitled "Memoirs." This volume has a good reputation for clearneſs of ſtyle; for the freedom of its repreſentations, and for the depth and ſagacity of its remarks. He died in 1711, having a few hours before his death written a letter to the king, in which, with great feeling, he recommended to his majeſty's favour his only ſon, as innocent of what had made him unfortunate, and born of a race which had always faithfully ſerved their king. Gen. Biog.

Feuquie'res, in *Geography*, a town of France, in the department of the Oiſe; eight miles W. of Granvilliers.

FEURBON, Justus, in *Biography*, who flouriſhed in the 17th century, was brought up to the profeſſion of the law, which he ſoon relinquiſhed for the ſtudy of theology and the belles lettres. He obtained ſeveral reſpectable ſituations, till at length, on the death of Helvicus, in 1617, he was made profeſſor of divinity at Gieſſen, of which town he was already the paſtor of the church. In 1649 he was nominated preacher to the court by the Landgrave George; and in the following year he received ſtill higher preferment at Gieſſen. After this, his high reputation obtained for him invitations from other places, but he preferred ſpending the remainder of his days at Gieſſen, where he died in the year 1656. He was author of many theological works which are enumerated by Moreri and others.

FEVRE, Guy le, was born, in 1541, at the family ſeat of La Boderie, in Lower Normandy, whence he obtained the title of "Sieur de la Boderie." It has been ſuppoſed, from the bent of his ſtudies, that he was intended for the eccleſiaſtical profeſſion. He was a diligent ſtudent in the oriental languages, and had, in after life, a large ſhare in the compoſition of the Polyglott of Antwerp, of which Arias Montanus was the chief director. He complains that neither himſelf, nor his brother Nicholas, who had likewiſe a ſhare in the ſame work, was properly remunerated for their labour. On his return to France he was made ſecretary and linguiſt to the duke of Alençon, who was likewiſe deficient in the principle of gratitude. He died on his eſtate at La Boderie in 1598, leaving behind him various works relative to the Syriac, Chaldaic, and other oriental languages. He tranſlated a treatiſe on baptiſm, written by Severus, patriarch of Alexandria; and wrote ſome poetical pieces, by which he acquired conſiderable reputation among his contemporaries. His brother Anthony, born about 1555, was ſome time Charge des affairs for Henry IV. at the court of Rome, and afterwards ambaſſador extraordinary in England; and when he left this country he received ſingular marks of friendſhip from king James and ſeveral of the nobility. An account of his negociations, in letters written by him to the miniſters, and their replies, were publiſhed in 5 vols. 12mo. under the title of "Ambaſſades de M. de la Boderie en Angleterre ſous le Regne de Henry IV. et la minorité de Louis XIII." Moreri.

Fevre, or Fabri, James de, who flouriſhed in the 16th and 17th centuries, was born at Etaples. He was of low extraction, but poſſeſſed vigorous mental powers, which he improved by a diligent application to the different branches of uſeful and ornamental learning. He purſued his ſtudies in the univerſity of Paris, where he afterwards took the degree of doctor, and delivered lectures to numerous pupils in the belles lettres and philoſophy. The ſyſtem which he taught, or rather his oppoſition to old and long eſtabliſhed theories, expoſed him to the jealouſy of ignorant zealots, by whom he was accuſed of being friendly to Lutheraniſm. He was obliged to leave Paris, and, on the invitation of William Briçonnet, biſhop of Meaux, he took refuge in the family of that worthy eccleſiaſtic, who was obliged, in a ſhort time, for the ſake of his own peace, and that of his family, to withdraw the protection of which Fevre ſo much ſtood in need. He was now abandoned to the wide world, and firſt went to Blois, thence to Guienne, about which time he was degraded from the doctor's degree, by the faculty of the Sorbonne. Not content with this, his enemies induced the parliament of Paris to order a proceſs to be carried on againſt him; from the effects of which he was timely delivered by an order from the ſovereign Francis I., who forbade them to come to any reſolution againſt Le Fevre without his injunction. Margaret, ſiſter to the king, and herſelf queen of Navarre, took the perſecuted man under her protection, and honoured him with her confidence and eſteem during the remainder of his life. By her authority he went to Straſburg to confer with Bucer and Capito, reſpecting a reformation in the church; it does not, however, appear that he was prepared to go far into the buſineſs of reform. He continued, by profeſſion at leaſt, attached to the church of Rome till his death in 1537. But towards the cloſe of life he felt uneaſineſs at not having been more bold in the cauſe of truth. While at dinner with his patroneſs, the queen of Navarre, and in a company of learned men, he was obſerved, in the midſt of the entertainment, to burſt into tears, and, in explanation, he declared that his conſcience accuſed him of being highly criminal, in having known the truth, and taught it to others, who had ſeal-d it with their blood, and yet ſhrunk from his duty in avowing it, and timidly taken refuge in a place of ſecurity, far from the ſcenes where the crowns of martyrdom were diſtributed. The queen endeavoured to conſole him, but probably without much effect; he felt that he had not done all that he might and ought to have done, and was come to that point of time in which ſelf-deception could no longer avail. This declaration ſeemed to give eaſe to his labouring mind; he made ſome arrangements with regard to his property, and almoſt immediately expired. Le Fevre publiſhed various works that diſplay much ſolid erudition, and great critical ſkill; and if the opinion of Simon be of weight, he is to be ranked with the beſt commentators of his age. His tranſlation of the New Teſtament into French is highly eſteemed, and is now very ſcarce. Le Fevre once involved himſelf in a conteſt with Eraſmus, by treating his notes on the New Teſtament with undue ſeverity, and even charging the author with intentionally corrupting the ſcriptures, and advancing impieties. Eraſmus vindicated his conduct in the moſt ſatisfactory manner, and freely forgave his antagoniſt, aſſuring him that he ſhould, notwithſtanding what had happened, continue to reſpect him. Such liberal conduct on the part of Eraſmus produced the happieſt effect on Le Fevre, who ſincerely repented of his having attacked Eraſmus; and "they continued," ſays the learned and candid Jortin, "to ſpeak of each other with great reſpect and eſteem;" hence, he infers, that "it would be happy if wrangling geniuſes would copy from their example, and conſider a little how all men of ſenſe and manners applaud ſuch moderation, and how they abhor and deſpiſe thoſe, who having begun to quarrel, perhaps upon mere baubles, never end their conteſts and animoſities, till death comes and puts them to ſilence." Bayle. Moreri. Jortin.

Fevre, Tannegui Le, was born at Caen in the year 16 5. He received a private education, and then finiſhed his ſtudies at the college of La Fleche, where he diſtinguiſhed himſelf. At Paris he obtained the patronage of cardinal Richlieu, who procured him a penſion of 2000 livres, as inſpector of the works printed at the Louvre. At the death of Richlieu he went to Langres, where he avowed himſelf a Proteſtant, and was invited to Saumur to the profeſſorſhip of claſſical literature. His mode of inſtruction was ſo excellent that he had pupils from all parts. Voltaire, in ſpeaking of him, aſſerts, that he deſpiſed thoſe of his ſect, and lived among them more as a philoſopher than a huguenot. He died in 1672, as he was preparing to quit Saumur for Heidelberg, whither he had been invited by the prince palatine. His works were tranſlations of, and comments on, Greek and Latin authors; he publiſhed two volumes of "Letters," and Greek and Latin poems. He wrote Latin elegantly, though not without ſome Gallciſms. He was a man of ſtrict probity and integrity, of which he gave proof by dedicating a work to Peliſſon while a ſtate priſoner. Moreri.

Fevre, Claude Le, a painter, a native of France, born in 1633. He principally painted portraits, but he likewiſe attempted flowers, and even hiſtorical ſubjects, but not with ſo great ſucceſs. He came to London, where he met with much encouragement for ſeveral years, and there he died in 1675.

FEURS, Forum Segusianorum, in *Geography*, a town of France, in the department of the Loire, and chief place of a canton in the diſtrict of Montbriſon; 25 miles W. of Lyons. The place contains 1,796, and the canton 14,016 inhabitants, on a territory of 250 kiliometres, in 18 communes. About a league from this town, at the foot of a rock, called Dinzy, is a mineral ſpring, of a ſulphureous quality.

FEUTSKING, John Henry, in *Biography*, was born in the duchy of Holſtein in the year 1672. Having acquired a good ſtock of elementary knowledge, he went to

Roſtock to ſtudy philoſophy and theology, and from thence he removed to Wittemberg, where he was created doctor in philoſophy, in the year 1692. Here he acquired much reputation, and was appointed paſtor and ſuperintendant of the dioceſe of Jeſſen in the year 1697. In the following year he was admitted to the degree of doctor in divinity. He obtained ſeveral offices, and at length became paſtor of the church of St. Bartholomew at Zerbſt, preacher to the court, confeſſor and eccleſiaſtical counſellor, and ſuperintendant of the dioceſe of Zerbſt, in Anhalt, by the prince of that name. In the year 1709 he undertook the offices of profeſſor of divinity, and aſſeſſor of the eccleſiaſtical conſiſtory of that city. At the ſame time he preached once a week before the electreſs of Saxony, and was honoured with the poſt of eccleſiaſtical counſellor to the duke of Saxe-Gotha. His laſt appointment was that of confeſſor to the electreſs of Saxony, in 1712, an office that he enjoyed but a few months, as he died in 1713, when only 41 years of age. His works, which are very numerous, are chiefly on theological ſubjects. They are enumerated by Moreri, who may be referred to by the curious.

FEWEL. See Fuel.

FEWMET. See Fumet.

FEWS, in *Geography*, a barony of the county of Armagh, Ireland, with a village of the ſame name. The ſouth and weſt parts of this barony are full of mountains. The ſoil of theſe mountains is much inclined to graſs, which is leſs coarſe than that uſually met with on mountain ground, ſo that the cattle have always full paſture, except in time of continued ſnow. The graſs-farms are large and extenſive; and there is alſo much tillage in this diſtrict. The Fews abound with whins or gorſe (ulex Europæus), ferns, and thoſe plants which flouriſh in a warm ſoil. There is no limeſtone in the diſtrict, but either a brittle and decayed freeſtone with a ferruginous tinge, or a hard ſtone found in large blocks, which is called whinſtone, but which differs from other ſtones called by that name. Coote's Armagh.

FEY, in *Rural Economy*, is a term which ſignifies the winnowing or cleaning of grain by means of the natural wind. It likewiſe ſignifies the bed or ſtratum of earthy materials by which chalk, marle, and other ſimilar ſubſtances are covered, and which muſt be removed before the workmen can come at them. This ſort of labour is conſequently termed *feying*, and is uſually paid for by meaſure, according to the difference in depth. In both chalk and marle pits they are conſidered the more valuable the leſs the *fey*.

Fey is alſo in ſome diſtricts applied to the cleaning and digging out of ponds and wells.

FEYDANY, in *Geography*, a town of Samogitia; 16 miles S.S.W. of Miedniki.

FEYDEAU, Matthew, in *Biography*, was born at Paris in the year 1616. He purſued his ſtudies in the college of the Sorbonne, and ſo conducted himſelf in that place as to obtain the eſteem of perſons of all ranks. In the year 1645, he was engaged by M. de Bellegarde, archbiſhop of Sens, to deliver a courſe of inſtructions to the candidates for holy orders in his dioceſe. He obtained ſome preferment in the church, and compoſed ſeveral uſeful books, among which was one entitled "A Catechiſm on Grace," which was afterwards reprinted with the title of "Illuſtrations of certain Difficulties reſpecting Grace." This work was condemned by a decree of the inquiſition at Rome, which M. Fouquet, attorney-general of the parliament at Paris, would not permit to be promulgated in that city. In 1656, M. Feydeau was one of the ſeventy-two doctors who were expelled by the faculty of the Sorbonne, for refuſing to ſubſcribe to the condemnation of M. Arnauld, and on this account he was obliged to relinquiſh his church preferment. After this, for ſeveral years, he lived chiefly in retirement, and produced his "Reflections on the Hiſtory and Harmony of the Goſpels," in 2 vols. 12mo.; a work which has gone through ſeveral editions. In 1665, he was preſented by the biſhop of Aleth with a prebend in his dioceſe; this he reſigned in 1668, in order to undertake the cure of Vitri le François, in Champagne. Here he officiated ſeven years, and was then obliged to give up his charge in conſequence of the perſecutions with which his party was haraſſed. He was baniſhed by a lettre de cachet to Bourges in 1677: and by another proceſs he was ſent to Annonai in the Vivarès, where he died in July 1694, in the 79th year of his age. He publiſhed many works, and left behind him many others that have not yet appeared. A long Latin epitaph was engraved on his tomb, which is preſerved by Moreri.

FEY-HIANG, in *Geography*, a town of China, of the third rank, in Pe-tchéli; 12 miles S.E. of Quang-ping.

FEYJOO, Benedict Jerom, in *Biography*, a learned phyſician of the order of St. Benedict, born in Spain, who died in the year 1765. By his writings many have thought that he contributed as much towards curing the mental diſeaſes of his compatriots, and reforming the vitiated taſte of his countrymen, by introducing liberal notions in medicine and philoſophy; as the great Michel Cervantes had done thoſe of a preceding age, by writing his immortal work, the incomparable hiſtory of Don Quixotte. In the Teatro Critico, publiſhed in fourteen volumes, are many ſevere and cutting reflections againſt the ignorance of the monks, the licentiouſneſs of the clergy, ridiculous privileges, abuſe of pilgrimages, exorciſms, pretended miracles, &c. &c.; by which he made a formidable hoſt of enemies. The confeſſor of truth, he would certainly have been alſo a martyr, had the numerous calls of vengeance been liſtened to by thoſe in power. In a ſuperſtitious country like Spain, it was ſufficient only to have praiſed ſuch men as a Bacon, a Deſcartes, a Newton, &c. to incur the charge of hereſy. The learned part of the nation, however, undertook his defence, and he eſcaped the graſp of the inquiſition. And although in his writings he has demonſtrated the uncertainty of the healing art, and the charlatancy of many among its practitioners; yet the medical college at Seville conferred on him the degree of doctor, and honoured him with a ſeat at their board. Mr. Bourgoing obſerves, that Dr. Feyjoo, or Feijoo, was one of thoſe writers who treated this conjectural art in the moſt rational manner. Tableau de l'Eſpagne.

FEYOE', in *Geography*, a ſmall iſland of Denmark, a little to the north of Laaland. N. lat. 54° 57'. E. long. 11° 25'.

FEYREGG, a town of Auſtria; 8 miles W.S.W. of Steyr.

FEYSTRIZ, a town of Auſtria; 15 miles S.S.W. of Ebinfurth.

FEZ, a province of the empire of Morocco, in Africa, ſituated to the north of Tedla and Shavoya, and having to the weſt the provinces of Benihaſſen and Garb, and mount Atlas to the eaſt, and ſtretching to the north as far as the provinces of Shaus, Rif, and Garet. This was formerly a kingdom of very great extent, and ſtill its dependencies are numerous and extenſive, including ſeveral mountains, abounding in inhabitants, and well cultivated. According to Jackſon, the diſtrict of Fez, excluſive of the cities or towns, contains 1,280,000 inhabitants. The kingdom of Fez has been united to Morocco, ſince it firſt became an independent ſovereignty in the 13th century. Although a conſiderable part of this country lies waſte, and a tract to the weſt of Old Fez abounds with marſhes, which render the air unwholeſome, and the people unhealthy; the ſoil is elſewhere fertile, and produces, in the greateſt abundance, corn, fruit, flax, ſalt, gum, wax, &c. and alſo oranges, lemons, figs, and olives. The mountains abound with game, and the foreſts with wild beaſts. The lions of Fez are the moſt daring and ſavage of any in Africa; horſes, camels, kine, ſheep, goats, and hares, are very numerous. The principal exports from this province are hides and leather of all ſorts, particularly that denominated Morocco, ſkins, furs, wool, dates, almonds, figs, raiſins, olives, honey, wax, ſilk, cotton, flax, horſes, oſtrich-feathers, gold-duſt, &c. The imports chiefly conſiſt in ſpicery, cochineal, vermilion, iron, braſs, ſteel, wire, arms, ammunition, drugs, watches, ſmall looking-glaſſes, quickſilver, tartar, opium, alum, aloes, Engliſh and other linen and woollen cloths, muſlins, calicoes, fuſtians, gold wire, ſilk of all kinds, brocades, damaſks, velvets, and woollen caps, toys and trinkets of all ſorts, Guinea cowries, combs, paper, and a great variety of earthen ware.

Fez, a city of Africa, and capital of the province of that name, was built, about the end of the eighth century, by Edris, the deſcendant of Mahomet and Ali, whoſe father, flying from Medina to avoid the proſcriptions of the caliph Abdallah, retired to the extremity of Africa, and was proclaimed ſovereign of the Moors. Sidy Edris, ſucceeding to the crown of his father, founded the city of Fez, in 793, and built the moſque in which he is buried. From that time the city of Fez has been conſidered by the Moors as a ſacred aſylum, and an object of devotion. In the firſt moments of that zeal which every religious novelty inſpires, a ſtill larger moſque was built at Fez, and called "Carubin," becauſe it was founded by the Arabs of Cairoan. This is one of the fineſt edifices in the whole empire. Many other moſques were ſucceſſively built at Fez, to which were annexed, according to the cuſtom of the Mahometans, colleges and hoſpitals; and this city was held in ſo high a degree of veneration, that when the pilgrimage to Mecca was interrupted, in the fourth century of the Hegira, the weſtern Mahometans, as a ſubſtitute, repaired to Fez, while the eaſtern journeyed to Jeruſalem. When the Arabs had extended themſelves in Aſia, Africa, and Europe, they brought to Fez the knowledge they had acquired in the arts and ſciences; and, to its religious ſchools, this capital added academies for philoſophy, phyſic, and aſtronomy. Fez, reſorted to from almoſt all Africa, and the object of the devout pilgrimages of the Mahometans, ſoon became the rendezvous of the neighbouring provinces. The increaſe of wealth produced the love of pleaſure, and every ſpecies of luxury; licentiouſneſs quickly followed; and as its progreſs in hot countries is always moſt rapid, Fez, the ſchool of ſciences and manners, ſoon became the ſink of every vice. The public baths, which health, cleanlineſs, and cuſtom rendered neceſſary, became the receptacles of the moſt infamous debauchery. The Mahometans of Andaluſia, Grenada, and Cordova, during the revolutions of Spain, paſſed over to Fez, whither they brought new manners, knowledge, and, perhaps, ſome degrees of civilization. They taught the Spaniſh method of dreſſing and dyeing red and yellow goat and ſheep ſkins, then called Cordova leather, now Morocco, from the city of that name, where, however, the dye is leaſt in perfection. At Fez, likewiſe, they eſtabliſhed the manufacture of milled woollen caps, worn by the Moors and eaſtern nations. Gauzes, ſilks, ſtuffs, and beautiful ſaſhes, wrought in gold and ſilver, are manufactured at Fez; and the little they do proves how much might be done, if induſtry were encouraged. Some love of learning is ſtill preſerved at Fez, where Arabic is better ſpoken than in the other parts of the empire. The rich Moors ſend their children to the ſchools at Fez, where they gain more inſtruction than they could do elſewhere.

The city of Fez contains ſome tolerably convenient inns; the ſtreets are ill-paved, and ſo narrow that in many places two horſemen cannot ride abreaſt. Fez, though in times paſt it attracted the attention of travellers, is in no reſpect preferable to the other cities of the empire, except by its ſituation, ſchools, induſtry, and ſomewhat greater urbanity; yet, though more poliſhed than their countrymen, the Moors of Fez are vain, ſuperſtitious, and intolerant. The ſaints, whom they pretend to have buried in that city, furniſh a pretext for prohibiting Jews and Chriſtians to enter it; and an order from the emperor is neceſſary to gain admiſſion. The local ſituation of Fez is ſomewhat ſingular. It is ſeated at the bottom of a valley, and ſurrounded by hills in the form of a funnel, flattened at the narrow end. The upper part of the valley is divided into gardens, planted with high trees, orange groves, and orchards. A river, called Raſalema, winds along the valley, watering it in various directions, turning by its ſtreams a number of mills, and ſupplying water in abundance to all the gardens and moſt of the houſes. On the height of Old Fez is a plain capable of great cultivation. Jacob-Ben-Abdallah, of the race of Beni-Merins, built, in the 13th century, New Fez, contiguous to the Old, and, by its ſituation, keeping the latter in awe. The high town, which is ſalubriouſly ſituated, contains ſome old palaces, in which the ſons of the emperor live. The new town is inhabited by ſome Mooriſh families, but by a greater number of Jews, who trade with Old Fez, notwithſtanding the contempt with which they are treated by the inhabitants; their gains, however, reconcile them to this contempt. Fez is about 200 miles N.N.E. of Morocco. Fez is ſaid to have about 3000 inhabitants. N. lat. 33° 50′. W. long. 5° 20′. Chenier's Morocco, vol. i.

FEZZAN, a country of Africa, ſituated to the ſouth of Tripoli, and 60 journies weſt of Cairo. Mr. Horneman, a late traveller, ſent out at the expence of the African aſſociation, informs us, that the greateſt length of the cultivated part of this country is about 300 Engliſh miles from north to ſouth, and the greateſt width 200 miles from eaſt to weſt; but the mountainous region of Harutſch to the eaſt and other deſerts to the ſouth and weſt are reckoned within its territory. The borderers on the north are Arabs, nominally dependent on Tripoli. Fezzan, to the eaſt, is bounded by the Harutſch and line of deſerts; to the ſouth and ſouth-eaſt is the country of the Tibboos, to the ſouth-weſt that of the nomadic Tuaricks; on the weſt are Arabs. The kingdom contains 101 towns and villages, of which Mourzouk is the capital. The principal towns next in order to the imperial reſidence are Sockna, Sebba, Hun, Wadon to the north, Gatron (or Kattron) to the ſouth, Yerma (or Jerma) to the weſt, and Zuela to the eaſt. The climate is at no ſeaſon temperate or agreeable. During the ſummer the heat is intenſe, and when the wind blows from the ſouth is ſcarcely ſupportable, even by the natives. The winter might be moderate, were it not for the prevalence of a bleak and penetrating north wind during that ſeaſon of the year, and which chilled and drove to the fire not only the people of the place, but even myſelf, the native of a northern country. It rains at Fezzan ſeldom, and then but little in quantity. In January 1799, there were ſome faint lightnings without thunder. Tempeſts of wind are frequent both from the north and ſouth. There is no river or even rivulet deſerving notice throughout the whole country. The ſoil is a deep ſand covering calcareous rock or earth, ſometimes a ſtratum of argillaceous ſubſtance. Dates may be termed the natural and ſtaple produce of Fezzan. In the weſtern parts ſome ſenna is grown, of a quality ſuperior to that imported from the country of the Tibboos. Pot-herbs and garden vegetables are plentiful. Wheat and barley are ſuited to the ſoil and climate; but, from inexperience, or want of ſkill, and from the indolence of the people and oppreſſions of government, corn is not raiſed ſufficient for the inhabitants, and they rely for ſubſiſtence on importation from countries bordering on the north. Very little attention is beſtowed in rearing beaſts: horned cattle are to be found only in the moſt fertile diſtricts, and even there few in number; they are employed in drawing water from the wells, and ſlaughtered only in caſes of extreme neceſſity. The ordinary domeſtic animal is the goat. Sheep are bred in the ſouthern parts of the kingdom, but the general ſupply is furniſhed by the bordering Arabs. The wool is manufactured into abbes, or coarſe woollen cloths, the general clothing throughout the country; with the meat the ſkins are roaſted while freſh, and eaten. The horſes are few: aſſes are the beaſts of general uſe, whether for burthen, draught, or carriage. Camels are exceſſively dear, and kept only by the chief people, or richer merchants. All theſe animals are fed with dates, or date kernels. The commerce of Fezzan is conſiderable, but conſiſts merely of foreign merchandize. From October to February Mourzouk is the great market and place of reſort for various caravans from Cairo, Bengaſi, Gadames, Twat, and Soudan; and for other ſmaller troops of traders, Tibboos, Tuaricks, and Arabs. The caravans from the ſouth bring ſlaves of both ſexes, oſtrich feathers, zibette, tiger ſkins, and gold. From Bornou copper is imported in great quantities. Cairo ſends ſilks, melayes, (ſtriped blue and white calicoes,) woollen cloths, glaſs, imitations of coral, beads for bracelets, and Eaſt-India goods. The merchants of Bengaſi, who uſually join the caravan from Cairo at Augela, import tobacco, ſnuff, and ſundry wares fabricated in Turkey. The caravan from Tripoli chiefly deals in paper, falſe corals, fire-arms, ſabres, knives, cloths called abbes, and red worſted caps. Thoſe trading from Gadames bring nearly the ſame articles. The ſmaller caravans of Tuaricks and Arabs import butter, oil, ſalt, and corn; and thoſe coming from the more ſouthern diſtricts bring ſenna, oſtrich feathers, and camels for the ſlaughter houſe. Fezzan is governed by a ſultan, deſcended from the family of the Shereefs. The tradition is, that the anceſtors of the reigning prince coming from weſtern Africa, invaded and conquered Fezzan about 500 years paſt. The ſultan reigns over his dominions with unlimited power; but he holds them tributary to the baſhaw of Tripoli. The amount of the tribute was formerly 6000 dollars; it is now reduced to 4000, and an officer of the baſhaw comes annually to Mourzouk to receive this ſum, or its value, in gold, ſenna, or ſlaves. On his journey he takes travelling merchants under his protection. The throne is hereditary in the eldeſt prince of the royal family, whether nephew or ſon. The revenues are produced from a tax on gardens and cultivated lands, fines and requiſitions, with a further income from duties on foreign trade; from domains of the crown, ſalt pools, natron lakes, &c. The public expenditure conſiſts in the maintenance of the ſultan, his court, and palace. The cadi and department of juſtice, the religious, and the great officers of government, are ſupported from the produce of date tree woods, and gardens ſet apart for that purpoſe. The dignity of cadi or judge, who is alſo chief of the clergy, is hereditary in a certain family. The population of Fezzan is looſely eſtimated at 70,000 or 75,000, all of whom, without exception, profeſs the Mahometan religion. The colour or complexion of the people varies; thoſe of the northern parts have a complexion and features ſimilar to thoſe of the Arabs. In the ſouthern diſtricts they have mixed with the natives of the great nations bordering on that quarter, and bear a reſemblance to the Tibboos and the Tuaricks. The genuine and indigenous race of Fezzaners may be deſcribed as a people of but ordinary ſtature, and their limbs by no means muſcular or ſtrong; their colour a deep brown, their hair black and ſhort, their form of face ſuch as in Europe we ſhould term regular, and their noſe leſs flattened than that of the negro. Their mien, walk, and every geſture, denote a want of energy either of mind or body. The tyrannic government, the general poverty of the country, and their only food conſiſting of dates, or a kind of farinaceous pap, with no meat, and rarely with a little rancid oil or fat, ſufficiently account for the abject ſtate of the inhabitants. Throughout Mourzouk Mr. H. could not find one artificer ſkilful in any trade or work: indeed there are no other tradeſmen but ſhoemakers and ſmiths. The latter work every metal without diſtinction; and the ſame man who forges ſhoes for the ſultan's horſe, makes rings for his princeſſes. The women fabricate woollen cloths ſolely by hand, as the weaver's ſhuttle is unknown. The dreſs conſiſts of a ſhirt or frock, made of coarſe linen or cotton cloth, brought from Cairo, and the abbe. The middling claſſes wear frocks made in Soudan of dyed blue cloth. The richer people, and the Mamelukes of the ſultan, are clothed in the Tripolitan habit, over which they wear a Soudan ſhirt of variegated pattern and colours, and likewiſe the abbe. The ornaments are chiefly confined to the head dreſs, and rings on the arms and legs. The women are fond of dancing, and are wanton in their manners. The men are much addicted to drunkenneſs. Their beverage is the freſh juice of the date tree, called lugibi, or a drink called buſa, prepared likewiſe from dates. The houſes are miſerably conſtructed with ſtones or bricks of a calcareous earth mixed with clay, and dried in the ſun. They are low, and the light enters by the door only. As to diet, ſays Mr. Horneman, I never knew a more abſtemious people than thoſe of Fezzan. Meat indeed is a food they can at no time abſtain from, when ſet before them; but meat is not an article of food with the people in general. To indicate a rich man at Mourzouk, the uſual expreſſion is, “ that he eats bread and meat every day.”

FEZZARA, a town of Egypt, on the W. branch of the Nile; 13 miles S. S. E. of Roſetta.

FI, a ſyllable in French ſolmiſation, with which ſome muſicians expreſs *f*♯, *ma*, *b* ♭. See SOLMISATION.

FIACONE, in *Geography*, a town of Genoa, on the confines of the Milaneſe, between Genoa and Tortona.

FIALLSIO, a town of Sweden, in the province of Angermannland; 83 miles N. N. W. of Hernoſand.

FIANO, a town of Naples, in Abruzzo Ultra; nine miles S. of Teramo.—Alſo, a town of Italy, on the Tiber; 15 miles N. of Rome.

FIANONA, a ſea-port town of Iſtria, with a good harbour; 36 miles S. E. of Trieſte. N. lat. 45° 49′. E. long. 14° 18′.

FIANTS, or FUANTS, the dung of a badger, fox, and other vermin.

FIAR, in *Rural Economy*, a term applied, in the northern parts of the kingdom, to certain averaged returns of the prices of different ſorts of grain, &c. In Eaſt Lothian, according to the agricultural ſurvey of that diſtrict, from time immemorial, it has been the practice of it and ſome others to fix, by public authority, fiar or average prices of each kind of grain ſold within the county for ready money. In it the average is taken only of wheat, barley, oats, and peas, as theſe were formerly the ſtaple produce of the country; but though at preſent a large quantity of beans are grown, no fiar prices of them have ever been ſtruck. In performing the buſineſs, the ſheriff of the county, who ſtrikes the fiars, calls before him, ſome time in the laſt week in February, or firſt week in March, a number of reſpectable tenants, and other perſons who deal in corn; when he requires of them an account of the quantity and price of the grain bought or ſold within the county, for ready money, from the time that the preceding crop came firſt into the market, until the day of the proof. Having procured an account of this, he ſtrikes a general average for each of the four ſpecies of corn; he then finds the number of bolls that have brought a price above that average, of theſe he likewiſe takes an average; and he proceeds in the ſame manner with what has been ſold below the general average. To each of theſe rates he adds two and a half per cent., and they then form what are called the firſt, ſecond, and third fiars. The addition of two and a half per cent. to the real prices muſt appear a ſingularity to ſtrangers, who may not eaſily perceive either the object or propriety of it. It is explained in the following ingenious and ſeemingly juſt manner. Upon looking into the extract from the ſecond of the fiars it will be found, that from the year 1627 down to 1647, the fiars were ſtruck only once in the year, and as the record is ſilent as to the date for the firſt thirteen years, it is impoſſible now to ſay at what period of the year theſe fiars were ſtruck; but in the year 1648 the record ſhews that fiars were ſtruck twice for that year, namely, at Candlemas and Lammas. In the following year, 1649, the fiars were ſtruck only once; but in the year 1650, and for every year down to 1675 incluſive, with the exception of the year 1665, the fiars were ſtruck twice, namely, at Candlemas and Lammas; but in the year 1676 they were again ſtruck only once, namely, at Candlemas; and this practice has continued uniformly down to the preſent time.

It is conſequently extremely probable, that the two and a half per cent. was firſt eſtabliſhed by being added to the Candlemas fiars for the year 1676, and was continued to be added to them for every year from that period downwards.

Upon examining the fiars for the twenty-ſix years, during which they were ſtruck at Candlemas and Lammas, and taking the average of both, which ſeems to be the fair medium price, it will be found that, in point of fact, the Candlemas, with the addition of two and a half per cent., is ſomewhat below the above medium of the double fiars. This appears to account in a ſatisfactory manner for the origin of the two and a half per cent.; and ſhews, that they who firſt introduced it had paid conſiderable attention to the ſubject. It is evident, indeed, that fiars taken at Candlemas cannot ſhew the average price of grain through the year, becauſe, in the early part of the ſeaſon it has not reached its full value. Whitſuntide would, perhaps, be the moſt proper time for finding a juſt average, and the addition made to the fiars taken at Candlemas may amount nearly to the ſame thing.

It may, however, be obſerved, that there is one objection to the manner of ſtriking the fiars in this county, which is deſerving of attention. The firſt price taken is the true average, the higheſt and loweſt are only the averages of the higheſt and loweſt market days, whereas they ſhould expreſs the average of the beſt and worſt grain. A perſon who makes a payment according to the higheſt fiars, may in fact pay conſiderably more than the average price of the beſt grain ſold throughout the ſeaſon. The ſales of a few high market days, in which prices riſe much above the level of the ſeaſon, thrown into the general maſs, may cauſe the higheſt fiars to be much above the current value of the beſt grain. It would ſeem to be a fairer mode to ſtrike the fiars from the weekly prices in the Haddington market; the averages of all the market days would give the general average, while the higheſt prices on each market day, thrown into one maſs, and the loweſt into another, would furniſh the true average of the beſt and of the worſt grain. The fiars in this county are, however, ſaid to be taken with greater correctneſs than in moſt other parts of Scotland.

In the more northern parts of Scotland, as in Perthſhire, they are annually ſettled, in the ſame manner as in other counties, by a jury of traders in grain; a method which would ſeem to be improper, as the perſons examined in reſpect to the prices of the grain may all have an intereſt preponderating in the ſame way, being themſelves dealers in the article of which they fix the price; whereas, were only one-third of that jury corn merchants, another third actually farming gentlemen, and the other third farmers, who pay one hundred pounds or upwards of yearly rent, every claſs of the community would be repreſented in theſe meetings, every intereſt would be attended to, and every objection ſtated and conſidered; ſo that there would be every chance, that the judgment given would reſt on the broad baſis of the general good of the whole county. The ſheriff ſhould continue, as at preſent, to be the chairman of the jury, the umpire in caſe of an equality of votes, and have the power of judging of any objection that may be brought forward againſt any of the members, as a dealer in grain, which might diſqualify him for holding a ſeat at the meeting. The time of ſettling theſe average prices is ſeemingly capable of being changed for the better, as Candlemas is too early a period; as but a ſmall proportion of the corn is by that time brought forward to be ſold, and even that ſmall portion of the crop which is threſhed out, and ſo brought, is in a green ſtate, and conſequently diſpoſed of at an undervalue. A fair eſtimate can, perhaps, hardly be made of any crop before the end of March, or perhaps a later period. As frequent deciſions in courts of law are given in reſpect to the prices of grain, many contracts entered into, and much corn and meal ſold with a reference to the fiars, as well as the rents of land, and the ſtipends of the clergy in various caſes, received according to them; there can hardly be a retroſpective rule or regulation of equal publicity, or of equal authority deviſed, or more properly calculated for directing ſuch tranſactions; conſequently, too much care and circumſpection cannot be employed in the mode of eſtabliſhing them, as the medium prices of all ſorts of grain, for the reſpective years to which they may have a reference.

However, in order to afford a better idea of what has been the average prices of grain in the firſt of the diſtricts noticed above, for ſeveral years paſt, according to the method of forming them juſt deſcribed, it may not be improper to introduce a liſt of fiars, from 1794 to 1804 incluſive.

Fiars of Grain.
Crop of 1794.

	First.			Second.			Third.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
Wheat -	1	5	6¼	1	3	11¼	1	2	3¼
Barley -	1	2	1¾	1	1	2	0	19	8½
Oats -	0	15	2¾	0	14	10	0	14	1½
Peas -	0	16	4½	0	15	6	0	14	9½

	First.			Second.			Third.		
	£.	s.	d.	£.	s.	d.	£.	s.	d.
Crop of 1795.									
Wheat -	2	6	9	2	4	4½	2	0	4¼
Barley -	1	5	2¼	1	3	10¼	1	1	11
Oats -	1	1	3¼	0	19	5¼	0	18	2¾
Peas -	1	0	4	0	18	9	0	17	9½
Crop of 1796.									
Wheat -	1	7	2½	1	5	10½	1	4	5
Barley -	1	5	0¼	1	2	8½	1	0	6¼
Oats -	0	16	1½	0	14	11	0	14	0
Peas -	0	14	3	0	13	5¾	0	12	8½
Crop of 1797.									
Wheat -	1	4	9½	1	3	0½	1	1	7
Barley -	0	19	4¼	0	17	9¼	0	15	5
Oats -	0	14	2	0	13	0¾	0	12	6¼
Peas -	0	13	1½	0	12	4¾	0	11	8
Crop of 1798.									
Wheat -	1	3	8	1	2	8	1	2	0
Barley -	0	19	5¼	0	18	6	0	17	9¼
Oats -	0	15	0½	0	14	8	0	14	0¼
Peas -	0	12	10	0	12	5	0	11	11¼
Crop of 1799.									
Wheat -	2	3	9	2	0	9¼	1	14	8
Barley -	1	14	8	1	11	11	1	9	2
Oats -	1	12	4½	1	8	7½	1	5	6½
Peas -	1	18	1½	1	13	1½	1	8	6¼
Crop of 1800.									
Wheat -	3	7	3¾	3	3	1¼	2	15	3¼
Barley -	2	12	6	2	6	11¼	2	2	4¼
Oats -	1	18	11½	1	15	8	1	10	9¼
Peas -	2	6	2¼	2	1	6	1	16	8¼
Crop of 1801.									
Wheat -	1	17	5¼	1	15	1	1	12	4
Barley -	1	8	5	1	6	1½	1	4	4
Oats -	0	18	7¾	0	17	4¼	0	15	11
Peas -	0	17	10¼	0	16	10¼	0	16	0¼
Crop of 1802.									
Wheat -	1	12	1½	1	8	8½	1	6	11¼
Barley -	1	0	8¼	0	19	2¼	0	17	1½
Oats -	0	16	6½	0	15	4¼	0	16	4¼
Peas -	0	16	1½	0	15	6	0	15	0
Crop of 1803.									
Wheat -	1	7	5½	1	5	11¼	1	4	7½
Barley -	0	19	2¼	0	17	10¼	0	16	6½
Oats -	0	18	6	0	16	11½	0	15	7
Peas -	0	17	10	0	16	10	0	15	10¼
Crop of 1804.									
Wheat -	2	6	1¼	2	2	4¼	1	15	7
Barley -	1	13	3½	1	11	6¼	1	9	5
Oats -	1	1	2½	0	19	8	0	18	5
Peas -	0	19	2¼	0	17	11½	0	16	11¼

Theſe records of the returns of grain are highly uſeful and intereſting, in ſhewing the different prices of corn in different years, for a conſiderable period, in the northern parts of the kingdom, and afford perhaps the beſt views of the ſubject that can be given.

FIARRA, in *Geography*, one of the ſmaller weſtern iſlands of Scotland. N. lat. 57° 4′. W. long. 7° 27′.

FIARSING, in *Ichthyology*, a name given by the Swedes and Danes to the fiſh generally called the *draco marinus* and *araneus marinus*, the ſea-dragon, and the ſea-ſpider. See TRACHINUS *Draco.*

FIAT, in *Law*, is uſed for a ſhort order or warrant of ſome judge, for making out and allowing certain proceſſes, &c. Thus, if a certiorari be taken out in vacation, and teſted of the precedent term, the fiat for it muſt be ſigned by a judge of the court, ſome time before the eſſoin day of the ſubſequent term, otherwiſe it will be irregular. There is no need for the judge to ſign the writ of certiorari itſelf, but only where it is required by ſtatute. 1 Salk. 150.

FIAT *juſtitia*, is an order granted on a petition to the king, for his warrant to bring a writ of error in parliament, in which caſe he writes on the top of the petition *fiat juſtitia*, and then the writ of error is made out, &c.

FIATO, *Ital.* a term, in *Muſic*, equivalent with *volta.* Time, not meaſure, put at the end of a ſtrain when there are different leading notes to the firſt and ſecond part of an air. *Primo ſiato*, or *prima volta*, the firſt time, *ſecondo ſiato*, the ſecond time; but the words fiato and volta are more frequently underſtood than expreſſed, as 1^{ma} 2^{da} mean the ſame thing.

FIATOLA, in *Zoology*, a name given by the Italian fiſhermen to the ſtromateus.

FIBER, or *fiber caſtor* of Linnæus, the *beaver.* See CASTOR *Fiber.*

FIBER, in *Ornithology*, a ſpecies of *Pelecanus*, which ſee.

FIBRARIÆ, in *Natural Hiſtory*, the name of a claſs of foſſile bodies, the greateſt part of which have been very improperly called by the writers on foſſils, fibroſe talcs, they being of a very different ſubſtance and ſtructure of parts from the talcs, and having none of their diſtinguiſhing characters.

The word is derived from the Latin *fibra, a fibre* or *filament*, theſe bodies being all compoſed of arrangements of parallel filaments or fibres. The fibrariæ in general are foſſils compoſed of parallel filaments, uſually remaining ſo diſtinct as to preſerve in the whole maſſes a thread-like texture, but ſometimes uniting ſo as to form plates or flakes reſembling thoſe of the talcs in external figure. They are bright, and in ſome degree tranſparent, not giving fire with ſteel, nor fermenting with, or ſoluble in, acid menſtrua. Hill's Hiſt. of Foſſ. p. 88.

Of this claſs of bodies there are two diſtinct orders, and under theſe four genera. To this claſs belong the amianthus, aſbeſtos, lachnides, and tricheriæ.

FIBRAUREA, in *Botany*, from the golden hue of the congeries of woody fibres which compoſe the ſtem. Loureir. Cochinch. 626. Claſs and order, *Diœcia Hexandria.* Nat. Ord. *Meniſperma*, Juſſ.

Gen. Ch. Male, *Cal.* none. *Cor.* Petals ſix, very ſmall, roundiſh, ſpreading. *Stam.* Filaments ſcarcely any; anthers ſix, oblong, two-celled.

Female, in a ſeparate plant, *Cal.* none. *Cor.* Petals ſix, roundiſh, concave, ſpreading. *Piſt.* Germens three, ſuperior, ovate, connected together, and angular, at the baſe; ſtyle none; ſtigmas three, cloven. *Peric.* Berries three, ovate, ſomewhat compreſſed, ſmooth, each of one cell. *Seed* ſolitary, ovate, rugged.

Eſſ. Ch. Male, Calyx none. Petals ſix. Female, Calyx none. Petals ſix. Stigmas three. Berries three, ſingle-ſeeded.

1. F. *tinctoria.* Cây Váng dăng of the Cochinchineſe; Tien ſien tan of the Chineſe. Found in the woods of

China and Cochinchina. *Stem* ſhrubby, climbing, without tendrils, long, woody, branched, as thick as the arm, compoſed of large pliant fibres, of a golden yellow, ranged in concentric circles, with perforations between. *Leaves* alternate, ovate, acute, entire, ſmooth, unequally ribbed, veiny. *Footſtalks* long, round, ſwelling at the baſe. *Flowers* white, minute, in long lateral cluſters. *Berry* ſmall, yellow, not eatable. The flavour of the whole plant is bitter.

The roots and lower part of the ſtem are eſteemed reſolvent, deobſtruent, and diuretic. The bruiſed ſtems afford, by boiling, a yellow dye, which is not very vivid, but laſting, and ſerves as a baſis for Turmerick and Safflower, which, though more beautiful, are not ſo durable.

Loureiro, from whom the above account is taken, ſuppoſes the *Tuba flava*, Rumph. Amboin. book 7. chap. 20. t. 24. to be nearly allied to this plant, as well as the *Abuta* of Aublet. t. 250, 251. Juſſ. 284. In the latter he ſeems to be right, as far as the natural order is concerned,and in the former at leaſt equally ſo. That they are all one ſpecies, as he ſuſpects, is manifeſtly not the caſe. Aublet gives his *Abutæ*, which have downy leaves, as the *Pareira Brava* of the Portugueſe.

FIBRE, in *Anatomy* and *Phyſiology*, is generally underſtood to denote the elementary component parts of the animal body: the moſt ſimple form of organized matter, to which the more complicated organs of the frame can be reduced by the various methods of examination employed by the anatomiſt. In this ſenſe, it is to the phyſiologiſt what the *line* is to the geometrician, that from which all other figures are produced. Haller has devoted the firſt ſection of his great phyſiological work to the conſideration of this ſubject. He obſerves that all the ſolid parts of the frame are compoſed of fibres, and that theſe are reſolvable into earth, water, oil, iron, and air. The ſimple fibre is inviſible, and cannot even be brought under obſervation by the aſſiſtance of microſcopes: ſince the ſmalleſt animals, which are only diſcernible by very great magnifying powers, are themſelves compoſed of ſuch elementary parts. He proceeds to explain that theſe primary and inviſible fibres unite together to conſtitute viſible fibres and plates of animal ſubſtance, from the aſſemblage and connection of which our organs are compoſed. Our reſpect for ſo great an authority muſt not induce us to repoſe any great confidence in ſuch ſtatements as the foregoing: they appear, on the very firſt examination, to be in great meaſure hypothetical. The confeſſion that theſe ſuppoſed elementary fibres are inviſible, muſt lead us to receive with great caution accounts of their phyſical and vital properties. And the obvious differences in the compoſition and texture of our organs will naturally give riſe to an inference, that the elementary conſtituents of theſe are probably diſſimilar. We do not ſpeak here of the chemical elements into which parts may be reſolved; but of the primary animal fibre reſulting from them. Without troubling ourſelves with deſcriptions of an object, the very exiſtence of which is not yet proved, we ſhall proceed to explain ſhortly the compoſition of the body, as far as it can be aſcertained by our ſenſes. In this inveſtigation we ſhall find ſtructures of very different appearance exhibited in the different organs of our frame; ſo that the imaginary fibre will not be found to aſſiſt the phyſiologiſt much, whatever benefit the *line* may afford to the reſearches of the geometrician. The following account is derived from the ingenious work of Bichat, entitled "Anatomie Generale."

An animal body is an aſſemblage of various organs, each of which, exerciſing ſome function, concurs in its own manner in the preſervation of the whole. Theſe organs may be regarded as ſo many particular machines contained in the general machine of the individual. But the latter are made up of ſeveral ſtructures or tiſſues of very different natures, which form the true elements of the organs. Chemiſtry has its ſimple bodies, which form compounds by the various combinations of which they are ſuſceptible. In the ſame way, anatomy has its ſimple tiſſues, which, when combined in numbers of four or more, make up the animal organs. They are, 1. the cellular; 2, nervous of the animal life; 3, nervous of the organic life; 4, the arterial; 5, the venous; 6, that of the exhalants; 7, that of the abſorbents and their glands, 8, the oſſeous; 9, the medullary; 10, the cartilaginous; 11, the fibrous; 12, fibro-cartilaginous; 13, muſcular of the animal life; 14, muſcular of the organic life; 15, the mucous; 16, the ſerous; 17, the ſynovial; 18, the glandular; 19, the dermoid; 20, the epidermoid: 21, the hairy. Such are the organized elements of our parts: they poſſeſs the ſame nature in all ſituations; as the ſimple bodies in chemiſtry are the ſame, whatever combinations they may enter into. The advantage of conſidering the ſtructure of the body under this point of view is, that it is not imaginary, but reſts on the real foundation of obſervation. The lines of demarcation between the various tiſſues are drawn by nature, and not produced by metaphyſical abſtractions.

The forms are every where different; here flattened, there rounded. The ſimple tiſſues may be arranged in membranes, tubes, or fibrous bundles. But theſe differences of form are merely acceſſory. The nervous tiſſue forms a pulp in the retina, and cords or threads in the nerves. The fibrous conſtitutes faſciculi or bundles in the ligaments, and membranes in the aponeuroſes. The organization and properties are the ſources of the eſſential diſtinctions.

None of the ſimple tiſſues are analogous in their organization, that is, made up of common and of proper parts; and the former are very differently arranged in each caſe. In one inſtance cellular tiſſue, blood-veſſels, and nerves, may exiſt in abundance; while in another one or two of theſe may be found very ſparingly, or may be entirely deficient. Here we have an abundance of capillary veſſels; there this ſyſtem can hardly be demonſtrated. The proper or characteriſtic parts are decidedly different. Their colour, thickneſs, hardneſs, denſity, &c. are all various. Simple obſervation is ſufficient to ſhew numerous characteriſtic attributes: but further properties are diſcoverable by the application of heat, air, water, acids, &c.

At the ſame time that nature beſtowed on each ſyſtem a different organic arrangement, ſhe endowed it alſo with different properties. (See Life, and the account of the particular ſyſtems.) The conſideration of theſe ſyſtems, as entering into the compoſition of organs, where they may be diſeaſed independently of each other, is of the higheſt importance in phyſiology; and the ſeparate affections of particular tiſſues in a compound organ will come more particularly under notice in chronic diſeaſes.

The organic ſyſtems of the living economy may be divided into two grand claſſes. Thoſe of one kind, diſtributed over the whole body, and preſent everywhere, concur not only in the formation of all the organs, but alſo in that of the other ſyſtems, and conſtitute a common and uniform baſis to every organized part: theſe are the cellular, arterial, venous, exhalant, abſorbent, and nervous ſyſtems. The others, placed in certain determined apparatuſes, and foreign to the reſt of the economy, have a leſs general exiſtence, and are often almoſt iſolated. Such are the oſſeous, cartilaginous, fibrous, muſcular ſyſtems, &c. &c. Bichat calls the former the generating ſyſtems. All organized parts are not neceſſarily provided with all the ſix. Some have no arteries,

arteries nor veins ; ſome no nerves, &c., but they meet together in moſt of the organs, and there are always ſome preſent, although others may be wanting. Thus tendons and cartilages, which have no blood, poſſeſs exhalants, abſorbents, &c. The two laſt-mentioned ſyſtems are the moſt univerſally found. Nutrition ſuppoſes their exiſtence: that function, in fact, reſults from a double motion, of compoſition which brings nutritive matter to the organs, and of decompoſition which removes it. The exhalants are the agents in the firſt of theſe motions ; the abſorbents in the ſecond. Since every organ is nouriſhed, and the mechaniſm of nutrition is uniform, it follows that theſe two ſyſtems muſt belong to all organs. The cellular exiſts the moſt generally after theſe. It is ſometimes found where there are no blood-veſſels, and it always exiſts where theſe are found. The arteries and veins come the next in order: often there are no nerves where theſe penetrate, as in the aponeuroſes, the fibrous membranes, &c. The nervous is that of all the generating ſyſtems, which can be traced into the feweſt organs. The ſerous membranes, the fibrous, fibro cartilaginous, and bony ſyſtems, &c. appear to want it.

The generating ſyſtems, beſides entering into the ſtructure of other organs, alſo belong reciprocally to each other. Thus, cellular ſubſtance is found in the nerves, arteries, and veins ; the latter ramify in the cellular ſubſtance, &c.

It will be expected, from the preceding obſervations, that the generating ſyſtems, conſidered as the common baſis of all the organs, ought to be developed more early than the others ; and we find this in the fœtus. The nerves, with their centre, the brain ; and the arteries and veins, with their central organ, the heart ; the cellular tiſſue, the exhalants and abſorbents all preſent this phenomenon. With reſpect to the two latter, it is ſufficiently clear from the great activity of abſorption and exhalation at this period.

Theſe general ſyſtems muſt perform the moſt important part in the office of nutrition. They conſtitute the nutritive parenchyma of every organ : this is the cellular, vaſcular, and nervous matter, into which the nutritive ſubſtance of the organ is depoſited. The latter, different in every inſtance, conſtitutes the difference of the various organs. It is phoſphate of lime and gelatine in the bones ; gelatine only in the cartilages, tendons, &c. ; fibrine in the muſcles ; albumen in other organs. If, therefore, the nutritive parenchyma of a bone was filled with fibrine, it would conſtitute a muſcle in the form of a bone, and under the oppoſite circumſtances, we ſhould have a bone in the form of a muſcle. The nutritive ſubſtances are hitherto for the moſt part unknown to us : but as the parenchyma is greatly analogous in all caſes, if the former were removed, the only differences would be in form, volume, arrangement of cellular laminæ, and of veſſels and nerves ; without any eſſential variation in nature and compoſition.

The mucous maſs of the fœtus, in the early periods of conception, ſeems to be merely an aſſemblage of general ſyſtems. The organs exiſt only in their nutritive parenchymas. As theſe grow, and become developed, the nutritive matters penetrate them ; and then each organ, hitherto ſimilar in its nature to others, begins to be diſtinguiſhed, and to poſſeſs an iſolated exiſtence ; each derives its appropriate ſubſtance from the blood.

The ſyſtems of the ſecond kind belong only to ſome particular apparatuſes of the animal economy : thus, the oſſeous, muſcular of animal life, cartilaginous and fibrous are peculiarly ſet apart for the locomotive organs : the ſerous, mucous, muſcular of organic life, &c. belong to the digeſtive, reſpiratory, and circulating apparatuſes, &c. All theſe, therefore, are much more iſolated, and perform a leſs extenſive part in the animal fabric. Concentrated in peculiar organs, they are foreign to others, and have an independent life ; while the vitality of the primitive ſyſtems is blended with that of the organs, into the compoſition of which they enter. The different parts of theſe ſyſtems are not connected together ; and this is exemplified in the bones, muſcles, cartilages, glands, &c. : various organs of different natures, and belonging therefore to other ſyſtems, are interpoſed between them. The primitive ſyſtems, on the contrary, are every where continuous, and uninterrupted. The cellular, arterial, venous, abſorbing, and nervous ſyſtems, are ſo diſpoſed, that, if it were poſſible to remove all the organs, which they penetrate, and leave them only, there would ſtill be a whole continuous fabric left behind. If, on the contrary, the organs, intermediate to the bones, cartilages, fibro-cartilages, &c. were removed, the various pieces of theſe ſyſtems would be immediately iſolated. The particular account of the different ſyſtems will be found under their reſpective articles in the Cyclopædia.

Fibre, *Animal*, *fibrin*, *muſcular fibre*, in *Chemiſtry*. The muſcle or fleſh of animals is compoſed of an infinite number of cylindrical, ſoft, nearly inelaſtic, ſemi-tranſparent fibres ; theſe, when examined by the microſcope, are ſeen to be ſtill further ſubdivided into bundles of parallel fibrils, bound together by very fine cellular membrane. The living muſcle is moreover penetrated by arteries, veins, nervous fibres, and lymphatics with their contents ; and thus a conſiderable quantity of extraneous matter is mingled with the pure fibre of the muſcle, ſo as to throw a certain degree of ambiguity on the chemical analyſis of this latter ſubſtance. By means, however, of maceration with cold and hot water, and mechanical preſſure, much of the foreign matter may be got rid of, after which the fibre exhibits the following properties.

Its colour is greyiſh-white, to the taſte it is inſipid, its texture is ſtringy ; it hardens rather than ſoftens by the long-continued action of hot water. When dried ſlowly in a warm air it becomes ſemi-tranſparent like horn, and very brittle.

Fibre, prepared as mentioned above, is entirely inſoluble in water, in moſt of the acids it diſſolves readily ; with the dilute nitric acid it gives out a large portion of azotic gas of great purity, but if ſtronger nitric acid is made uſe of, a more complicated action takes place, by which, according to Berthollet, one portion of the fibre is changed into a kind of ſuetty fat, which floats on the ſurface of the liquor, while the reſt is converted into oxalic acid.

Mr. Hatchett's valuable experiments on this ſubſtance throw great light on the compoſition of muſcular fibre, and point out a variety of before unnoticed points of reſemblance between fibre and condenſed albumen. Of theſe, the principal are the following : muſcular fibre (previouſly exhauſted by long maceration in cold and hot water of every thing ſoluble in this fluid) was ſteeped for a fortnight in nitric acid. diluted with three parts of water ; at the end of that period the acid was become yellow, and had acquired all the properties of a nitric ſolution of albumen. The undiſſolved reſidue, which conſiſted of by far the greater portion of the fibre, being thoroughly penetrated by the acid, was digeſted in boiling water, in which it diſſolved, and by evaporation afforded a gelatinous maſs, which, after being rediſſolved in water, was precipitated by infuſion of tan, and nitromuriat of tin, preciſely with the ſame phenomena as any of the common ſolutions of albumen. Fibre, penetrated as above-mentioned by nitric acid, is for the moſt part ſoluble in ammonia, forming a liquor of a browniſh orange colour. By digeſtion with potaſh the ammonia is given out, and a ſaponaceous maſs is produced, reſembling the other albuminous ſoaps. The reſidue left undiſſolved after the action of ammonia conſiſts chiefly of fat.

If waſhed fibre, however, is treated with *boiling* nitric acid, the ſolution ſtill more reſembles that of albumen in the ſame menſtruum, but with this additional circumſtance, that, on ſuperſaturation with ammonia, a copious white precipitate falls down, conſiſting of the phoſphat and oxalat of lime, the former of which pre-exiſted in the fibre, while the acid of the latter was produced by the action of the nitric acid on ſome portion of the fibre, and then united with the lime which naturally exiſts in fibre, in the ſtate of carbonat. Lime, therefore, is found in muſcular fibre in two ſtates; as a phoſphat, which is chiefly ſeparable by long boiling, and in ſome other ſtate in which it is not ſoluble in water, but remains ready to combine with the oxalic acid as ſoon as formed; this ſtate is probably the carbonat, and the quantity of lime thus combined is ſuch as to afford 17 grains of dry oxalat from 200 grains of dry fibre.

The proportion, however, of earthy ſalts contained in fibre varies greatly, according to the age of the animal; for it appears from Mr. Hatchett's experiments, that though beef contains both phoſphat and carbonat of lime, veal gives hardly any indication of the latter, and a much ſmaller proportion of the former.

The analyſis by fire ſhews the following very notable difference between gelatine, fibre, and albumen, (the three great conſtituents of the ſoft parts of animals,) in their proportions both of carbon and earthy reſidue.

500 grains of iſinglaſs, being gelatine in its pureſt form, diſtilled with a ſtrong heat in cloſe veſſels, left 56 grains of reſidue, of which 54.5 diſappeared by ſubſequent calcination in the open air, and therefore were carbon, the remainder, amounting to 1.5 gr. appeared to be phoſphat of ſoda, with a trace of phoſphat of lime.

500 grains of dry albumen, treated in the ſame manner, gave 63.25 grs. of carbon, and 11.25 grs. of reſiduum, conſiſting of ſoda in a ſemi-cauſtic ſtate, together with phoſphat of ſoda, and a very ſmall portion of phoſphat of lime.

500 grains of muſcle of beef, well waſhed and dried, gave 83.4 grs. of carbon, and 25.6 of reſidue, the greateſt part of which was carbonat of lime, mixed with ſome cauſtic lime and a little phoſphat: it is to be obſerved, however, that this is by no means the whole earthy contents of the muſcle, as by its previous digeſtion in boiling water nearly the whole of the phoſphat of lime would be diſſolved out.

The general inference from theſe experiments, and from others that have been mentioned under the article Albumen is, that the principal conſtituent of muſcular fibre is a ſubſtance which, from its habitudes with the principal chemical reagents, may be conſidered as nearly identical with inſpiſſated albumen.

A few miſcellaneous circumſtances concerning muſcular fibre may be added. When thoroughly waſhed and freed from all that can be extracted from it by cold water, it does not readily putrefy; but in its natural ſtate it ſoon undergoes this change, the texture becoming flabby and looſe, the colour pale, and the odour exceſſively fœtid. The fleſh of young animals putrefies ſooner than that of old ones in ſimilar circumſtances. When immerſed in running water, or buried under ground in large maſſes, it changes to that ſingular ſpermaceti-like matter already deſcribed in the article Adipocire. When ſlowly and thoroughly dried, and kept in a dry air, it will remain long without undergoing any change. Alcohol deprives it of colour, hardens its texture, and effectually prevents the acceſs of putrefaction; and it may be obſerved that antiſeptics in general are more efficacious in preſerving muſcular fibre than any other of the ſoft parts of the body.

The moſt important of the volatile products of the dry diſtillation of fibre is ammonia, which alſo indicates the preſence of much azot in the fibre itſelf. An acid alſo is given out at the ſame time, which is acrid, uncryſtallizable, and has the peculiar odour of roaſted meat. It was firſt deſcribed by Berthollet as a peculiar acid, and was named by him the *zoonic*; the general opinion of chemiſts however at preſent concerning this ſubſtance is, that it conſiſts of acetous acid, fouled and rendered empyreumatic by the action of heat on the ſubſtances from which it is procured.

Fibre, *Vegetable*. Almoſt all plants contain a fibrous matter, which is diſtinguiſhed from the other vegetable principles by its comparative inſolubility in chemical menſtrua, its indeſtructibility by ſpontaneous decompoſition, and a certain toughneſs and elaſticity occaſioned by its minutely fibrous texture. In ſome plants theſe fibres are remarkably flexible and tough, as in the flax, the hemp, the aloe, and the inner bark of the lime, the birch, and other trees that furniſh the materials of Ruſſia matting; in the cane and bamboo theſe fibres, though ſtill conſiderably flexible and elaſtic, are inferior to thoſe produced by the preceding plants; and in the ligneous fibre or wood of the larger trees they exhibit ſtill greater denſity and diminiſhed flexibility. The chemical characteriſtic of vegetable fibre is, that it preſents on analyſis a greater proportion of carbon and earthy matter than any other vegetable ſubſtance; as will be detailed at length under the article Wood.

FIBRILLA, a little fibre, or capillament.

FIBRO-CARTILAGE, in *Anatomy*, a tiſſue of the animal body, partaking of the characters both of ligament and cartilage. An ingenious French anatomiſt diſtinguiſhed it by this name; and he has included, under the expreſſion *fibro-cartilaginous ſyſtem*, all thoſe parts of the body which exhibit this kind of ſtructure. From the mixed nature of their properties, the fibro-cartilaginous organs have been partly arranged among the ligaments, and partly among the cartilages. They may be conveniently arranged under three diviſions. 1. The membranous fibro-cartilages; as thoſe of the ear, noſe, trachea, eye-lids, &c. Theſe are very thin, diſpoſed in an uniform plane, or convoluted in various directions. 2. Articular fibro-cartilages; of very variable forms, but in general thick; interpoſed between the oppoſite ends of bones, in ſome inſtances unconnected by their ſurfaces, and moveable, in others cloſely attached, as in the vertebræ. 3. Fibro-cartilages of tendinous ſheaths; conſiſting of a thick layer covering the bone in ſome inſtances, where the tendon paſſes over it. The ſtructure and vital properties are not exactly the ſame in all theſe organs.

The peculiar tiſſue of this ſyſtem is compoſed, as its name indicates, of a fibrous ſubſtance, with the addition of a true cartilage. The former ſeems to be the baſis of the organ. It is very diſtinct in the maſſes which connect the bodies of the vertebræ, but much leſs ſo in the membranous fibro-cartilages. The fibres are ſometimes parallel, and ſometimes interwoven. This fibre is exactly of the ſame nature, as in the fibrous ſyſtem, compact, hard and ſtrong; and hence ariſes the ſtrength of the different organs belonging to this ſyſtem. The ſolidity of the union which connects together the bodies of the vertebræ, and the difficulty of rupturing the fibro-cartilages of the knee, jaw, or clavicle, ſufficiently exemplify this. Theſe organs bend in every direction, whereas the true cartilages, if powerfully bent, would break. The cartilaginous ſubſtance is interpoſed between the fibres, and is particularly diſcernible in the articular fibro-cartilages; which owe to it their elaſticity, white colour, and the

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the inorganic appearance exhibited by a ſection. Theſe are rendered yellow and tranſparent by boiling, and are converted into jelly, although not quite ſo readily as the true cartilages. The fibro-cartilages of the organs of ſenſe, which we have already adverted to in the article CARTILAGE, are not reſolved into gelatine by boiling; they are ſoftened, but remain whitiſh. After ſome time their ſurrounding membrane is detached, and the ſubſtance itſelf breaks in ſeveral places. After macerating for ſome days they become red. Deſiccation renders them hard and brittle, without imparting the yellow colour which tendons or aponeuroſes receive on ſuch treatment. The inter-vertebral ſubſtances have, when dyed, a remarkable tranſparency, without any yellow tint. They ſwell when detached, and placed in water.

The fibro-cartilages in general have no perichondrium. Thoſe of the tendinous ſheaths are in contact on one ſide with the bone, and by the other with the ſynovial membrane. The articular ones are covered by the ſynovial membranes of the joints, and thoſe of the vertebræ are covered only by the anterior and poſterior vertebral ligaments. A very diſtinct and cloſely adhering fibrous tiſſue covers thoſe of the organs of ſenſe; and is rendered white by maceration.

The cellular texture is difficultly ſeen in theſe organs; but maceration brings it into view. Very little blood circulates through them in the ordinary ſtate; but they become vaſcular when inflamed. No nerves can be traced into them.

This ſyſtem is diſtinguiſhed moſt particularly by its elaſticity. The fibro-cartilages of the organs of ſenſe and of the trachea, when bent, immediately reſtore themſelves; and thoſe between the vertebræ, being compreſſed by the motions of the bones, reſume their former ſtate, as ſoon as the compreſſing force ceaſes to act. (See CARTILAGE.) They have the power alſo of bending in every direction, without any riſk of being broken. They poſſeſs extenſibility, and contractility.

Their vital properties are very obſcurely marked. They have no animal ſenſibility or contractility in the natural ſtate; but the former appears under inflammation. Organic ſenſibility, and inſenſible contractility, exiſt in theſe organs as far as they are neceſſary for the purpoſes of nutrition. This obſcurity of the vital properties renders all the vital phenomena very ſlow. If the ear of a dog be cut, and the ſides of the inciſion brought together, the ſkin quickly unites; but the cartilage is not agglutinated until long after. From the ſame cauſe we muſt explain the rare occurrence of diſeaſe in theſe organs. No parts in the body are ſo ſeldom diſeaſed as the fibro-cartilages of the noſe, ear, trachea, &c. Gangrene produces hardly any alteration in them, and it is almoſt doubtful whether they ever ſuppurate.

This ſyſtem is developed at an early period; the ends of the bones are large in the fœtus, and the articular fibro-cartilages are conſequently conſiderable. Thoſe of the tendinous ſheaths are not to be diſtinguiſhed from the cartilaginous epiphyſes which in the fœtus form the ends of the bones. The gelatinous portion exceeds the fibrous part in the fœtus; particularly in the inter-vertebral maſſes; and its proportion is here always in an inverſe ratio to the age of the ſubject. The membranous fibro-cartilages are developed very early in the fœtus.

The parts become ſtronger and more denſe as the age advances; and in the old ſubject they take a hard form. Hence the ſtiffneſs and inflexibility of the vertebral column.

The fibro-cartilages are much leſs prone to oſſification than the cartilages. This change has never been obſerved in the membranous ones. Thoſe of the vertebræ are almoſt the only ones in which oſſific matter is ſometimes depoſited, and this is very rare. Bichat, Anatomie Generale; tom. iii.

FIBROLITE, in *Mineralogy*, a ſubſtance firſt noticed by the count De Bournon, and found by him amongſt the matrix of Corundum, from India and China. It is of a whitiſh, or dirty whitiſh-grey colour; it occurs in maſſes of an indeterminate form and fibrous texture. The count De Bournon has only once ſeen a ſpecimen that had a tendency to a regular form, which was that of a rhomboidal priſm of about 100° and 80°. Longitudinal fracture fine fibrous, the fibres in ſome ſpecimens interwoven in all directions; croſs fracture compact, with a vitreous luſtre. Tranſlucent at the edges. Hardneſs about the ſame as quartz, when tried in a direction perpendicular to or acroſs the fibres. Gives ſparks with ſteel, and a deep reddiſh phoſphoreſcent light when rubbed againſt an hard body. Not electric by friction. Specific gravity about 3 2, being, like all ſubſtances not found in a cryſtallized ſtate, of different degrees of denſity. Infuſible *per ſe* by the blow-pipe. Analyſis by Mr. Chenevix of fibrolite from the peninſula of India and China.

	India	China.
Silica -	38.	38.
Alumina	58.25	46.
Iron, a trace	——	13.
Loſs -	3.75	3.
	100.00	100.

The remarkable circumſtance of the fibrolite from India yielding nothing but ſilica and alumina, and its always occurring in amorphous maſſes of a fibrous texture, induced the diſcoverer to give it the above name. See the intereſting paper on Corundum, by the Hon. Mr. Greville and the count De Bournon, printed in the Phil. Tranſ. for 1802.

FIBROUS SYSTEM, in *Anatomy*. This includes a great many organs of the body, compoſed of the ſame elementary parts, but differing widely in their forms. This variety, together with the differences of function and poſition, occaſions them to be diſtinguiſhed by the names of tendon, aponeuroſis, ligament, &c. For there is not here any general term, like that of muſcle or nerve in the muſcular or nervous ſyſtems, to denote the organization, whatever the form of the organ may be. There are two leading diſtinctions of form, under which all the fibrous organs may be arranged, *viz.* the membranous, which is thin and broad; and that of chords, which is thick and elongated.

1ſt Diviſion. *Fibrous organs of the membranous form*;—including fibrous membranes, fibrous capſules, tendinous ſheaths, and aponeuroſes. The fibrous membranes are the perioſteum, dura mater, ſclerotica, albuginea, and capſules of the kidney, ſpleen, &c. They generally envelope certain organs, and enter into their texture. The fibrous capſules are cylindrical bags, ſurrounding certain articulations, particularly thoſe of the humerus and femur, which they connect very cloſely to the ſcapula and os innominatum. The ſheaths confine the tendons paſſing over bones, where they are reflected—wherever, in ſhort, they are ſubject to diſplacement from the muſcular contraction; and might, in conſequence, tranſmit imperfectly to the bones the motion imparted by the muſcles. They may be arranged in two diviſions; 1. Such as are common to the tendons of ſeveral muſcles, as at the wriſt and tarſus; 2. Such as belong to one tendon only, or two, as in the fingers and toes. Aponeuroſes conſiſt of large ſheets of fibrous texture, belonging to the locomotive organs, and diſpoſed in ſome inſtances ſo as to form coverings of parts; while in others they afford points of attachment to muſcles. Hence they are diſtinguiſhed into aponeuroſes for enveloping, and aponeuroſes for inſertion. The former either ſurround the muſcles of a limb, forming for it a general ſheath, as in the thigh and fore-arm: or elſe they inveſt and confine ſome particular muſcles, as that which extends between the two poſterior ſerrati, that which is placed in front of the ſoleus, &c. The aponeuroſes of inſertion either form broader or narrower ſurfaces, as at the attachment of the triceps femoris, rectus cruris, gaſtrocnemius, &c.; or they conſiſt of ſeparate fibres, giving diſtinct attachments to the muſcular fibres, as at the origin of the iliacus internus, tibialis anticus, &c., or they form arches, which both give attachment to muſcular fibres, and at the ſame time allow the paſſage of veſſels, as at the diaphragm and calf of the leg.

2d Diviſion. *Fibrous organs in the form of chords;*—conſtituting tendons and ligaments. The former are placed at either of the attachments, or in the middle of muſcles. They are generally ſimple, conſiſting of elongated chords; but in ſome caſes they are more complicated, being divided into ſeveral ſmaller chords. Ligaments tie together the articular ſurfaces of bones. They may form either conſtant and regular faſciculi, as at the elbow, knee, &c. or irregular ones, as at the pelvis.

The following table exhibits the fibrous organs according to the preceding arrangement.

Fibrous Organs,	In the membranous form,	Fibrous membranes,		
		Fibrous capſules,		
		Fibrous ſheaths,	Partial, General.	
		Aponeuroſes,	For envelopement,	Partial, General.
			For inſertion,	In a broad ſurface, In the form of an arch, In ſeparate fibres.
	In the form of chords,	Tendons,	Simple, Complicated.	
		Ligaments,	With regular faſciculi, With irregular faſciculi.	

Although the numerous organs included in this table belong to parts of very different ſtructures; although they ſeem diſpoſed irregularly in the animal economy, without mutual connection, and apparently iſolated; they are in fact nearly all continuous. The common centre of this ſyſtem is the perioſteum, with which all its parts are cloſely connected, excepting the albuginea, the coats of the kidney and ſpleen, and the perichondrium of the larynx.

Organization of the fibrous ſyſtem.—This is nearly the ſame, under all the variety of forms which have been juſt particularized: and conſiſts of a peculiar tiſſue, with vaſcular, cellular, and other textures.

All fibrous organs have for their baſis hard, inelaſtic, and inſenſible fibres; incapable of contraction; ſometimes parallel to each other, as in the tendons and ligaments, ſometimes variouſly interwoven, as in the capſules, membranes, and ſheaths; of a white or grey colour, and great powers of reſiſtance.

The latter property enables all theſe organs to ſuſtain great efforts; and they are employed in offices which require ſuch a power. The ligaments firmly hold the articular ſurfaces in contact. The aponeuroſes confine the muſcles and reſiſt their diſplacement. The tendons are placed between two powers; *viz.* the powerful energy of muſcular contraction, and the greater or leſs reſiſting force, which that action is deſigned to move. The reſiſting power of the tendons is in many inſtances ſuperior to that of the bones: thus, the patella, the olecranon, and the os calcis may be broken by muſcular contraction. The difficulty of producing luxations in the dead ſubject, and the great force required in the former barbarous puniſhment, of fixing four horſes to the four limbs of a criminal, in order to tear them aſunder, ſufficiently exemplify the great ſtrength of this tiſſue. A tendon requires an enormous weight ſuſpended from it to break it. Yet this reſiſtance, however great, is ſometimes overpowered in the living body; and we ſee the ſtrongeſt tendons, as that of the calf, ruptured by muſcular contraction. We cannot help being ſurpriſed, on theſe occaſions, that the ſoft tiſſue of the muſcles ſhould not yield rather than the tendons.

Some anatomiſts have fancied that the fibrous and muſcular ſyſtems were analogous, and have affirmed that a tendon is formed by the condenſation of the muſcular fibres. This notion is altogether abſurd. The fibrous membranes and aponeuroſes are expanded, but they reſemble muſcular fibres in no reſpect. The chemical compoſition, the vital properties, and the apparent texture are widely different. Their functions have not the leaſt analogy. In fact, there is leſs reſemblance between the muſcular fibres and the tendon, in which they are inſerted, than between the latter and the bone, to which it is attached.

What then is the nature of the fibrous tiſſue? This we cannot determine, as we cannot recognize in it any very decided characters. Its properties are rather negative. It has not the contractility of the muſcular, nor the ſenſibility of the nervous tiſſue. It is always paſſive, and obeys the motion impreſſed on it, without having any of its own.

The parts, in which this is found, are very different from the ſkin, the cellular texture, cartilage, &c.; and hence the referring of all theſe to a common claſs of white organs is a premature generalization, reſting entirely on external appearances, and imperfect analyſis, in which the texture, vital properties, and functions of the organs are diſregarded.

The fibrous tiſſue, expoſed to maceration at a moderate temperature, does not experience any change for ſome time. Its denſity gradually diminiſhes, and its ſubſtance ſoftens, but it does not ſwell. The fibres may now be drawn aſunder, ſo as to expoſe the connecting cellular texture. After a very long period they are reduced into a ſoft whitiſh pulp, of homogeneous appearance. Tendons are the ſooneſt acted on; then aponeuroſes of inſertion; afterwards thoſe of envelopement; then the fibrous membranes, capſules, and ſheaths; and laſtly ligaments.

Any fibrous organ plunged into boiling water, or expoſed to conſiderable heat, curls up, and becomes contracted, like moſt other animal tiſſues: its volume is diminiſhed, it becomes more ſolid, and acquires an elaſticity, which it had not in the natural ſtate, and which it loſes again, when ſoftened. The force with which the fibres contract on expoſure to heat is very conſiderable.

It is ſufficient, when bones are boiled for a long time, to produce rupture and detachment of the perioſteum ; and, when the bones, ſurrounded by their ligaments, are expoſed to the action of boiling water, to lock the articular ſurfaces ſo cloſely together, that they cannot be moved.

The fibrous tiſſue ſoftens in boiling water, becomes yellow and ſemi-tranſparent, and at laſt is partly diſſolved. Theſe changes take place moſt quickly in the tendons, then in the aponeuroſes. the membranes, the capſules, and fibrous ſheaths, and laſtly in the ligaments. But all ligaments do not reſiſt equally. Thoſe which connect the ſpinous proceſſes of the vertebræ, at their roots, do not undergo the ſame changes, but remain white and coriaceous.

The evaporation conſequent on expoſure to the air deſtroys the whiteneſs of the fibrous ſyſtem ; it contracts, becomes yellow and tranſparent, and is eaſily broken. By immerſion in water, in a few days after being dried, the whiteneſs and ſoftneſs are recovered, and the part regains nearly its original appearance. This is particularly the caſe with the tendons. Nitrous and ſulphuric acids ſoften the fibrous tiſſue very quickly, and reduce it into a blackiſh pulp in the latter, and yellowiſh one in the former caſe. It curls up and contracts when firſt plunged into the acid, as it does on expoſure to boiling water.

It reſiſts putrefaction for a conſiderable length of time, and remains unaltered, when ſkin, muſcles, nerves, &c. are completely diſorganized. But it yields in the end.

Cellular texture exiſts in all fibrous organs ; being more or leſs abundant, in proportion as the fibres are more or leſs approximated. Maceration renders it obvious enough in all caſes. As the cellular tiſſue itſelf can hardly be perceived, no fat can be diſtinguiſhed in it. But an adipous exudation has been noticed, in ſome inſtances, after fibrous organs, carefully cleaned from all ſurrounding ſubſtance, have been dried. Veſſels are found in very different ſtates in different parts of the fibrous ſyſtem. They are numerous in the dura mater and perioſteum, very few in the aponeuroſes, and not diſcernible at all in the tendons. The former organs are the moſt liable to inflammation and ſwelling. Abſorbents have not been detected in the fibrous ſyſtem nor nerves.

Properties of the fibrous ſyſtem.—Its elaſticity is very trifling ; but becomes conſiderable, when parts are removed from the body, and dried. Thus tendons, and ſtrips of aponeuroſis, which are inſuſceptible of vibration in their freſh ſtate, produce ſound when very dry.

The extenſibility and contractility of theſe organs is not conſiderable ; and it always takes place ſlowly. The fact is exemplified in hydrocephalus, ſwellings of the bones, tumefaction of the limbs, diſtenſion of the abdomen, &c. If the force be applied ſuddenly, and the reſiſtance of the fibrous organ be too great, various ſymptoms ariſe. Preſſure of the moſt painful kind, and dangerous conſequences, is produced on the contained parts, as in inflammatory tumefaction of the limbs, inflammation of the teſtis, eye-ball, &c. When the power is too great, the organ is torn, as in the rupture of the tendo Achillis, of the ligaments in luxations, &c. The contractility correſponds in its kind and degree to the extenſibility: as no fibrous organ can be ſuddenly extended, ſo it cannot recover ſuddenly after diſtenſion. Hence, when a tendon or aponeuroſis is divided in the living ſtate, there is ſcarcely any ſeparation of the margins. The ſeparation conſequent on rupture of a tendon ariſes from muſcular contraction, or from the poſition of the limb Indeed, if the muſcle be in a ſtate of action, the end of the divided tendon attached to the muſcle is drawn away from the other a little ; but that portion of the tendon which is fixed to the bone undergoes no change. When a tendon is divided, while the muſcle is relaxed, no ſeparation enſues.

The vital properties of theſe organs have been a ſubject of great controverſy among phyſiologiſts. Numerous experiments have been inſtituted, and many works publiſhed on the queſtion, Whether or no they poſſeſs ſenſibility. Haller and his followers maintain the negative, and their publications contain a vaſt ſtore of experiments. There is little doubt that they poſſeſs feeling, or, what Bichat calls animal ſenſibility ; although this does not ſhew itſelf by the uſual phenomena. The different mechanical and chemical ſtimuli produce no pain, unleſs the organ be inflamed. This is the caſe with the tendons, the aponeuroſes, the fibrous membranes, and the ligaments, when expoſed and cut in operations, or irritated chemically in living animals. But, if theſe parts are ſuddenly expoſed to violent diſtenſion or twiſting, acute pain is produced. Bichat appeals, for the proof of this ſtatement, to experiments on living animals. And he conſiders that this mode of ſenſibility is appropriate to the functions of the organs. They have no concern with exterior ſources of excitation ; but, in performing their offices, they are liable to be drawn, twiſted, and ſtretched in the motions of the limbs. The ſenſation, which they tranſmit in theſe caſes, is a warning of the danger, by which its further progreſs is prevented. The great pain of luxations, and of the extenſion employed for their reduction, and of ſtrains, ſeems to confirm the preceding ſtatement.

Theſe organs poſſeſs no animal contractility. They have organic ſenſibility, and organic inſenſible contractility in common with all other organs.

The vital powers are more developed in this than in the bony and cartilaginous ſyſtems. The peculiar kind of feeling, which we have juſt explained, is a proof of this. It is much more frequently the ſeat of pain and inflammation, and the pain is much more acute. This is exemplified in rheumatiſm, which affects the fibrous organs about the articulations. It ſeems that this ſyſtem, hardly in any inſtance, forms pus.

In the gelatinous ſubſtance, of which the embryo conſiſts, the fibrous organs can hardly be diſtinguiſhed ; and they cannot be recognized until ſeveral other parts are formed. The fibres are not perceptible until towards the ſeventh month ; and, as they increaſe, the organs become more hard and reſiſting. They poſſeſs at this time a pearly whiteneſs. It is only by degrees that they acquire the firmneſs which particularly characterizes their tiſſue. The comparative ſoftneſs of theſe organs in the firſt years of life will explain many circumſtances both of natural phenomena and diſeaſe. As the ſubject grows up, the fibrous ſyſtem becomes denſe and hard ; and it remains ſtationary in the adult. It is ſtill more compact in old perſons ; yielding leſs eaſily to putrefaction and maceration. Hence the ſtiffneſs in the articulation at this period. All the parts now become yellow.

The fibrous membranes will be conſidered under the article MEMBRANE. The capſules are deſcribed in the account of the articulations to which they belong. See EXTREMITIES.

The fibrous ſheaths belonging to one tendon form a canal, in which the tendon runs. There is a channel in the bone, completed into a canal by the fibrous organ, and lined internally by a cloſely adhering ſynovial membrane, which is reflected to the retained tendons at the extremities of the canal. Theſe ſheaths are connected externally to the ſurrounding parts by a looſe cellular texture. They are extremely denſe in their texture, and ſtrong in proportion to the efforts which they have to ſuſtain. The particular ſheaths will be deſcribed in the account of the muſcles to which they belong. The larger ones of the hand and foot, common to ſeveral muſcles, are deſcribed in the article Fascia.

The aponeuroſes of envelopement are conſidered under the article Fascia. Thoſe of inſertion, belonging ſo eſſentially to the muſcles, will be treated, as well as the tendons, under Muscle.

The ligaments will be ſpoken of in the account of the ſtructure of Joints. This article is drawn entirely from the Anatomie Generale of Bichat, vol. iii.

Fibrous *Amethyſt*, or thick fibrous amethyſt. It is generally of a dark violet blue colour, ſometimes of a pale and light one, which borders on grey, from which it paſſes to blueiſh and yellowiſh-white. It occurs only maſſive and in rolled pieces. Internally its luſtre is gliſtening, ſometimes ſhining, and is vitreous. The principal fracture is thick fibrous, and is ſtraight and diverging fibrous: the fracture in ſome inſtances is intermediate between thin fibrous and ſplintery; the croſs fracture is generally imperfectly conchoidal, approaching to uneven and ſplintery. Commonly tranſlucent, but varies from that to tranſparent. Hard, rather more ſo than rock cryſtal; gives ſparks with ſteel. Not very difficultly frangible. Specific gravity 2.750. According to Karſten it is compoſed of

Silica	97.5
Alumina	00.25
Iron	00.50
A trace of Manganeſe	
	98.25

Infuſible *per ſe* in the ſtrongeſt heat of a wind furnace, but melts upon charcoal when expoſed to a ſtream of oxygen gas.

It is found in agate veins, and is generally accompanied by common amethyſt. When both kinds occur together the fibrous is ſuppoſed to be the oldeſt, as it adheres to the ſides of the vein.

Its geographic ſituations are very numerous; it is found in abundance in various places in Saxony, in the Eaſt Indies, Spain, the Uralian mountains, &c. The moſt beautiful ſpecimens are brought from Catherineburg, in Ruſſia.

The loſs of its colour by heat indicates either that the colouring matter is very volatile or very little in quantity; and it has been doubted, by ſome philoſophers of great reputation, whether this and many other highly coloured ſtones owe their colours to metallic oxyds, or to ſome unknown modification or affection of light; and it is well known that fluor and other phoſphoreſcent ſtones loſe their power of emitting light with the loſs of their colour.

Fibrous *Gypſum*. See Gypsum.

Fibrous *Limeſtone*. This ſubſpecies is uſually divided into two kinds: 1. Common fibrous limeſtone. 2. Fibrous limeſtone, ſtalactite, kalkſinter of Werner.

1. *Common Fibrous Limeſtone*.—Its colours are white, greyiſh, or yellowiſh-white, and ſometimes reddiſh-white. It occurs maſſive. Luſtre gliſtening, often ſhining, and is pearly and chatoyant, particularly when cut and poliſhed. Fracture from coarſely to extremely delicately fibrous. The fibres ſtraight, undulating, or contorted, and are generally parallel, ſometimes diverging. Splits eaſily in the direction of the fibres. Fragment priſmatic; croſs fracture perpendicular to the former. Moderately tranſlucent. Rather harder than cryſtallized carbonate of lime, which it ſcratches. Specific gravity 2.7. The beautiful variety called ſattin ſpar was firſt diſcovered, in 1798, by Mr. Mawe, in ſmall veins, lying between pyrites in a calcareo-argillaceous ſchiſtus, in the county of Cumberland.

It is ſaid, in ſome late treatiſes on mineralogy, to be found in Derbyſhire; but this miſtake has perhaps ariſen from the circumſtance of its having been wrought into a great variety of beautiful ornaments, as necklaces, lockets, rings, &c. at the manufactory of Brown and Mawe of Derby and Matlock. A variety, but of inferior quality, for the above purpoſes, has been very lately found at Aſhover, in Derbyſhire, in cutting a road to the lime works through the upper bed of toad-ſtone, where it was very abundant in ſmall veins and nodules; and it is a remarkable circumſtance, that all the carbonate of lime found in this toad-ſtone is fibrous; that of the nodules radiating from a centre. It has a conſiderable reſemblance to fibrous gypſum, but may be diſtinguiſhed from it by its great hardneſs, and by its being generally traverſed by veins of greeniſh pyrites. It may be diſtinguiſhed from zeolite by its greater ſpecific gravity and inferior luſtre, and from both theſe and fibrous gypſum, by its efferveſcing with acid. Sattin ſpar is now very rare, the vein being long ſince exhauſted. Analyſis by Mr. Pepys:

Lime	50.8
Carbonic acid	47.6
	98.4

2. *Stalactite, Kalkſinter of Werner*.—Its common colour is white, from which it paſſes into greyiſh, greeniſh, and yellowiſh-white; from theſe it paſſes into the various degrees of yellow, brown, green, blue, &c. deriving its colour from the mineral ſubſtances by which it is accompanied.

Dr. Kidd, in his mineralogy, ſays, that the greeniſh-white ſtalagmite of Derbyſhire owes its colour and peculiar opacity to oxyd of zinc. It occurs moſt commonly maſſive, alſo in a variety of external ſhapes, but moſt often ſtalactitic. Its ſurface is generally rough and droſſy, and the ſtalactites are frequently terminated either by a ſingle cryſtal, or group of cryſtals, ſometimes having the appearance of a cauliflower. Its internal luſtre varies from glimmering to gliſtening, and is generally pearly. Fracture ſtraight, and ſtellularly diverging fibrous. Fragments moſtly indeterminately angular, ſometimes ſplintery and wedge-ſhaped. It occurs moſt commonly in concentric lamellar concretions, which are bent in the direction of the external ſurface. The ſtalactitic and tuberoſe varieties are often hollow. It is conſiderably tranſlucent, in ſome caſes even ſemi-tranſparent. Its hardneſs, frangibility, and ſpecific gravity, nearly the ſame as cryſtallized carbonate of lime.

It is found in all countries where limeſtone, particularly of the older formation, abounds. Its localities are too numerous to mention, but in England the moſt beautiful ſpecimens are found in Cumberland, Durham, Yorkſhire, and particularly Derbyſhire, where it is wrought into various ornaments. It is alſo uſed for purpoſes where very pure lime is wanted, as it is free from many impurities that contaminate common limeſtone.

The alabaſter of the ancients is ſaid to be ſtalactitic carbonate of lime, brought from Arabia, and uſed for the draperies of ſtatues. And it is employed at preſent in Italy for the ſame, and other architectonic purpoſes, under the name of Marmo alabaſtrino. The ramified or coralloid variety, commonly, though improperly, called Flos ferri, as it contains no iron, and on which the count De Bournon has publiſhed his obſervations in the 93d vol. of Philoſophical Tranſactions, under the name of hard carbonate of lime, is brought principally from the iron mines of Stiria, where it is found in veins of ſparry iron ore. From the numerous and contorted branches of which it is formed, ſome have been induced to think it rather the product of ſublimation than aqueous depoſition; and this idea receives ſome confirmation from the circumſtance of this ſpecies of carbonate of lime having been found in true lavas. Its luſtre is very ſplendent and pearly, ariſing from the minute cryſtals that cover the branches, and are ſo inclined to the axes as to reflect the light very abundantly. Theſe cryſtals are figured and deſcribed in the paper above mentioned, and in the mineralogy of count De Bournon, lately publiſhed. Its fracture is vitreous, inclining to ſmall conchoidal; hardneſs ſufficiently great to ſcratch fluor. Specific gravity 2.912. Although chemical analyſis does not diſcover the leaſt difference between this and common carbonate of lime, yet the external characters differ ſo widely, that it is impoſſible not to render them as different ſpecies; in many reſpects it agrees with arragonite, yet in others it differs ſo much from it, that it is at leaſt doubtful whether it ought to be conſidered as being a variety of this laſt ſubſtance.

Fibrous *Root*, in *Vegetable Phyſiology*, conſiſts entirely of fibres, without any tuberous or bulbous part, except ſuch a common baſis, or point of connection, as is neceſſary to hold them together. The fibres, or *radiculæ*, are the only eſſential part of a root, being what immediately abſorbs nouriſhment from the ſoil. They are produced afreſh every year, when vegetation firſt awakes from the torpor of winter, and it is only before they ſhoot forth that plants can be removed, or kept for ſome time out of the ground, in perfect ſafety. The radical fibres of ſuch graſſes as grow in looſe ſand, are uſually very downy, probably to attach them more firmly to ſo ſlippery a ſupport, or to multiply the ſurface, or points of abſorption, in ſo meagre a ſoil.

Graſſes and annual plants, in general, have fibrous roots. Such have a natural direction downwards, and penetrate with facility through the ſofteſt parts of the ſoil, their extremities chiefly being elongated, or rather formed, as they go. If they grow in water, or a perfectly homogeneous ſoil, where the reſiſtance is every where equal, the fibres are quite ſtraight; but this being ſcarcely ever the caſe in ordinary ground, they aſſume that contorted and divaricated ſhape we uſually obſerve in all roots.

Some paraſitical plants have a peculiar kind of fibrous roots, which attach them to the branches or ſtems of trees, and therefore are bare on one ſide. They may abſorb moiſture by that ſide from the air, perhaps in as great abundance as they derive nouriſhment on the other from the tree. See Root.

Fibrous-*rooted Plants*, in *Agriculture*, are all thoſe which have fine thread-like roots which ſpread out laterally near the ſurface of the ground, without ſtriking very deeply into it. They are diſtinguiſhed into ſeveral different ſorts from the nature of the roots and the manner in which they grow. See Fibrous *Roots* and Root.

Fibrous *Roots*, in *Gardening*, all ſuch as conſiſt principally of ſmall filaments or fibres. There are great numbers of plants which have roots of this kind, both of the flower and other deſcriptions. They are likewiſe diſtinguiſhed into different ſorts from the nature of the roots: when the roots penetrate downwards in a direct manner, they are denominated *perpendicular;* where they creep under the ſurface, *horizontal*, and *creeping;* when they are rather thick, *fleſhy;* when extremely thin, *capillary;* where they run all the way undivided, *ſimple;* when they are divided or ſend off ſmaller roots, *branched;* and when covered with very fine ſhort fibres on the ſurface, *hairy*. See Root.

Fibrous *Shells*, in *Natural Hiſtory*, is a name which certain foſſil ſhells have acquired, on account of their breaking abruptly acroſs, and ſhewing a fibrous or tranſverſely ſtriated texture, which occaſions their thus breaking ſhort, and being ſo brittle, that very few indeed of the ſhells can be obtained whole. A very ſingular kind of theſe fibrous ſhells abounds in certain beds of the chalk ſtrata, moſtly in ſquare ſmall fragments; and the flints which interlay the chalk beds have often, in theſe caſes, their fragments ſet or imbedded in their ſolid ſubſtance. Often when theſe flints are found among alluvial matter, and broken, the pieces of fibrous ſhells are decompoſed and gone, and a ſingular narrow and deep cavity, like a ſmall mortiſe-hole, is left; a circumſtance which moſt obſervers, in or to the weſt of chalk diſtricts, cannot fail to have noticed. In the great alluvial maſſes of Bedfordſhire, at ten or fifteen miles from the edge or ending of the chalk ſtrata, theſe flints, with fibrous ſhells in them, and ſometimes large and nearly perfect fibrous ſhells, are found among the flints and other ruins or ſpolia (as Woodward calls it) of the chalk ſtrata, which is mixed with the clay of the ſtrata, ſuperior to the chalk, as ſhould ſeem from the large Ludus Helmontii and others of its products, which are found mixed in the greateſt confuſion, through the ſubſtance of hills, many miles long, one or two wide, and eighty or one hundred feet high, which are there found, of theſe diſtant alluvial matters, covering the regular ſand and other ſtrata of the diſtrict; and wherein fragments of grey-weathers, the produce of the uppermoſt ſand ſtrata above the chalk, are found, ſome of them weighing a ton or more.

Fibrous *Spar*, in *Mineralogy*, is a variety of calcareous ſpar, (carbonate of lime,) found in Derbyſhire and elſewhere, which is often mamelated on the ſurface, owing probably to hollows in the ſurface of the fiſſure or crack which it once filled; the fibres or ſtria of this ſpar croſs it tranſverſely, and occaſion its ſudden and eaſy fracture, like the fibrous ſhell above deſcribed. Fibrous ſpar is very common in the fiſſures near the top of the firſt or upper toadſtone, as in the entrance cut to Hockley lime-quarry, near Aſhover town, a quarter of a mile N.E. of Bonſal church, in Longſtone-edge mine in Longſtone, Weſtedge mine in Aſhover, &c.

Another kind of fibrous calcareous ſpar (ſulphate of lime or gypſum,) is dug at Elvaſton, Chelhaſton, Tutbury, and other places, in or near Derbyſhire; it lies in thin ſtrata, the fibres or ſtria of which croſs it vertically, and occaſion nearly a ſimilar fracture in that direction to thoſe of the ſpar and ſhell above deſcribed

FIBULA, in *Anatomy*, the ſmall bone of the leg.

Fibula, in *Natural Hiſtory*, a name given to a claſs of the *echinodermata*, which have their mouth in the middle of the baſe, and the aperture of the anus on one edge. Theſe are found principally among the foſſil kinds, and ſeem to have had their ſhells of the aſſulated kind, or compoſed of ſmall plates joined tranſverſeley to one another. Of this claſs there are two genera, the *conulus* and *diſcoides*.

Fibula, in *Surgery*, an inſtrument in uſe among the ancients, for the cloſing of gaping wounds.

Celſus ſpeaks of the fibula, as to be uſed when the wound was ſo patent as not eaſily to admit of being ſewed. Op. lib. vii. cap. 25. apud fin.

Authors are ſomewhat at a loſs as to the form of the ancient fibula. Guido ſays there were iron circles, or ſemicircles, bent backwards both ways; the hooks whereof, being faſtened on both ſides to the wound, anſwered exactly to each other; but as this muſt have been an inſupportable pain to the patient, this deſcription is generally ſet aſide.

Fallopius, Sanctorius, and others, take the word fibula to have ſignified, in reality, no more than the ſewing up of the wound with a needle and thread, as uſed at this day.

Fibula, *Luxation* of. See Luxation.

FICARIA, in *Botany*, Pilewort, ſo called by Brunfelſius and other old writers, on account of the fig-like tubercles of the root, which reſembling the diſeaſe called the piles, the plant was ingeniouſly ſuppoſed to be a remedy for that complaint. The next ſtep was to affirm it to be ſo, as we find in ſuch writers, "either applied outwardly, or taken internally." As it is very acrid, and even cauſtic, we cannot recommend a trial.

Hudſon eſtabliſhed the *Ficaria* as a ſeparate genus from *Ranunculus*, ſee Fl. Angl. 244, on account of the ſmaller number of its calyx-leaves, and greater number of its petals; but he has not been followed. *Ranunculus* is too natural a genus to admit of ſuch a ſeparation on artificial principles alone.

FICEDULA, in *Ornithology*, a name given to ſeveral ſpecies of *Motacilla*, (which ſee.) See alſo Turdus *trichas*, Muscicapa *Atricapilla*, and Parus *Americanus*.

FICHANT, Figens, a French term uſed in *Fortification:* thus, a flank fichant, or a line of defence fichant, is a place, whence the ſhots made do not only raſe the oppoſite face to be defended, but alſo enter within it.

The word is formed of *ficher, to ſtick a thing in.*

FICHE', in *Heraldry*. See Fitchee.

FICHERUOLO, in *Geography*, a town of Italy, in the department of the Lower Po, on the Po; 13 miles W.N.W. of Ferrara.

FICHTELBERG, a mountain of Franconia, which extends from the vicinity of Bareuth to Eger in Bohemia. It is one of the higheſt mountains in Germany, and contains in it many deſerts, rocks, bogs, and moraſſes. It takes its name from the great number of pines, with which it is covered; it has alſo many oaks, beech, elm, and other kinds of trees. The extent in length is 22 Engliſh miles, and 16 miles in breadth. The ſummits have various names: the Ochſenhopf being reckoned the higheſt. The lake, called "Fichtelſee," is a cavity of this mountain, called the See Loh, and is remarkable merely as the ſource of the White Mayn. Other parts of this mountain give riſe to the Eger, which runs to the E., and the Sala and Nab flowing to the N. and S.

FICINUS, Marsilius, in *Biography*, a celebrated phyſician, divine, and philoſopher, was born at Florence A. D. 1433. His father being phyſician to Coſmo de Medicis, the ſon was noticed by that liberal prince; and on the death of his father, Marſilius obtained the ſame honourable diſtinction. He ſtudied not only medicine and divinity, but acquired the knowledge of both vocal and inſtrumental muſic, and could perform upon ſeveral inſtruments. He was profoundly ſkilled in the Latin, Greek, and other learned languages. Under the patronage of the houſe of the Medici, he might have acquired not only fame, but wealth; more eſpecially after he had, by taking holy orders, rendered himſelf capable of holding the valuable preferments in the church, belonging to that illuſtrious family. But, a total ſtranger both to covetouſneſs and ambition, Ficinus was content with the appointment of a canonry in the great church of St. Laurentius, in his native city, and ſome ſmall eſtates in the vicinity, beſtowed upon him by his patron. Although now an eccleſiaſtic, who exerciſed the duties of his profeſſion, yet he continued to practiſe phyſic; the profits from which latter profeſſion he devoted to the uſe of his nephews and nieces, and other collateral poor branches of his family. The cardinal John de Medicis, having been raiſed to the ſovereign pontificate, under the name of Leo X. Ficinus received an acquiſition to his fortune. He was appointed profeſſor of philoſophy, he became exceeding popular, and his lectures were crowded with ſtudents from every country; many of whom, becoming in their turn celebrated, enhanced ſtill higher the profeſſor's fame. He certainly appears to have poſſeſſed great merit in the didactic chair, although in his illuſtrations he adopted the reveries of judicial aſtrology; but in this he was not ſingular; it was a mania that ſeized moſt of his cotemporaries among the philoſophers. He ſpent much of his time at his country houſe, Corregio, near Florence, at which agreeable retreat he was viſited by numerous friends, who, like him, could reliſh the refined pleaſures of rational retirement, and the charms of philoſophical converſation. So reſpected was he, that Ficinus could number among his friends ſome of the ableſt of mankind, and the moſt exalted in rank: doctors, philoſophers, biſhops, cardinals, and even princes; the celebrated patron of every thing great and good, Lorenzo the magnificent, eſteemed it an honour to be claſſed in the number. The ſolitude that he adopted aroſe from motives of inclination and neceſſity. Habitually contemplative, retirement was pleaſing; and naturally exceeding delicate, repoſe from the buſtle and cares of public life at times became eſſential to his exiſtence on earth. Senſible of his infirmity, he endeavoured to preſerve his health by means bordering upon ridiculous ſuperſtition. He would, it has been obſerved, change his calotte, or under cap, ſix or ſeven times an hour. All methods, however, proved unavailing, ſo that he at length fell a victim to a weak conſtitution, at the age of ſixty-ſix, A.D. 1499. Sweetneſs of temper, moderation in diſputation, and modeſty of manners, were features eminently conſpicuous in his character; and he was no leſs diſtinguiſhed by his extenſive learning, than his genuine piety, ſave that the former perhaps was too much tinctured with the Grecian philoſophy, and the latter too ſtrongly ſhaded with the gloom of ſuperſtition.

His works are numerous and diverſified; they contain obſervations upon phyſical, metaphyſical, moral, and religious ſubjects. Opuſcula de Sole & Luna, various tranſlations from the works of Plato, Plotinus, Jamblichus, Proclus, and other Platoniſts; and the Platonic ſyſtem thus became faſhionable in Italy. The tranſlations are not always accurate, and through all a bias is evident in favour of that philoſophy. He would feign perſuade his readers, the writers of that ſchool muſt have been believers in divine revelation. His Theologia Platonica was printed at Florence in 1482; his Epiſtolæ, in twelve books, at Venice, 1495; and his whole works were collected and publiſhed in two volumes, folio, at Baſle, in 1576. Moreri, Grand Dictionnaire Hiſtorique.

FICK, in *Rural Economy*, a term ſignifying to ſtruggle with the legs, as a cow in the tie, or a horſe in the fetters, &c.

FICKLETOW, in *Agriculture*, is a term which is ſometimes applied to the fore-tackle, or carriage which ſupports the plough-team.

FICOIDEA, in *Botany*. See AIZOON, ſpecies 2d.

FICOIDEÆ, the 87th natural order in Juſſieu's ſyſtem, or the 5th of his fourteenth claſs. The name is taken from *Ficoides*, applied by Tournefort to the *Meſembryanthemum* of Linnæus, which is one of this order. The definition of this claſs is, *Cotyledons* two. *Flowers* polypetalous. *Stamens* inſerted into the *calyx*, which is of one leaf, ſuperior or inferior, divided more or leſs deeply. *Corolla* inſerted into the calyx, generally polypetalous, ſometimes wanting, rarely monopetalous, by a concretion, as it were, of ſeveral petals into one. *Stamens* definite or indefinite in number, often diſtinct, ſometimes united by their filaments. *Germen* ſuperior, ſimple or manifold, or rarely inferior and ſimple. *Styles* one or many to each germen, ſometimes none; ſtigma entire or divided. *Fruit* ſometimes ſimple, ſuperior or inferior, of one or many cells; ſometimes, but rarely, manifold, ſuperior, each pericarp being of one cell. Sometimes, by abortion, the ſexes become ſeparate in different flowers.

The *Ficoideæ* are thus characterized. *Calyx* of one leaf, inferior or ſuperior, definitely divided. *Petals* moſtly indefinite, inſerted into the upper part of the calyx; ſometimes wanting, in which caſe the calyx is coloured within. *Stamens* more than twelve, often numerous, inſerted into the ſame part; anthers oblong, incumbent. Germen ſimple, ſuperior or inferior; ſtyles ſeveral; ſtigmas as many. *Fruit* either a capſule or berry, with as many cells as there are ſtyles, each containing ſeveral ſeeds attached to their inner angle. *Embryo* incurved, ſurrounding a farinaceous albumen. *Stem* herbaceous or ſomewhat ſhrubby. *Leaves* oppoſite or alternate, generally ſucculent, moſtly various in ſhape. The firſt ſection, which has a ſuperior germen, contains *Reaumuria, Nitraria, Seſuvium, Aizoon,* and *Glinus*, with *Orygia* of Forſkall; the ſecond, with an inferior germen, has *Meſembryanthemum* and *Tetragonia*. The plants of this natural order are alkaleſcent, ſecreting of themſelves *ſoda*, or foſſil alkali, independently of ſoil or ſituation, though they naturally grow for the moſt part in maritime places.

FICOIDES. See MESEMBRYANTHEMUM.

FICORONI, FRANCISCO DÉ, in *Biography*, a learned and celebrated Roman antiquary, author of an excellent treatiſe on the theatrical maſques of the ancient Romans, with engravings from ancient gems, cameos, marbles, and bronzes, upon nearly 100 plates well executed, and firſt publiſhed at Rome in 1736, 4to. This work is replete with erudition on the ſubject, and is at once curious, amuſing, and inſtructive. It is peculiarly connected with dancing, ſaltation, comic ſcenes, and the muſical declamation and melody of the ancients. The wide mouth in the form of a ſhell, ſays Ficoroni, ſo common in the ancient maſks, ſerved to augment the power of the voice, upon the principle of a ſpeaking-trumpet. "Quella bocca a conchiglia, che ſi vede in altre maſchere, ſerviva per ingrandire la voce, come ſuccede nelle trombe a proporzione." See MASQUES.

FICTA, *Lat.* feigned; as *Muſica ficta*, muſic tranſpoſed out of the hexachords to keys that require flats and ſharps, uſed in old times to be thus called. Fa fictum, *f* ※.

FICTION. See FABLE.

FICTION *of a perſon in Rhetoric*. See PROSOPEIA.

FICTION *of Law, Fictio Juris*. Fictions are allowed of in law, in ſeveral caſes, but muſt be framed according to the rules of law, not what is imaginable in the conceptions of man; and there ought to be equity and poſſibility in every legal fiction. There are many of theſe fictions in the civil law; and by ſome civilians it is ſaid to be an aſſumption of law upon an untruth for a truth, in ſomething poſſible to be done, but not done. (Godolphin and Bartol.) The ſeiſin of the conuſee in a fine is but a fiction in our law; it being an inverted form of conveyance only. (1 Lill. Abr. 610.) And a common recovery is *fictio juris*, a formal act or device by conſent, where a man is deſirous to cut off an eſtate tail, remainders, &c. (10 Rep. 42.) The proceedings in ejectments are alſo grounded on a fiction of law. By fiction of law, a bond made beyond ſea may be pleaded to be made in the place where made, *viz.* in Iſlington, in the county of Middleſex, &c. in order to try the ſame here; without which it cannot be done. (Co. Litt. 261.) And thus it alſo is in ſome other caſes; but the law ought not to be ſatisfied with fictions, where it may be otherwiſe really ſatisfied; and fictions in law ſhall not be carried further than the reaſons which introduce them neceſſarily require. 1 Lill. Abr. 610. 2 Hawk. 320.

FICTITIOUS PLAINTIFF, denotes one not in being at all, or one who is ignorant of the ſuit. The offence of ſuing another in the name of ſuch a plaintiff, if committed in any of the king's ſuperior courts, is left, as a high contempt, to be puniſhed at their diſcretion. But in courts of a lower degree, where the crime is equally pernicious, but the authority of the judges not equally extenſive, it is directed by ſtat. 8 Eliz. c. 2. to be puniſhed by ſix months' impriſonment, and treble damages to the party injured.

FICUS, in *Botany*, an ancient Latin word of uncertain derivation. The Fig-tree. Linn. Gen. 555. Am. Acad. v. 1. 23. Schreb. 746. Vahl. Enum. v. 2. 181. Juſſ. 400. Tourn. t. 420. Gærtn. t. 91. Mart. Mill. Dict. v. 2. Claſs and order, *Diœcia Triandria*. Linnæus placed it in *Polygamia Triœcia*, becauſe the *Caprificus*, or Wild fig as it is called, has entirely male bloſſoms, while the cultivated figs have on one tree more perfectly male, on another female, flowers. The different ſtructure of the partial calyx in the two flowers, authorizes its being kept in *Diœcia* at leaſt, though Vahl removes it to *Triandria Monogynia*. Nat. Ord. *Scabridæ*, Linn. *Urticæ*, Juſſ.

Gen. Ch. *Common Receptacle* ſomewhat globular, fleſhy, concave, cloſed with ſeveral ſcales within the orifice. Its inſide is lined entirely with numerous florets; the uppermoſt, or thoſe neareſt the orifice, being males; the reſt, more numerous, females; all ſeparately ſtalked.—Male, *Cal.* Perianth deeply three-cleft, rarely more, erect; its ſegments lanceolate, erect, equal. *Cor.* none. *Stam.* Filaments three, briſtle-ſhaped, the length of the calyx; anthers two-lobed. *Piſt.* a deciduous twiſted rudiment only.—Female, *Cal.* Perianth inferior, in five deep, lanceolate, pointed, ſtraight, nearly equal ſegments. *Cor.* none. *Piſt.* Germen oval, filling the perianth; ſtyle awl-ſhaped, inflexed, lateral; ſtigmas two, pointed, reflexed, unequal. *Peric.* none, except the perianth enlarged and become pulpy. *Seed* one, roundiſh, compreſſed.—The male florets are commonly abortive in all the figs of one tree, the female ones on another. Thoſe figs which are entirely male, as above-mentioned, are conſidered as moſt effectual for impregnation, and for conſequently improving the fruit of the female trees. Hence the curious hiſtory of *Caprification*. See that article.

Eſſ. Ch. Common receptacle roundiſh, fleſhy, cloſed, lined internally with ſeparated florets. Male, Calyx in three deep ſegments. Corolla none. Female, Calyx in five deep ſegments. Corolla none. Piſtil one. Seed one.

The ſpecies of this moſt natural genus are prodigiouſly more numerous than Linnæus had any idea of. His lateſt edition contains but 17. Vahl, whoſe liſt is the moſt complete of any, has 92. Even this number we have it in our power greatly to augment.

It is neceſſary briefly to enumerate all Vahl's ſpecies, in order to contraſt our new ones with them. We therefore take this opportunity of reviewing the whole genus, as there is much to correct, not only in what he has done, but in what regards the original ſpecies of Linnæus, the hiſtory of which could not be cleared up, but by an examination of the Linnæan Herbarium.

Section 1. *Leaves undivided and entire.*

1. F. *religioſa*. Linn. Sp. Pl. 1514. (Arealu; Rheede Hort. Mal. v. 1. 47. t. 27.) "Leaves ovate or heart-ſhaped, entire, very long-pointed. Fruit ſeſſile."—Native of the Eaſt Indies, where it is treated by the Hindus with ſuperſtitious veneration, their god Viſhnu having been ſuppoſed to be born under it. Chriſtians civilly call it the Devil's tree. The *leaves* are evergreen, ſmooth and ſhining, of a fine green, alternate, on long ſtalks, elegantly pendulous. *Fruit* the ſize of a large pea, dry and taſteleſs. This tree grows readily in our ſtoves.

2. F. *populifolia*. Vahl. Symb. v. 1. 82. t. 22.—"Leaves neatly cordate, acute. Fruit ſtalked, in pairs."—Native of Arabia, miſtaken by Forſkall for the preceding. *Fruit-ſtalks* an inch long. Whole plant very ſmooth.

3. F. *Pilaſhi*.—Leaves ovate, ſomewhat heart-ſhaped, pointed, very ſmooth, finely veined. Fruit ſolitary, ſeſſile, globoſe.—Gathered by Dr. Buchanan at Narain hetty in Nepal, in Dec. 1802. The Nawars call it *Pilaſhi*. It is a tree, generally paraſitical. *Leaves* about three inches long, on ſtalks one-third their length, reſembling the leaves of a Poplar. *Fruit* ſmooth, the ſize of a black currant.

4. F. *umbellata*. Vahl. Enum n. 3. "Leaves exactly heart-ſhaped, long-pointed, ſmooth. Fruitſtalks three to five in an umbel."—Found by Thonning in Guinea. *Tree* very tall and ſpreading. *Fruit* the ſize of a plum.

5. F. *nymphæifolia*. Linn. Mant. 305.—"Leaves heart-ſhaped, roundiſh, pointed, ſmooth, glaucous beneath."—Native of the Eaſt Indies. *Leaves* like thoſe of *Nymphæa alba* in ſize and figure, but very glaucous beneath. *H. Linn.*

6. F. *cordata*. Thunb. Diſſ. 8. fig. 1.—"Leaves ovate, ſomewhat heart-ſhaped, acute, ſmooth, leathery. Stem ſhrubby, erect."—Cape of Good Hope. *Thunb.* A ſmooth *ſhrub*, of a moderate ſize. *Fruit* ſeſſile about the upper part of the branches, the ſize of a ſmall pea.

7. F. *polita*. Vahl. Enum. n. 7.—"Leaves ovate, inclining to heart-ſhaped, pointed, ſmooth, even, entire."—Found in Guinea by Iſert. *Leaves* two inches or more in length, veiny. *Fruit* ſtalked, ſmooth, globoſe, the ſize of a hazel-nut.

8. F. *Chanas*. Forſk. Arab. 219.—"Leaves heart-ſhaped, rough."—Native of mountains in Arabia, where it is called Chanas. It reſembles F. *Sycomorus*, n. 85, except in the aſperity of its leaves, and like that has an eatable fruit. We have ſpecimens gathered by the late ſir George Staunton in the iſland of St. Jago, under the name of *Sycomorus*, which appear to be the *Chanas*.

9. F. *coſtata*. Ait. H. Kew. v. 3. 452.—"Leaves ovate, heart-ſhaped, with a deep narrow ſinus; entire, ſmooth, acute, green on both ſides."—Eaſt Indies.

10. F. *lævigata*. Vahl. Enum. n. 9.—"Leaves heart-ſhaped, ovate, pointed, veiny, very ſmooth. Fruit ſtalked, globoſe, ſmooth."—Weſt Indies. *Leaves* three or four inches long, very finely veined. *Fruit* ſize of a cherry, three-lobed at the orifice. *Vahl.*

11. F. *lentiginoſa*. Vahl. En. n. 10.—"Leaves ovate-oblong, ſomewhat heart-ſhaped, pointed. Fruit lateral and axillary, ſtalked, in pairs."—Gathered by Mr. Ryan in the iſland of Montſerrat. *Leaves* thin, three or four inches long, veiny. *Fruit* the ſize of a pea, with a minute calyx under it.

12. F. *ſcabra*. Forſt. Prod. 76.—"Leaves ovate, ſomewhat heart-ſhaped, oblique, rough beneath. Fruit top-ſhaped, without a calyx."—Found by Forſter at Tanna and Namoka. *Leaves* half a foot long, remotely toothed; roughiſh above; rough, paler, ſlightly downy beneath. *Vahl.*

13. F. *citrifolia*. Lamarck. Dict. v. 2. 494. (Plum. Ic. t. 131. f. 2.)—"Leaves oval, ſomewhat heart-ſhaped, ſharpiſh, entire, ribbed, ſmooth on both ſides. Fruit globoſe, ſolitary, ſtalked, axillary."—Weſt Indies. Cultivated in the Paris garden. *Leaves* more heart-ſhaped at the baſe than Plumier repreſents them. *Figs* bigger than a walnut, green, white within, almoſt taſteleſs. *Lamarck.*

14. F. *lucida*. Ait. H. Kew. v. 3. 451.—"Leaves ovate, heart-ſhaped, entire, ſmooth, obtuſe, three-ribbed at the baſe. Branches erect."—Imported in 1772, from the Eaſt Indies, by Mr. W. Malcolm. *Leaves* about a foot long, nearly elliptical, ſtalked, of a fine green, ſhining, veiny.

15. F. *ſcandens*. Lamarck. Dict. v. 2. 498. (F. ſtipulata; Ait. H. Kew. v. 3. 452.) Leaves heart-ſhaped, unequal at the baſe, ſmooth, reticulated with veins beneath. Stipulas acute. Branches thread-ſhaped, creeping.—This is ſuppoſed to be a native of the warmer parts of America. It is common in the European ſtoves. The *ſtems* creep up the walls, and throw out numerous, alternate, ſubdivided, ſlender, leafy, downy branches, making an elegant evergreen tapeſtry. *Leaves* alternate, on very ſhort downy ſtalks, heart-ſhaped, obtuſe, entire, unequal at the baſe, dark ſhining green, ſmooth, reticulated with paliſh veins beneath. *Stipulas* intrafoliaceous, in pairs, as long or longer than the footſtalk, brown, membranous, ovate, pointed. It has never fruited in England or France, but we have received from the ſtoves in the royal gardens near Liſbon, by favour of Mr. Correa, branches laden with fruit, of a top-ſhaped form, purple, nearly as big as common figs, but inſipid, which were poſitively aſſerted to be produced by the plant in queſtion. Theſe branches moreover are thick, firm, and ſtraight, furrowed, bearing leaves ten times as large as thoſe above deſcribed, quite coriaceous, exactly ovate or elliptical, equal at the baſe, exquiſitely reticulated with prominent veins beneath, and punctated between them, as well as a little hairy. The whole, in ſhort, of theſe ſpecimens accords with F. *pumila*, n. 46, hereafter deſcribed, and nothing but our perfect confidence in our correſpondent's accuracy could induce us to believe there were not ſome miſtake. Lamarck mentions Mr. Correa's information, but had ſeen no ſpecimens.

16. F. *ſtipulata*. Thunb. Diſſ. 8.—Leaves heart-ſhaped, unequal at the baſe, reticulated with hairy veins beneath. Sipulas acute. Branches round, decumbent.—Native of Japan. *Thunb.* China. Herb. Linn. The *branches* are decumbent and creeping, compound, round, minutely downy, reddiſh brown, often ſcaly with the permanent ſtipulas after the leaves are fallen. *Leaves* much like the laſt, but the veins at the back are ſtronger, more crowded, and more curiouſly reticulated; as well as roughiſh or hairy. *Stipulas* like the former. *Fruit* unknown. We are inclined to think, if this be diſtinct from the laſt, of which there is ſome queſtion, that F. *pumila* may be this in a perfect ſtate.—We have other ſpecimens of creeping kinds, which perhaps undergo a ſimilar metamorphoſis when they fructify,

and which ought to teach botaniſts caution in defining the ſpecies of this genus.

17. F. *ſagittata*. Vahl. En. n. 16.—"Leaves heart-ſhaped, oblong, acute, rough on both ſides. Stem creeping."—Native of Java, where it runs up trees. *Herb. Linn.* *Stem* creeping, by roots oppoſite to each leaf, downy when young. *Leaves* alternate, two or three inches long, heart-ſhaped, equal at the baſe, entire, acute, roughiſh to the touch, dotted beneath. *Footſtalks* downy, near half an inch long. *Stipulas* lanceolate. Our deſcription will be found to differ a little from Vahl's, but not materially.

18. F. *pedunculata*. Ait. H. Kew. v. 3. 450. (F. arbor americana, &c. Pluk. Alm. t. 178. f. 4.) "Leaves ovate-oblong, heart-ſhaped, acute, ſmooth. Fruit globoſe, on long twin ſtalks."—Native of America and the Weſt Indies. Jacquin firſt ſent it to Europe from Martinico, and it was long kept in the gardens for F. *indica*. *Leaves* from three to ſix inches long, and one or two broad, ſmooth; paler and opaque beneath. *Fruit* the ſize of a pea.

19. F. *venoſa*. Ait. H. Kew. v. 3. 451. (Tsjakela; Rheede H. Mal. v. 3. 87. t. 64.)—"Leaves ovate, ſomewhat heart-ſhaped, acute, ſmooth, with impreſſed dots above. Fruit ſeſſile, cluſtered, globoſe."—Native of the Eaſt Indies. The *leaves* are a ſpan long, two or three inches broad, on long ſtalks. *Fruit* the ſize of pepper-corns.

20. F. *radicalis*. Leaves lanceolate, acute, ſmooth. Fruit in radical cluſters.—Gathered by Dr. Buchanan in the Eaſt Indies, probably in the Myſore country. *Stem* ſhrubby, branched, ſmooth. *Leaves* crowded, three or four inches long, ſcarcely one broad, pointed, paler beneath, minutely dotted, but not rough to the touch. *Footſtalks* ſcarcely an inch long. *Stipulas* longer, lanceolate, deciduous. *Fruit* in cluſters from the root.

21. F. *neriifolia*. Leaves elliptic-lanceolate, pointed, ſmooth, with parallel veins. Fruit top-ſhaped, ſeſſile, ſlightly furrowed.—Gathered in Feb. 1803, at Narain hetty in Nepal, by Dr. Buchanan. It is called there *Dud Cuſhi*. *Stem* arboreſcent. *Branches* furrowed, ſmooth. *Leaves* yellowiſh green, about three inches long, with narrow linear points, and numerous parallel, tranſverſe veins. *Footſtalks* furrowed, hardly an inch long. *Fruit* ſolitary or in pairs, ſize of a hazel-nut, or perhaps larger when ripe.

22. F. *lutea*. Vahl. En. n. 19.—"Leaves oval-oblong, pointed, ſomewhat emarginate at the baſe, ſmooth. Fruit in pairs, globoſe, ſeſſile. Calyx four-cleft."—Native of Guinea. *Thonning.*—A tall *tree*. *Leaves* from four to eight inches long, coriaceous, with white ribs, and fine reticulations. *Fruit* axillary, ſcarcely ſo big as a cherry, yellow, cheſnut-coloured when ripe.

23. F. *ovata*. Ibid. n. 20.—"Leaves ovate-oblong. Fruit ſeſſile, in pairs. Common calyx hood-ſhaped, deciduous; that of the fruit torn into two parts."—Gathered by Thonning in Guinea. A tall *tree*, with ſomewhat whorled branches, often rooting. *Leaves* from five to eight inches long, rather leathery, with white ribs. Young fruit covered with a fleſhy veil, cut round at the baſe as the fruit ſwells, and deciduous. *Figs* the ſize of plums, inclining to ovate.

24. F. *calyptrata*. Ibid. n. 21.—"Leaves ovate, rather oblong. Fruit in pairs. Common calyx, and that of the fruit, hood-like, deciduous."—Gathered by Thonning in Guinea.—A tall ſpreading *tree*. *Leaves* rather pointed, ſomewhat coriaceous, with white ribs and fine veins, five inches long. *Fruit* ſeſſile, globoſe, orange-coloured, ſmaller than a cherry, with a double cap-like deciduous covering.

25. F. *Granatum*. Forſt. Pl. Eſcul. 37.—"Leaves ovate, entire. Fruitſtalks terminal, in pairs, horizontally divaricated. Fruit globoſe, with a calyx."—Native of the iſle of Tanna, where it is alſo cultivated for the ſake of the fruit, which is ſweetiſh, but watery and rather inſipid, larger than common figs, red with yellow ſpots, and ſlightly downy; internally purple, ſoft and pulpy. The *tree* is tall, with an angular rugged trunk, and long aſcending branches. *Leaves* a ſpan long, ſmooth, dark green above, with a few yellow veins; brighter underneath. *Fruit* on ſhort thick ſtalks, from the boſoms of the uppermoſt leaves. *Buds* terminal, ſharp-pointed, clothed with brown hairs. *Forſter.*

26. F. *ſeptica*. Burm. Ind. 226. Rumph. Amb. v. 3. 153. t. 96. (Handur-alu; Rheede H. Mal. v. 3. 77. t. 59.)—Leaves ovate, pointed. Stem erect. Fruit ſolitary, axillary, top-ſhaped, on ſhort curved ſtalks.—Native of the Eaſt Indies. "*Branches* round and ſmooth. *Leaves* ſix or ſeven inches long, broad-oblong, membranous, very ſmooth, glaucous beneath, veiny, tipped with a ſharp point an inch in length. *Stipulas* lanceolate. *Footſtalks* round, two inches long, coloured at the top and bottom. Rheede's figure wants the point of the leaf." *Vahl* from Juſſieu's herbarium.

27. F. *Taab*. Forſk. Arab. 219.—"Leaves in pairs, ſtalked, ovate, entire."—Gathered by Forſkall at Zebid in Arabia, where it is called *Taab*. The *leaves* are four inches long. No other botaniſt appears to have ſeen this ſpecies.

28. F. *Ampelos*. Burm. Ind. 226. Lam. Dict. v. 2. 496. (Folium politorium, Ampelaas; Rumph. Amb. v. 4. 128. t. 63. Teregam; Rheede H. Mab. v. 3. 79. t. 60?)—"Leaves ovate, acute, rough. Fruit ſolitary, ſtalked, rough, with an open ſcaly mouth."—Native of Malabar. The *branches*, *footſtalks* and *leaves* are extremely rough, with minute cartilaginous points; the latter are about a ſpan long, three-ribbed, but the lateral ribs are ſhort, and run into fine tranſverſe veins, as Rumphius deſcribes them. His ſynonym appears to us more certain than that of Rheede, whoſe leaves are too ſmall, and fruit unlike our ſpecimens. The latter may poſſibly be F. *politoria* of Loureiro, quoted by Vahl under *Ampelos*, as that is ſaid to have ſmall leaves. The *fruit* in our's is like a ſmall gooſeberry, rough, the mouth beſet with numerous, prominent, recurved ſcales. *Fruitſtalks* axillary, ſolitary, recurved, very rough, half an inch long.—The leaves are ſaid to be very uſeful for poliſhing fine cabinet work, or toys, of wood, ivory or coral. They are not, however, ſo fine a file as Dutch ruſhes, *Equiſetum hyemale*. The Amboyna name, as made into Greek by Burmann, only tends to deceive.

29 F. *pyrifolia*. Burm. Ind. 226. (Itty-alu; Rheede H. Mal. v. 1. 45. t. 26, according to Vahl.)—"Leaves ovate, pointed, fringed."—Native of Japan. *Burm.* Eaſt Indies, according to Juſſieu's herbarium. *Vahl.* The latter deſcribes the *leaves* as quite ſmooth, two inches long. *Fruit* globoſe, rather bigger than a pea, rough with elevated points. *Fruitſtalk* very ſhort. It ſeems not certain that Vahl and Burmann mean the ſame plant, and the former copies the very ſame ſynonym of Rheede, after Linnæus, for F. *benjamina* in his next paragraph.

30. F. *benjamina*. Linn. Mant. 129. (F. arbor, denſioribus foliis parvis integris Amboinenſis; Pluk. Phyt. t. 243. t. 4. Varinga parviflora; Rumph. Amb. v. 3. 139. t. 90?) Leaves ovate, pointed, tranſverſely ſtriated, ſmooth-edged. Fruit axillary, ſolitary, ſtalked. Found in various

parts of the Eaſt Indies. It forms a tall *tree*, with innumerable, ſlender, zig-zag, leafy *branches*, with a rugged bark. *Leaves* an inch or inch and half long, ſtalked, exactly ovate, with an elongated point, entire, very ſmooth and ſhining, diſtinguiſhed by numerous, tranſverſe, ſtraight, parallel veins, which do not reach the edge. The *fruit* is axillary, ſolitary, on a ſtalk a quarter of an inch long, bearing two or three ſmall round ſcales about the middle, and ſeveral more under the fruit, which, in the very early ſtate now before us, is the ſize of muſtard-ſeed, ſmooth, crowned with two or three long projecting ſcales from its mouth, ſo like ſtigmas, that if we had not the ſanction of the moſt able botaniſts, we ſhould have great doubt of this being a *Ficus*.

31. F. *infraſoliacea*. Buch. MSS.—Leaves ovate-oblong, taper-pointed, entire, ſmooth. Fruit below the leaves, ſcattered, ſtalked, globoſe.—Gathered by Dr. Buchanan in March 1803, by the way ſide at Lohiar in Nepal. This *tree* has the aſpect of F. *religioſa*. *Leaves* deciduous, about three inches long, and above one broad, with ſeveral parallel tranſverſe veins, and innumerable reticulated ones between them. *Footſtalks* an inch or inch and half long, ſmooth, channelled. *Stipulas* downy, deciduous. *Fruit* from about the top of the laſt year's ſhoots, globoſe, ſmooth, the ſize of a gooſeberry, on ſhortiſh thick ſtalks, moſtly ternate.

32. F. *macrophylla*. Roxb. and Buch. MSS.—Leaves roundiſh-ovate, pointed, five-ribbed at the baſe; ſmooth above; finely downy beneath.—Native of the Eaſt Indies. Young *branches*, *ſtipulas* and *footſtalks* downy, as well as the back of the *leaves*, which are eight or ten inches long and ſix or eight broad, wavy at the edge, paler beneath, reticulated with innumerable tranſverſe rectangular veins.

33. F. *benghalenſis*. Linn. Sp. Pl. 1514. Trew, Ehrh. t. 50. (Peralu; Rheede H. Mal. v. 1. 49. t. 28.)—Leaves ovate-oblong, obtuſe, ſmooth above; ſomewhat downy beneath; ribs radiating from above the baſe. Fruit globoſe, ſeſſile, crowded.—Frequent in the Eaſt Indies. A tall and ſtout *tree*. *Leaves* coriaceous, rather elliptical, four or five inches long, minutely downy beneath, their five ribs meeting a little way above the baſe. *Fruit* generally in pairs or crowded, as large as a bullace plum, red, downy, encompaſſed with a broad calyx, of ſeveral downy leaves, at the baſe. Our ſpecimen from the *Hortus Cliffortianus* agrees with one ſent by Dr. Roxburgh from Bengal. In both the leaves are decidedly downy beneath, though deſcribed as ſmooth. We have alſo from Dr. Roxburgh what ſeems a variety, with rather narrower leaves, very downy beneath, and fruit no bigger than peas, equally downy, generally in pairs, and very abundant.

34. F. *rubiginoſa*, Ventenat Jard. de la Malmaiſon, t. 114.—Leaves elliptical obtuſe; ſmooth above; downy and ruſty beneath. Fruit globoſe, nearly ſeſſile. Calyx downy, almoſt as long as the fruit.—Native of New Holland. Cultivated in the greenhouſe at Kew, where it fruits about midſummer. *Stem* ſhrubby, with thick downy branches. *Leaves* three or four inches long, and two broad, coriaceous, evergreen, ſtalked, clothed beneath, eſpecially when young, with ſoft, dark, ruſty, purpliſh down, and furniſhed with numerous tranſverſe parallel veins, of which the lowermoſt do not grow in a radiating manner like the laſt ſpecies. *Fruit* axillary, ſolitary, the ſize of a ſloe, reddiſh, dotted, enveloped, till half grown, in the brown downy calyx.

35. F. *calloſa*. Willd. Diſſ. 25. t. 4. Vahl. Enum. n. 29.—"Leaves oblong, obtuſe, narrower at the baſe, with two callous dots; rough beneath."—Native of the Eaſt Indies. *Leaves* ſmooth and ſhining above, paler beneath. *Fruit* globoſe, umbilicated, the ſize of a cherry. *Willdenow*.

36. F. *microcarpa*. Vahl. En. n. 30.—"Leaves ovate, ſomewhat oblong, obtuſe, ſmooth. Branches wand-like. Fruit globoſe, ſeſſile, in pairs."—Found by Thonning in Guinea. A rather tall and ſpreading *tree*, its branches throwing out roots. *Leaves* three to five inches long, ſtalked, finely reticulated, pale beneath. *Fruit* ſmall.

37. F. *paraſitica*. Willd. Diſſ. 25. t. 3. Vahl. En. n. 31.—"Leaves elliptical, bluntiſh; reticulated and roughiſh beneath. Fruit-ſtalks in pairs. Fruit globoſe, umbilicated."—Grows in the Eaſt Indies. *Branches* round, ſmooth. *Leaves* ſmooth and ſhining above, coriaceous, moſt veiny beneath. *Fruit* axillary, the ſize of a pea.

38. F. *americana*. Aubl. Guian. 952. (F. alia, foliis lauri, fructu minore; Plum. Ic. 124. t. 132. f. 2.)—"Leaves ovate-oblong, veiny. Fruit axillary, ſtalked, cluſtered."—Native of Jamaica. *Leaves* ſmooth, two inches long. *Fruit* ſmall, yellow.

39. F. *racemoſa*. Linn. Sp. Pl. 1515. (Atti-alu; Rheede H. Mal. v. 1. 43. t. 25.)—"Leaves elliptic-ovate, acute, dotted on the upper ſide. Fruit ſeſſile, top-ſhaped, downy." *Vahl*. Native of the Eaſt Indies, in ſandy ſoil. A tall and ſpreading *tree*. *Branches* downy in the upper part. *Leaves* ſtalked, remote, two or three inches long, narrowed at each end, eſpecially the upper, acute, ſtriated, in a manner, with ribs, ſomewhat veiny, ſmooth on both ſides, dotted on the upper when examined with a microſcope. *Footſtalks* rather downy. *Fruit* pear-ſhaped, ſeſſile, downy. *Vahl*.—We know this only by the above authorities, having no authentic ſpecimen. The fruit is not ſeſſile in *Hort. Malab.*

40. F. *glomerata*. Roxb. Corom. v. 2. 14. t. 123.—Leaves elliptic-ovate, acute, not dotted above; minutely granulated beneath. Fruit cluſtered, ſtalked, top-ſhaped, downy.—Generally found near villages, and about rivers and water-courſes in Bengal, where the ſoil is rich and moiſt. *Fruit* eaten by the natives, but Dr. Roxburgh thought it diſagreeable; purpliſh, the ſize of a pidgeon's egg, growing many together on the young branches, each on a ſeparate ſtalk. *Leaves* four or five inches long, ſmooth above; feeling roughiſh underneath.

41. F. *indica*. Linn. Sp. Pl. 1514 α. Lamarck. Dict. v. 2. 494. Cluſ. Exot. 1. (F. cotoneæfolia; Vahl. En. n. 34. Catu-alu; Rheede H. Mal. v. 3. 73. t. 57.)—"Leaves ovato-lanceolate, coriaceous, downy beneath. Fruit ſeſſile. Branches taking root at the extremity."—Native of the Eaſt Indies, where it has been celebrated from the moſt remote antiquity, for its property of letting its branches droop and take root, ſo extending itſelf by that means, that a ſingle tree forms a curiouſly-arched grove. We cannot therefore approve of Profeſſor Vahl's innovation, in transferring its ancient name to another, which Linnæus thought a variety, but which is totally diſtinct. See our n. 68.—The *leaves* are three or four inches long, pointed. *Fruit* globoſe, the ſize of a large gooſeberry, reddiſh, ſweet, but not pleaſant-taſted.

42. F. *Toka*. Forſk. Arab. 219.—"Leaves two-ranked, rough, ovate, acute, entire, alternate, ſtalked."—Found by Forſkall in Arabia, where it is called *Toká*, which is all we know concerning it.

43. F. *punctata*. Thunb. Diſſ. 9.—"Leaves oblong, emarginate, ſmooth, dotted beneath. Stem zig-zag, throwing out roots."—Native of the Eaſt Indies.—*Stem* paraſitical, creeping to a great extent, round, rugged, brown, hardly ſo thick as a gooſe-quill, branched; the ultimate diviſions very ſhort. *Leaves* obtuſe, only from half an inch

to an inch long, ſpreading or reflexed, their margin entire, a little reflexed. *Footſtalks* very ſhort. *Fruit* obovate, almoſt as large as the common F. *Carica. Thunberg.*—We ſuſpect this ought to be placed near *ſcandens*, n. 15, but we are unwilling to diſturb Vahl's arrangement. It ſeems by analogy to confirm the report there given of the fruit of that ſpecies.

44. F. *pertuſa.* Linn. Suppl. 442; excluding the ſynonym.—Leaves elliptical, pointed, very ſmooth. Fruit globoſe, umbilicated, ſtalked, axillary, in pairs. Calyx in two lobes.—Native of Surinam. Whole *plant* ſmooth. *Leaves* two or three inches long and one broad, taper-pointed, with fine tranſverſe veins. *Footſtalks* half an inch long. *Fruit* the ſize of a pepper-corn, on a ſtalk nearly its own length. *Calyx* ſmall, in two deep, recurved ſegments. Vahl deſcribes the fruit in cluſters an inch long, which is altogether unfounded. He alſo copies from the *Suppl. Plant.* an erroneous ſynonym of Plumier, t. 132. f. 2, which he had juſt before rightly applied to F. *americana*.

45. F. *ſarmentoſa.* Buch. MSS.—Leaves ovate-oblong, pointed; ſmooth above; downy and glaucous beneath. Fruit ſolitary, axillary, ovate, hairy, on ſtalks as long as the footſtalks. Stem trailing.—Gathered, in May 1802, by Dr. Buchanan, in the woods of Upper Nepal, where this and others of its genus are called *Bocoſhi.*—*Stem* trailing, milky, as thick as the thumb, branching out, at the top of the tree that ſupports it, into many ſpreading, alternate, downy, leafy ſhoots. *Leaves* about three inches long, reflexed at the margin, very veiny, three-ribbed at the baſe; their under ſide whitiſh, downy, finely reticulated. *Foot-ſtalks* half an inch or more in length, hairy. *Flower-ſtalks* rather longer. *Young fruit* the ſize of a hazel-nut, ſomewhat angular, obtuſe, very hairy. *Calyx* very ſmall, and a little remote, of three hairy leaves.

46. F. *pumila.* Linn. Sp. Pl. 1515, but not Syſt. Veg. ed. 14. 922. (F. ſylveſtris procumbens, folio ſimplici; Kœmpf. Amœn. 803. t. 804.)—Leaves ovate, ſmooth; very cloſely reticulated beneath. Stem jointed, creeping. Fruit ſtalked, nearly as long as the leaves.—The only certain knowledge we have of this Fig is from Kœmpfer, who deſcribes it as running up walls and rocks in Japan, the *branches* being marked with annular contractions. *Leaves* ever-green, ſcattered, ſtalked, about two or three inches long, hard, rigid, exactly ovate, but pointed; ſmooth and of a rather ſhining green above; paler, opaque, and moſt beautifully reticulated with prominent veins beneath, ſo crowded that there is ſcarcely room for the point of a needle between them. *Fruit* taſteleſs, on thick, ſhort, recurved, axillary, ſolitary ſtalks, the ſize and ſhape of a walnut with its coat on, or elſe pear-ſhaped, or turbinate with a taper baſe, hardiſh, rugged, generally green with a blue bloom, ſprinkled with white dots. Nothing can much better accord with the ſpecimens ſent us from Portugal than the fruit of F. *ſcandens*, n. 15. Thunberg's deſcription is ſtill more preciſe, as he ſays the leaves are obtuſe, and branches furrowed. We have ſeen no authentic ſpecimens of F. *pumila*. Linnæus altered the ſpecific character, and added a deſcription, in his *Syſtema Vegetabilium*, from a widely different plant in his herbarium, the *erecta* of Thunberg; ſee n. 59.

47. F. *Cabur.* Buch. MSS.—Leaves oblong-ovate, taper-pointed, ſmooth; very cloſely reticulated beneath. Fruit ſtalked, axillary, ſolitary, globoſe, hairy.—Native of woods in Nepal, where it is called *Cabur*. *Stem* ſhrubby, three or four feet high. *Branches* downy. *Leaves* alternate, four or five inches long, ſomewhat revolute; very ſmooth above; whitiſh and reticulated, like the laſt, beneath. *Footſtalks* and *fruitſtalks* each about half an inch long, thickiſh, hairy. *Fruit* the ſize of a moderate gooſeberry, globular, pointed, hairy, ſlightly ribbed.

48. F. *reflexa.* Thunb. Diſſ. 11.—"Leaves elliptical, obtuſe, ſmooth. Branches recurved. Fruit globoſe, ſeſſile."—Native of the Eaſt Indies. *Branches* ſtriated, rugoſe, aſh-coloured, ſmooth. *Leaves* ſomewhat obovate, a finger's length, with parallel ribs (or rather veins?). *Footſtalks* half as long as the leaves. *Fruit* ſeſſile on the branches, either ſcattered or crowded, ſmooth, the ſize of a pea. *Thunb.*

49. F. *trigona.* Linn. Suppl. 441. (F. folio citri obtuſo, fructu ſanguineo; Plum. Ic. 123. t. 132. f. 1.)—Leaves elliptical, ſmooth, five-ribbed at the baſe; ribs hairy. Fruit globoſe, ſolitary, axillary, ſtalked; mouth with a triangular border.—Communicated to Linnæus from Surinam. The *branches* are ſlightly hairy about the extremities only. *Leaves* alternate, three or four inches long, on very hairy footſtalks not an inch in length; both ſides are ſmooth and even; the upper minutely dotted; the under ſcarcely perceptibly reticulated with veins, but furniſhed with a ſtrong mid-rib, ſeveral very ſtraight, parallel, tranſverſe ribs, and at leaſt two radiating ones, on each ſide, at the baſe, all hairy. *Fruit* the ſize of a black currant, on a ſhort thick hairy ſtalk, minutely downy, with an oblique variouſly divided calyx, externally hairy, beneath it, and a ſingular triangular elevated border round the mouth, which is cloſed. Plumier's figure ſeems to agree tolerably well, but there is no certainty in his ſynonym.

50. F. *nitida.* Thunb. Diſſ. 10. (F. microcarpa; Linn. Suppl. 442. Itti-arealou; Rheede H. Mal. v. 3. 69. t. 55.)—Leaves elliptical, bluntly-pointed, ſomewhat unequal, ſmooth, with numerous parallel veins. Fruit ſeſſile, globoſe, flattened at the top.—Native of the Eaſt Indies. Whole plant ſmooth. *Leaves* two or three inches long, uſually oblique or inequilateral, near two inches broad, with a ſhort blunt point; tranſverſe ribs or veins very ſlender, terminating in one undulating vein within the margin, as in many other ſpecies. *Fruit* the ſize of a pea, enveloped, till half grown, in a ſtrong three-cleft calyx; its mouth is always cloſed with ſcales folded over each other.—The *footſtalks* are ſhort and thick. Vahl overlooked the Linnæan ſynonym, and Lamarck could not aſcertain it.

51. F. *ſcabriuſcula.*—Leaves elliptic-rhomboid, unequal, acute, roughiſh on both ſides. Fruit axillary, ſtalked, in pairs, globoſe, rough.—Native of the Eaſt Indies, where the leaves are uſed for poliſhing ivory, being a very fine file. Every part of the plant is rough with moſt minute cartilaginous points, hardly perceptible but by the touch. *Leaves* two or three inches long, of a light green, on ſtalks half an inch long. *Fruit* the ſize of red currants, with a tumid, ſlightly perforated, mouth. We have ſome doubt whether Vahl's *rhomboidalis*, hereafter mentioned, n. 86, be different from this.

52. F. *comoſa.* Roxb. Corom. v. 2. 14. t. 125.—Leaves elliptical, pointed, ſmooth, with numerous tranſverſe veins. Fruit ſeſſile, in pairs, roundiſh, with a triangular mouth.—Found by Dr. Roxburgh on the Circar mountains. It is called among the Telingas Pootra, or Pudda, Juvy. A large *tree*, with ſlender, often pendulous, branches. *Leaves* two or three inches long, and half as broad; their lateral veins ſtraight and parallel, having numerous reticulations between them. *Footſtalks* near an inch long, and rather ſlender, very different from thoſe of *nitida*, n. 50. *Fruit* when ripe the ſize of a moderate gooſeberry, firſt purple, then orage.

53. F. *rubra.* Vahl. En. n. 42. (F. pyrifolia; Lam. Dict. v. 2. 497. Varinga rubra; Rumph. Amb. v. 3. t. 85?)

t. 85?)—“ Leaves oval, ſmooth ; very minutely reticulated beneath. Fruit globoſe, nearly ſeſſile.”—Gathered by Commerſon in the Mauritius, from whoſe ſpecimens Lamarck deſcribed it. *Leaves* two inches long, one and a half broad, ſtalked. *Fruit* about the tops of the ſmall branches. We know this ſpecies only by the above deſcription.

54. F. *aggregata.* Vahl. En. n. 43. (F. punctata; Lam. Dict. v. 2. 495.)—“ Leaves oval, obtuſe, ſmooth ; dotted on the upper ſide. Fruit globoſe, aggregate, ſeſſile.”—Gathered by Commerſon in the Mauritius and Madagaſcar. *Leaves* about three inches long and half as broad, blunt or emarginate, not coriaceous, dark green dotted with white. *Fruit* ſmall. Lamarck quotes H. Mal. v. 3. t. 55 as reſembling his plant, which we judge rather to repreſent F. *nitida.*

55. F. *politoria.* Lam. Dict. v. 2. 500. Vahl. En. n. 44. —Leaves elliptic-oblong, with a blunt point, rough with hooked ſpines. Fruit globoſe, ſtalked, axillary, ſolitary, rough. —Gathered in Madagaſcar by Commerſon, one of whoſe ſpecimens is before us. *Leaves* about two and a half inches long, ſcarcely one broad, obtuſe, with a little broad obtuſe point; paler beneath, with largely reticulated veins; both ſides, but eſpecially the veins beneath and the edges, are rough with minute white, hooked, rigid prickles, as are the footſtalks, fruitſtalks, upper part of the branches, and the fruit itſelf, which is rather larger than a black currant, and purple.

56. F. *mollis.* Vahl. Symb. p. 1. 82. Willd. Diſſ. 26. t. 5. —“ Leaves oblong, downy beneath. Fruit axillary, ſeſſile, ſolitary, downy.” *Vahl.*—Native of the Eaſt Indies. *Branches* round, downy. *Leaves* two inches long ; ſmooth above ; veiny beneath, rather ſoft ; obtuſe, on downy *footſtalks*, ſhorter than the leaves. *Fruit* very ſmall.

57. F. *verrucoſa.* Vahl. En. n. 46. (F. ſeptica; Forſt. Prod. 76.)—“ Leaves oblique, oblong-ovate, pointed. Fruitſtalks in pairs, with a ſmall calyx at the top. Fruit warty.” *Forſter.* Found in the iſle of Tanna.

58. F. *coriacea.* Ait. H. Kew. v. 3. 453.—“ Leaves oblong, ſmooth, coriaceous ; attenuated and heart-ſhaped at the baſe ; veins ſunk.”—Grows in the Eaſt Indies.

59. F. *erecta.* Thunb. Diſſ. 9. (F. pumila ; Linn. Syſt. Veg. ed. 14. 922, but not Sp. Pl. 1515.)—Leaves ovate-oblong, ſharp-pointed, ſmoothiſh ; reticulated beneath. Stem nearly decumbent, with upright branches. Fruit top-ſhaped, ſtalked, axillary, ſolitary, ſmooth.—Found in Japan. *Stem* weak, not perfectly decumbent, round, ſtriated, ſmooth. *Branches* ſcattered or aggregate, erect, ſtraight, leafy. *Leaves* from two to four inches long, green, and often minutely briſtly, above ; pale, and reticulated with numerous downy veins, beneath. *Footſtalks* half an inch or more in length, rather downy upwards. *Fruitſtalks* rather longer, erect, with a three-leaved calyx at the top. *Fruit* the ſize of a hazel-nut, rather tapering at the baſe, ſweet and eatable.

60. F. *falcata.* Thunb. Diſſ. 8. Vahl. En. n. 49.—“ Leaves oblong, ſickle-ſhaped, ſmooth. Stem thread-ſhaped, creeping.”—Native of Java. *Leaves* obtuſe, with one ſide narrower than the other, about an inch long, very finely veined, pale beneath, on very ſhort footſtalks. *Stem* and *branches* ſlender, zig-zag, brown. This ſeems to be akin to n. 15 and 16, next to which Thunberg has placed it, and we know not why Vahl, who appears to have ſeen ſpecimens of the *falcata* at leaſt, has removed it to ſo great a diſtance.

61. F. *drupacea.* Thunb. Diſſ. 11.—“ Leaves obovate, pointed, ſmooth. Fruit ovate, rugged, ſeſſile.”—Native of the Eaſt Indies. *Branches* round, furrowed, ſmooth. *Leaves* coriaceous, four inches long, ribbed ; green above ; aſh-coloured beneath, on thick ſtalks about half an inch long. *Fruit* towards the ends of the branches, ſmooth, as big as plums. *Thunb.*

62. F. *retuſa.* Linn. Mant. 129.—Leaves oblong, obovate, very obtuſe, quite ſmooth ; three-ribbed near the baſe. Fruit ſeſſile, globoſe, ſmooth. Calyx downy.—Native of Java. *Branches* ſmooth, angular. *Leaves* three inches long, ſtalked ; ſhining above ; opaque, paler and veiny beneath ; furniſhed with a ſtraight lateral rib on each ſide, which vaniſhes about the middle of the leaf, and ſeveral tranſverſe ribs beſides. *Fruit* when young enveloped in a calyx which is externally downy ; when full grown the ſize of a currant, ſmooth, with broad poliſhed ſcales at the mouth.

63. F. *prolixa.* Forſt. Prod. 77. Vahl. En. 52.—“ Leaves lanceolate-oblong, pointed ; dotted beneath. Fruit moſtly in pairs, globoſe, axillary, ſmooth, on wavy ſmooth ſtalks.”—Native of the Society Iſles. *Branches* ſmooth. *Leaves* ſtalked, three or four inches long, an inch or more in breadth, with very fine nerves, ſcarcely veined, membranous. *Fruit* the ſize of a pea, on very ſhort ſtalks. *Vahl.*

64. F. *laurifolia.* Lam. Dict. v. 2. 495. Vahl. En. n. 53. (F. virens ; Ait. H. Kew. v. 3. 451. F. indica maxima, folio oblongo, funiculis e ſummis ramis demiſſis radices agentibus ſe propagans, fructu minore, ſphærico, ſanguineo ; Sloane Jam. v. 2. 140. t. 223.)—“ Leaves oblong-lanceolate, ſmooth, with a few ſcattered depreſſed points above. Fruit ſeſſile, ſolitary, globoſe, axillary.”—Native of the Weſt Indies. A very lofty *tree*, according to Sloane, whoſe upper branches throw out long roots. Pidgeons of all kinds are fond of the fruit, which is the ſize of a hazel-nut, ſcarlet, ſweetiſh and not unpleaſant. The *leaves* ſeem to reſemble thoſe of the Cherry-laurel.

65. F. *griſea.* Vahl. Enum. n. 54.—“ Smooth. Leaves oblong, obtuſe, narrowed at the baſe. Fruit ſeſſile, nearly ſolitary.”—Deſcribed by Vahl from Juſſieu's herbarium. Its native country is unknown. The *branches*, according to him, are grey in the upper part. *Leaves* ſtalked, three or four inches long, paler beneath, very ſmooth. *Footſtalks* an inch long. *Fruit* globoſe, grey, twice as big as a pea. *Stipulas* lanceolate, attenuated, ſmooth, as long as the nail.

66. F. *pallida.* Ibid. n. 55.—“ Leaves oblong, ſomewhat wedge-ſhaped, ſmooth, even, obtuſe. Fruit axillary, in pairs, on ſhort ſtalks.”—Gathered by Von Rohr at St. Martha, in South America. *Branches* greyiſh. *Leaves* membranous, two or three inches long, and one broad, bright green, minutely veined, with a yellow rib. *Footſtalks* ſlender, ſmooth, an inch long. *Fruit* globular, ſmooth, the ſize of black pepper. *Vahl.*

67. F. *excelſa.* Ibid. n. 56. (Atti meer alou ; Rheede H. Mal. v. 3. 75. t. 58.)—“ Leaves lanceolate, ſomewhat elliptical, acute ; narrower on one ſide at the baſe. Fruit ſtalked, globoſe.”—Native of the Eaſt Indies. *Branches* and *leaves* ſmooth ; the latter three or four inches long, moſt veiny beneath, on ſhort ſtalks. *Fruit* in pairs, axillary, ſmooth and even, the ſize of a pea, on ſtalks longer than thoſe of the leaves. *Vahl.*

68. F. *ampliſſima.* (F. indica; Vahl. En. n. 57. F. indica β; Linn. Sp. Pl. 1514. Tsjela ; Rheede H. Mal. v. 3. 85. t. 63.)—“ Leaves broad-lanceolate, long-pointed, ſmooth. Fruit cluſtered, globoſe, ſmooth, on ſhort ſtalks.”—Native of the Eaſt Indies. This, according to Rheede, is a *tree* of vaſt dimenſions, about 70 feet high, and 18 in the circumference of the trunk, with widely-ſpreading branches. *Leaves* ſtalked, two or three inches long, with numerous,

parallel, tranſverſe, ſlender ribs; the point ſometimes an inch long. *Fruit* copious, the ſize of a pea, inſipid, the food of bats, on which account the Portugueſe and Dutch call it the Bat-tree.

69. F. *ſalicifolia.* Vahl. Symb. p. 1. 82. t. 23. (F. indica; Forſk. Fl. Arab. 179.)—"Leaves lanceolate, pointed, ſmooth. Fruit axillary, ſtalked, in pairs."—Gathered by Forſkall in Arabia, where it is called *Thäab.* Of the bark, dried and twiſted, matches for great guns are made. The *branches,* though long and pendulous, do not throw out roots. The whole plant is very ſmooth. *Leaves* ſtalked, from three to five inches long, rounded at the baſe, dotted beneath, not above an inch broad. *Fruit* larger than a pea, ſmooth.

70. F. *obliqua.* Forſt. Prod. 77.—"Leaves lanceolate, very ſmooth, with a cartilaginous edge. Fruit-ſtalks in pairs, very ſhort. Calyx as long as the fruit, deciduous." *Forſter.* A native of the South Sea Iſlands of Namoka and Tanna.

Section 2. *Leaves undivided, ſerrated, or toothed.*

71. F. *ſemicordata.* Buch. MSS.—Leaves half-heart-ſhaped, ſlightly ſerrated, rough; rather hairy beneath. Fruit on radical ſhoots, ſtalked, in pairs, downy.—Native of woods in Upper and Lower Nepal, where it was found by Dr. Buchanan, early in 18 2. A large *tree,* with downy or hairy branches. *Leaves* above a foot in length, oblong, ſharp-pointed, very unequally heart-ſhaped at the baſe, paler and veiny beneath, on ſhort, rough, or downy footſtalks, the larger lobe croſſing the branch, and furniſhed with radiating ribs. *Stipulas* long, narrow, ſmooth, deciduous. *Flowering branches* from the baſe of the trunk, or even from the roots under ground, drooping, panicled, downy, ſometimes leafy towards the extremity. *Fruit* in pairs from each joint of theſe branches, globoſe, hairy, on hairy or downy ſtalks, with a pair of downy bracteas; when ripe as large as a common plum.—The natives eat the figs raw, as well as fried.

72. F. *auriculata.* Lour. Cochinch. 666.—"Leaves heart-ſhaped, pointed, ſomewhat ſerrated, downy. Fruit auricled, ſmooth, in terminal cluſters."—Cultivated, and probably wild alſo, in Cochinchina, where the unripe figs are ſliced and eaten in ſalads, inſtead of cucumbers, which they reſemble in flavour. The *tree* is large, with ample leaves. *Fruit* turbinate, two inches long, red, in denſe, upright, terminal cluſters, furniſhed at its top, beſides the uſual orifice, with four diſtant holes, ſurrounded with a prominent cartilage, and reſembling ears.

73. F. *Forſkalii.* Vahl. En. n. 61. (F. morifolia; Forſk. Arab. 179.)—"Leaves ovate, ſomewhat heart-ſhaped, rough, ſerrated, longer than their footſtalks."—Native of Arabia. *Leaves* half a ſpan long. *Stipulas* linear-lanceolate. *Fruit* eatable, but unpleaſant. *Forſk.*

74. F. *mauritiana.* Lam. Dict. v. 2. 499. Vahl. En. n. 62.—"Leaves ovate or heart-ſhaped, ſerrated; downy and rough beneath. Fruit globoſe, ſomewhat turbinate, ſtalked, on naked pendulous branches."—Gathered by Commerſon in the Iſle de Bourbon. *Branches* downy, rather hiſpid. *Leaves* ſmooth on the upper ſide, ſix or ſeven inches long, four or five broad, ovate, generally heart-ſhaped at the baſe, on *foot-ſtalks* two or three inches in length. *Fruit* larger than a walnut, in pairs. Vahl ſays, the figure in Hort. Mal. v. 3. t. 61, does not ill accord with this plant. See F *ſymphytifolia,* n. 80.

75. F. *lateriflora.* Vahl. En. n. 63. (F. morifolia; Lam. Dict. v. 2. 499.)—"Leaves ovate, ſomewhat heart-ſhaped, acute, ſerrated, ſmooth. Fruit globoſe, ſtalked, below the leaves."—Gathered by Commerſon in the Iſle de Bourbon. *Branches* browniſh. *Leaves* reſembling thoſe of a mulberry-tree, ſtalked, green on both ſides ſcarcely at all rough, about three inches long and two wide. *Fruit* ſmooth, ſcattered over the naked part of the branches.

76. F. *ulmifolia.* Lam. Dict. v. 2. 499. Vahl. En. n. 64.—"Leaves ovate, ſparingly toothed, pointed, unequal at each end, rough on both ſides."—Native of Java, and the Philippine iſlands. *Branches* round, rough. *Leaves* two or three inches long, ovate-oblong, very rough with little tubercles, terminating in a point an inch long, wavy at their edges, ſometimes three-cleft, or ſomewhat pinnatifid. *Fruit* globoſe, very rough, rather bigger than a pea, on ſtalks half the length of the leaf-ſtalks.

77. F. *capenſis.* Thunb. Diſſ. 13.—"Leaves ovate, acute, ſerrated, ſmooth. Fruit ſtalked, ſmooth, turbinate." —Gathered by Thunberg at the Cape of Good Hope. A very lofty, ſpreading, ſmooth *tree.* *Leaves* a finger's length, ſpreading, deeply toothed, paler and ribbed beneath, on *foot-ſtalks* an inch long. *Fruit* ſcattered, bigger than a hazel-nut. *Thunb.*

78. F. *groſſularioides.* Burm. Ind. 227.—"Leaves ſtalked, ovate; entire at the baſe; ſerrated at the top; yellowiſh white beneath."—Found by Garein at Surat. The *fruit* is yellow, reſembling a gooſeberry, but poiſonous. Such is Burmann's account, who conſiders Hort. Mal. v. 3. t. 62. as a variety of this, differing only in having ſhorter *foot-ſtalks.* See F. *rufeſcens,* n. 102.

79. F. *exaſperata.* Vahl. En. n. 67. (F. ſcabra; Willd. Diſſ. t. 2. *Vahl.*)—"Leaves oblong-ovate, very rough, pointed, toothed towards the end. Fruit ſtalked, globoſe"—*Branches* rough when young, afterwards ſmooth. *Leaves* three inches long, ſtalked, three-ribbed, downy beneath. *Fruit* in pairs, rough, the ſize of a pea, on ſtalks an inch long.

80. F. *ſymphytifolia.* Lam. Dict. v. 2. 498. Vahl. En. n. 68.—(Perin-teregam; Rheede H. Mal. v. 3. 81. t. 61?) "Leaves ovate-oblong, acute, minutely toothed; rough on both ſides. Fruit hairy, ſtalked, ſomewhat whorled, in long cluſters."—Native of Java, and other parts of the Eaſt Indies. Lamarck deſcribed it from Sonnerat's ſpecimen, and remarks, that the figure in the Hortus Malabaricus would be tolerably exact if the leaves were repreſented with ſmall teeth. The *leaves* are nine or ten inches long, ſtalked, with hairy ribs. *Fruit* globoſe. Vahl deſcribes the fruit ſeſſile, the ſize of a cherry. Rheede's plant is a very large long-lived tree, laden with fruit, as well as leaves, all the year long.

81. F. *maculata.* Linn. Sp. Pl. 1515. (F. caſtaneæ-folio, fructu globoſo maculato; Plum. Ic. 122. t. 131. f. 1.) —Leaves oblong, pointed, ſerrated. Fruit globoſe, ſeſſile, in long ſpikes.—Native of America. Plumier's figure, whence the above characters are taken, is our only authority for this ſpecies. The *fruit* is an inch in diameter, beſprinkled with ſpots or warts. *Leaves* a foot long, regularly and ſharply ſerrated, with innumerable ſtraight, parallel, tranſverſe veins.

82. F. *hiſpido.* Linn. Suppl. 442. Thunb. Diſſ. 13.—Leaves elliptic-oblong, pointed, obſcurely ſerrated, rough on both ſides. Fruit turbinate, ſtalked, axillary, ſolitary, very briſtly.—Native of Java. The *branches* and *footſtalks* are nearly ſmooth, the latter an inch or an inch and quarter long. *Leaves* near four inches long, rough with minute points, furniſhed with ſeveral unequal, curved, briſtly, lateral ribs, and reticulated veins; the edges waved, but ſcarcely ſerrated. *Fruitſtalks* full half an inch long, covered, like the *fruit* itſelf, with numerous rigid, ſhining, tawny briſtles.

Had we not one of Thunberg's own ſpecimens, we ſhould hardly have recognized the plant by his deſcription.

83. F. *oppoſitifolia.* Roxb. Corom. v. 2. 14. t. 124. (F. Dæmonum; Vahl. En. n. 71. F. ſcabra; Jacq. H. Schoenbr. v. 3. 36. t. 315.—Leaves oppoſite, oblong, ſlightly ſerrated; rough above; more downy beneath. Fruit ſtalked, angular, very hairy.—Gathered by Konig and Roxburgh in moiſt rich ſoil, about the banks of rivulets, in the Eaſt Indies. It is but a ſmall *tree*, with hollow jointed, hairy *branches*, which ſometimes take root about their extremities. *Leaves* very unequal in ſize, from one to five inches long, one or two broad, on thick, ſhortiſh, hairy ſtalks; the upper ſide is extremely harſh to the touch; the under hoary, and ſtrongly reticulated. *Fruit* the ſize of a large nutmeg, very ſcaly at the mouth; axillary and ſolitary on the young branches; on the older ones racemoſe or cluſtered; tawny, hoary, ſeldom eaten. This ſpecies being, as far as hitherto diſcovered, ſingular in its genus for having oppoſite leaves: we greatly prefer Roxburgh's name to any other. The milky juice is ſaid to be poiſonous, as in ſeveral more.

84. F. *montana.* Burm. Ind. 226.—"Leaves oblong, with wavy ſerratures. Fruit very ſmall."—Native of hills in Java. Known by Burmann's ſhort character only.

Section 3. *Leaves angular or ſinuated.*

85. F. *Sycomorus.* Linn. Sp. Pl. 1513. (F. Cypria; Rauwolf. H. 57. t. 57. Sycomorus; Matth. Valgr. v. 1. 259.)—Leaves oval-heartſhaped, bluntly angular, wavy, ſmooth on both ſides. Fruit from the main ſtem, obovate, ſtalked.—Native of Egypt, from whence we have ſpecimens gathered by Dr. Delile. It is rarely ſeen in collections, and unknown in our gardens. The *leaves* and habit ſo much agree with F. *Chanas*, n. 8. that we ſhould have placed them next to each other, had we not for convenience followed Vahl's arrangement; they differ however from that ſpecies in being ſmooth. The *fruit* grows, either ſolitary or on branched ſtalks, from the main ſtem of the tree, (which is of very large dimenſions), and reſembles common figs in ſhape, but are ſmaller, paler, ſweet and delicate, but not always well ripened. The operations of an inſect called *Cynips Sycomori* are ſuppoſed neceſſary to their coming to perfection. (See CAPRIFICATION.) The ſpecific character is very unjuſtifiably perverted in the Syſtema Vegetabilium from a ſynonym of Plukenet, t. 178. f. 3, which belongs, as Lamarck obſerves, to *Hibiſcus tiliaceus*, a plant with downy leaves.—By no leſs ſtrange a perverſion, the name of Sycamore has become attached to our greater Maple, *Acer Pſeudoplatanus.*

86. F. *rhomboidalis.* Vahl. En. n. 74.—"Leaves oblong, or ſomewhat rhomboid, veiny. Fruit ſtalked, globoſe, rather downy."—Gathered by Dr. Rottler in the Eaſt Indies. *Branches* round, thick, ſubdivided, ſmooth, grey. *Leaves* ſcattered, ſtalked, pale green, entire, ſmooth on both ſides; ſometimes acute, ſometimes obtuſe, at the ſummit; acute at the baſe; often furniſhed with a prominent angle, about the middle, on each ſide. *Fruit* axillary, ſolitary, umbilicated, the ſize of a pea. Vahl.—This deſcription agrees, in many points, with our *ſcabriuſcula*, n. 51, but ſurely the roughneſs of the leaves, which are uſed as a file, could never have been overlooked by Vahl, nor the fruit called villoſe.

87. F. *reticulata.* Thunb. Diſſ. 12.—"Leaves elliptical, ſomewhat angular, toothed, pointed, ſmooth; reticulated beneath. Fruit globoſe, ſolitary, ſtalked."—Found in the Eaſt Indies. *Branches* erect, ſmooth, purple. *Leaves* obovate, tapering at the baſe, three or four inches long, ſpreading, paler underneath, on ſhortiſh thick *footſtalks.* *Fruit* axillary, ſmooth, larger than a pea, on a ſtalk a line in length.

88. F. *Sur.* Forſk. Fl. Arab. 180. Vahl. En. n. 76.—"Leaves lanceolate, waved, very ſmooth, ſomewhat heart-ſhaped at the baſe. Fruit cluſtered on the main ſtem."—Native of Arabia, where it is called *Sur.* This *tree* reſembles the *Sycomorus.* The young *branches*, *ſtipulas*, and under ſide of the *footſtalks*, according to Vahl, are hairy. *Leaves* rather coriaceous, broadiſh-lanceolate, with wavy teeth; pale and reticulated at the back. The *fruit* is deſcribed by Forſkall as the ſize of a pidgeon's egg, and eatable.

89. F. *aſpera.* Forſk. Pl. Eſcul. 36.—"Leaves unequally heart ſhaped, ſinuated or toothed, rough on both ſides. Calyx obſolete, united to the baſe of the turbinate fruit."—Cultivated in the gardens and ſhrubberies of the iſle of Tanna, for the ſake of its fruit, which is ſweet and pleaſant, as well as of the leaves, which when boiled afford the inhabitants an agreeable diſh. *Tree* four or five fathoms high, with jointed leafy branches. *Leaves* a ſpan long, on very ſhort ſtalks, rough and hairy, one ſide narrower than the other. *Fruit* axillary, in pairs, ſeſſile, downy, white; the ſize of a common fig. *Forſter*; who cites H. Mal. v. 3. t. 62. as having ſome reſemblance to this ſpecies; ſee *rufeſcens*, n. 102.

90. F. *ſinuata.* Thunb. Diſſ. 12.—"Leaves elliptical, ſinuated or toothed, pointed, ſmooth. Fruit globoſe, aggregate, ſeſſile."—Native of the Eaſt Indies. *Branches* erect, ſmooth, grey. *Leaves* obovate, toothed, and ſomewhat angular towards their points, with a reflexed margin: entire towards the baſe; pale, ribbed and reticulated beneath, three or four inches long, on ſtalks the length of the nail. *Fruit* ſcattered or aggregate upon the ſmall branches, ſeſſile, knotty, ſcarcely ſo big as pepper. Such is Thunberg's deſcription, and yet, in his ſpecific character, he calls the fruit ſtalked.

91. F. *ſubinciſa.* Buch. MSS.—Leaves oblong, pointed, harſh, naked; here and there jagged. Fruit ovate, tuberculated, axillary, ſtalked, ſolitary.—Gathered by Dr. Buchanan on the rocks of Upper Nepal, Jan. 28, 1803. A *tree* with very numerous, rigid, crooked *branches*, leafy at the ends only. *Leaves* two inches or more in length, with a taper point almoſt an inch long, elliptic-lanceolate, moſtly entire, but often cut, toothed or wavy in the upper part at one or both edges, veiny, rough to the touch, paler beneath. *Footſtalks* ſhort. *Fruit* towards the end of each branch, the ſize of a nutmeg, pointed, covered with prominent warts, not hairy, on ſtalks twice as long as thoſe of the leaf, thickened above the middle, where there is a ſmall three-leaved involucrum.

92. F. *roſtrata.* Lam. Dict. v. 2. 498. Vahl. En. n. 79.—Leaves oblong, unequally angular and wavy, with a linear obtuſe point; ſmooth above. Fruit globoſe, ſmooth, on ſhort ſtalks.—Gathered by Commerſon in Java. *Branches* ſlender, roughiſh with minute points when young. *Leaves* on ſhort rough ſtalks, two or three inches long, of a ſingular abrupt and irregular figure, irregularly veiny, reticulated; paler and ſomewhat harſh beneath; the point almoſt an inch long, rather broadeſt towards the end. *Fruit* the ſize of pepper, axillary, two or three together, on very ſhort ſtalks. The leaves of this ſpecies ſuggeſt ſome idea of the fiſh called *Chætodon longiroſtris*, figured in Bronſſonet's *Ichthyologia.*

93. F. *difformis.* Lam. Dict. v. 2. 500. Vahl. En. n. 80.—"Leaves oblong, acute, rough, of various ſhapes; undivided; ſomewhat angular; ſinuated; or deeply laciniated."—Native of the Philippine iſlands. We know nothing of

it but the above definition of Lamarck, who quotes a ſynonym of Ray which we would rather apply to F. *heterophylla*, n. 99. if that be different from the preſent, which we doubt. Lamarck indeed appears to have had two diſtinct plants under theſe names, but his *heterophylla* is not that of Linnæus. See *rufeſcens*, n. 102.

Section 4. *Leaves divided.*

94. F. *palmata*. Vahl. Symb. v. 1. 84. t. 24. Forſk. Fl. Arab. 179.—Leaves ovate or lobed, ſerrated, acute, rough; heart-ſhaped at the baſe. Fruit pear-ſhaped, ſmooth, ſtalked, axillary, ſolitary.—Native of Arabia. *Branches* ſmooth. *Leaves* from two to four inches long, ſharply ſerrated throughout, veiny; paler, with purple veins, beneath; on ſlender *footſtalks*, full an inch long. *Fruit* the ſize of a hazel-nut, its ſtalk ſhorter than that of the leaf, with a ſmall two-leaved involucrum.

95. F. *hirta*. Vahl. En. n. 82.—“ Leaves oblong, undivided or three-lobed, finely ſerrated; ſomewhat heart-ſhaped at the baſe; ſmooth above. Fruit ſeſſile, briſtly.”—Native of China. *Leaves* diſtant, three-lobed towards the extremity; lobes pointed, the lateral ones ſmalleſt; ribs hairy beneath. *Footſtalks* hairy, an inch and a half long. *Fruit* axillary, ſolitary, the ſize of a pea. Vahl ſaw a Java ſpecimen with ſome leaves undivided; and two or three fruits together, twice the above ſize.

96. F. *truncata*. Vahl. Symb. v. 1. 83.—“ Leaves oblong, undivided or lobed, entire, rough. Fruit ſtalked, oblong, abrupt.”—Native of the Eaſt Indies. *Branches* angular, ſmooth. *Leaves* above two inches long, on ſhort rugged footſtalks, either undivided, or with three, ſometimes five, oblong lobes, the lateral ones blunteſt. *Fruit* rough with minute points, its top as it were cut off abruptly.

97. F. *ſerrata*. Ibid. 83. Forſk. Fl. Arab. 179.—“ Leaves oblong, undivided or palmate, rough, with wavy teeth. Fruit ſtalked, globoſe, very rough and hairy.”—Gathered by Forſkall in various parts of Arabia, where the leaves are uſed to clean and poliſh ruſty iron. *Branches* and younger *leaves* very rough with numerous extremely minute points. *Fruit* the ſize of a hazel-nut, on ſhort ſtalks.

98. F. *toxicaria*. Linn. Mant. 305. (F. toxica; Thunb. Diſſ. 14. F. Padana; Burm. Ind. 226.)—“ Leaves ovate, or heart-ſhaped, cut and lobed, ſomewhat toothed; white beneath. Fruit ſtalked, ovate, downy.”—Found near the town of Padano in Sumatra, by Garcin, who reports it to be extremely poiſonous. The *leaves* are a foot long, being equal in ſize to thoſe of F. *benghalenſis*. *Burmann*. *Fruit* the ſize of a plum. *Thunb.*

99. F. *heterophylla*. Linn. Suppl. 442. (F. denticulata; Vahl, Symb. v. 1. 83. F. indica ſylveſtris, indis *Iſis*, &c; Raii Hiſt. v. 3 append. 50. n. 12?)—Leaves oblong, undivided, three-lobed and cut, unequally toothed; harſh on both ſides. Fruit ſolitary, ſtalked, globoſe, tuberculated, roughiſh.—Gathered by König in the Eaſt Indies, where it is called *Nir Atti*, water fig, from it's inhabiting the banks of rivulets and other watery places, ſo overrun with the prickly rattan, *Calamus Rotang*, as to be hardly acceſſible. The *branches* are reddiſh-brown, ſlender, roughiſh; angular and downy at their ends. *Leaves* on ſhortiſh rough ſtalks, green and very rough to the touch, on both ſides, with extremely minute cartilaginous points; their ſhape remarkably various, ſome being oblong, undivided, acute, partly entire, partly toothed for a conſiderable ſpace, but quite irregularly; others with a deep wide rounded entire ſinus at one, or oftener both, ſides, thus become two or three-lobed, and are toothed unequally like the former. *Veins* pale, forming large quadrangular reticulations. The length of each leaf is from two to four inches. *Fruit* the ſize of a muſquet-ball, pale, covered with very minute rough points, and with ſcattered ſlightly prominent warts; its mouth obtuſe, cloſed with broad flat ſcales. *Fruitſtalks* axillary, thick, ſhorter than the footſtalks, rough with little prickles, and bearing an involucrum of three ſmall obtuſe concave leaves, a little below the fruit. The ſynonyms of Linnæus and Vahl are determined by authentic ſpecimens; that of Ray we can only gueſs at, but his deſcription anſwers exactly to our plant. He ſays the leaves are uſed for poliſhing wooden furniture, and that the fruit is mawkiſhly ſweet, eaten by children and birds only, but uſeful for cataplaſms when boiled and bruiſed. The inner bark is given in decoction for the gonorrhœa, and to throw out the meaſles. We cannot account for Linnæus's deſcribing the fruit as ſmooth, nor can we anſwer for Vahl's *heterophylla* being the ſame as our's, though it is very poſſible he might happen to ſee young fruit only; but our's even in an early ſtate is rough.

100. F. *repens*. Roxb. MSS.—Leaves unequally heart-ſhaped, finely toothed throughout, rough on both ſides; undivided; or three or four-lobed. Fruit ſolitary, ſtalked, obovate, abrupt, briſtly.—Communicated by Lord Viſcount Valentia from the Eaſt Indies. *Branches* ſlender, downy when young. *Leaves* on ſome branches four or five inches long and three broad, heart-ſhaped, with one ſide of the baſe much larger than the other, on ſlender *footſtalks* two inches long; on other branches unequally heart-ſhaped at the baſe in a ſimilar manner, but much ſmaller, and deeply three-lobed, one lateral lobe uſually divided, their *footſtalks* ſcarcely an inch long, and more downy; theſe ſeem to be younger leaves than the undivided ones; all are rough with minute points and briſtles, paler beneath, minutely but ſharply toothed throughout, ſomewhat pointed. *Fruit* axillary, the ſize of a filberd or bigger, tapering at the baſe, lopped at the end. *Fruitſtalk* ſhorter than the footſtalk, with a ſmall three-leaved involucrum about the middle, which is cloſe to the fruit when very young. This is probably nearly related to the following, which we have not ſeen, but the deſcriptions of their leaves can ſcarcely be made to agree.

101. F. *cannabina*. Lour. Cochinch. 668.—“ Leaves of the ſtem haſtate, cut; thoſe of the branches ovato-lanceolate, ſlightly ſerrated. Stem nearly erect.”—Native of the plains of Cochinchina. A *ſhrub* ſix feet high, branched, with a ſmooth tough and fibrous bark. *Leaves* ſtalked, ſcattered, very rough. *Fruit* oval-top-ſhaped, on long, ſimple, ſolitary, lateral ſtalks, with a three-cleft rounded involucrum.

102. F. *rufeſcens*. Vahl. En. n. 89. (F. heterophylla; Lamarck. Dict. v. 2. 499. Valli-teregam; Rheede H. Mal. v. 3. 83. t. 62.)—“ Leaves ovate-oblong, ſomewhat toothed, undivided or lobed, rough. Fruit ſlightly ſtalked, hairy like the ſtalks and branches.”—Native of China, and the Eaſt Indies. *Sonnerat*. *Leaves* green on both ſides, about five inches long, and half as broad, on ſtalks not an inch in length; ſome of them undivided, others with three or four deep lobes, almoſt as in the common fig-tree. *Fruit* clothed with reddiſh hairs or briſtles. *Lamarck*. Rheede ſays his plant is a climbing ſhrub ſix or ſeven feet high, throwing out long trailing branches in every direction.

103. F. *morifolia*. Ibid. n. 90.—“ Leaves in three deep diviſions, very rough; their ſegments lanceolate, angular, and ſomewhat pinnatifid.”—Native of the Eaſt Indies. *Branches* ſlender, ſcarcely rough, a little downy in the

upper part. *Leaves* ſtalked, alternate, obtuſe at the baſe, three-ribbed; veinleſs above; ſlightly veiny beneath; deſtitute of pubeſcence, but very rough on both ſides with minute points, the upper ſide appearing under a magnifier as if covered with ſmall white, membranous ſcales. The ſegments are narrow and tapering. *Vahl.*

104. F. *ſimpliciſſima.* Lour. Cochinch. 667.—"Leaves palmate. Stem perfectly ſimple. Fruit compreſſed."—Native of the woods of Cochinchina. A *ſhrub* five feet high, with a ſtraight upright ſtem, deſtitute of branches. *Leaves* large, ſtalked, ſcattered, rough. *Fruit* ſmall, axillary, ſeſſile, ſolitary, roundiſh, ſaffron-coloured. *Loureiro.*

105. F. *Carica.* Common Fig. Linn. Sp. Pl. 1513. Miller Illuſtr. t. 100. Trew Ehrh. t. 73, 74, excellent. (Ficus and Chamæficus; Ger. em. 1510.)—Leaves palmate, bluntiſh, wavy, or ſomewhat toothed, rough. Fruit top-ſhaped, umbilicated, ſmooth.—Native of the ſouth of Europe and ſome parts of Aſia, where it is alſo generally cultivated, but will not bear the ſevere winters of the north of Europe, nor even our own, without protection. *Stem* branched from the bottom, from ſix to twenty feet high, with long, twiſted, pliant, round, greyiſh branches, rough when young. *Leaves* deciduous, a ſpan long, in three or five deep rounded lobes, of which the central one is the largeſt, the outermoſt much the ſmalleſt; they are of a deep green, ſcarcely paler, but rather more hairy; beneath, furniſhed with radiating ribs, one to each lobe, and many tranſverſe veins. *Fruit* ſolitary, on a ſhort thick ſtalk, tapering at the baſe, and furniſhed with a three-leaved involucrum. Its colour is generally purpliſh, its pulp ſoft, ſweet and fragrant. There are numerous varieties of cultivated figs, of which the moſt hardy is the Common Purple. Others are either more tender, worſe bearers, or leſs deſirable in flavour. Several excellent kinds however are found in the ſouthern parts of France, Italy, Spain and the Levant. In thoſe countries figs are uſually brought to table, with melons and mulberries, in the beginning of the dinner, as well as at breakfaſt, and do not in general make a part of the deſert.

The F. *Carica* in its wild ſtate is a more humble and diſtorted ſhrub, bearing fruit which comes to no perfection as to flavour, but the parts of fructification are very perfect, and the ſeeds are duly ripened, even in France. Such figs as ſeem to fall off before they arrive at maturity, are commonly thoſe in which the ſtamens are moſt numerous or effective, and which have therefore attained their final perfection. Theſe are carefully collected in the Levant to impregnate the female bloſſoms of the cultivated fig, their pollen being probably more perfect than what is produced by the ſtamens of ſuch individuals as have, on the other hand, more perfect piſtils. In other words, the plants are incompletely diœcious, like the mulberry and many others. This will explain the myſtery of *Caprification,* whether wounding the fruit be uſeful to promote its ripening, or whether the perfection of the pulpy receptacle be owing chiefly to the vigorous growth of the female flowers conſequent to their impregnation. Though both cauſes ſeem to co-operate, we ſhould lay moſt ſtreſs on the latter, which the analogy of other fruits confirms. See CAPRIFICATION.

All the ſpecies of *Ficus* are either trees or ſhrubs, whoſe ſecreted fluids are milky, more or leſs acrid or fœtid, however ſweet and wholeſome the fruit of ſeveral, though not of all, may be. The leaves are ſimple, ſtalked. Stipulas lateral, not intrafoliaceous, in pairs, membranous, deciduous, generally taper-pointed. Flowers more or leſs polygamous.

We have in the above ſynopſis of the ſpecies added fourteen to thoſe of Vahl, though we have preſumed to reduce two of his to one; ſee n. 99. Poſſibly ſome of the reſt, which he, as well as ourſelves, have been obliged to adopt upon truſt, may, on a future examination, prove not diſtinct from each other, while it is probable that numerous undeſcribed ſpecies may ſtill be latent in the wilds of Aſia and America. S.

FICUS, in *Gardening,* a tree of the deciduous fruit kind, of which the ſpecies cultivated are, the common fig-tree (F. *carica*); the Egyptian fig tree, or ſycomore (F. *ſycomorus*); the poplar leaved fig-tree (F. *religioſa*); the Bengal fig-tree (F. *Bengalenſis*); and the Indian fig-tree (F. *Indica*).

Of the firſt ſpecies there are ſeveral varieties, the chief of which are the following:

Brown Iſchia fig.—This is a ſort which has a large fruit, ſhort, globular, with a pretty large eye, pinched in near the footſtalk, of a brown or cheſnut colour on the outſide, and purple within; the grains large, and the pulp ſweet and high-flavoured; it often burſts open as it ripens, in the end of July, or the beginning of the following month. This has its fruit ripening well on ſtandards in warm ſoils and ſituations.

Black Genoa fig.—This is a kind which has a long fruit, that ſwells pretty large at the top, where it is obtuſe; the lower part is very ſlender towards the ſtalk; the ſkin of a dark purple colour, almoſt black, and has a purple farina over it, like that on ſome plums; the inſide is of a bright red, and the fleſh very high-flavoured. It ripens early in Auguſt.

Small white early fig.—This is a ſort which has a roundiſh fruit, a little flatted at the crown, with a very ſhort foot-ſtalk; the ſkin thin, and, when fully ripe, of a pale yellowiſh white colour; the inſide white, and the fleſh ſweet, but not high-flavoured. It ripens in Auguſt, as in the preceding kind.

Large white Genoa fig.—This is a kind which has a large globular fruit, a little lengthened towards the ſtalk; the ſkin thin, of a yellowiſh colour when fully ripe, and red within. It is a good fruit, but the trees are not good bearers in general.

Black Iſchia fig.—This, which is a ſhort fruit, of a middling ſize, a little flatted at the crown, has the ſkin almoſt black when ripe, and the inſide of a deep red; the fleſh very high-flavoured. It bears well, and ripens in Auguſt in this climate.

Malta fig.—This, which has a ſmall brown fruit, much compreſſed at the top, and greatly pinched towards the foot-ſtalk, has the ſkin and inſide of a pale brown colour; the fleſh very ſweet, and well-flavoured. When the fruit is permitted to hang upon the trees till ſhrivelled, it becomes a fine ſweetmeat.

Murray, or brown Naples fig.—This is a kind which has a pretty large globular fruit, of a light brown colour on the outſide, with faint marks of a dirty white, the inſide nearly of the ſame colour; the grains are pretty large, and the fleſh well-flavoured. It ripens the latter end of Auguſt in general.

Green Iſchia fig.—This is a ſort which has an oblong fruit, almoſt globular at the crown; the ſkin is thin, of a green colour; but, when fully ripe, ſtained through by the pulp to a browniſh caſt; the inſide purple, the fleſh high-flavoured. It ripens about the end of Auguſt.

Madonna, Brunſwick, or Hanover fig.—It is a kind which has a long pyramidal fruit of a large ſize; the ſkin, brown; the fleſh of a light brown colour, coarſe, with little flavour. It ripens the end of Auguſt, and the beginning of September.

Common blue, or purple fig.—This is a ſort which is oblong, it is a great bearer. The fruit ripens in Auguſt in general.

Long brown Naples fig.—This is a kind which has the leaves deeply divided; the fruit long, ſomewhat compreſſed at the crown; the foot-ſtalks pretty long; the ſkin of a dark brown when fully ripe; the fleſh inclining to red; the grains large, and the fleſh well-flavoured. It ripens in September.

Yellow Iſchia fig.—This is a ſort which has a large fruit of a pyramidal form; the ſkin is yellow when ripe, and the fleſh purple and well flavoured. It is not a good bearer, but ripens in September in moſt caſes.

Small brown Iſchia fig.—This is a ſort which has a ſmall pyramidal fruit, with a very ſhort foot-ſtalk; the ſkin of a light brown, the fleſh inclining to purple, of a very high flavour. It ripens late in September. It is not a good bearer.

Gentile fig.—This ſort has a middle-ſized globular fruit; the ſkin, when ripe, yellow; the fleſh alſo inclines to the ſame colour; the grains large, and the fleſh well-flavoured, but it ripens very late, and is a bad bearer.

There are alſo other ſorts, as the beſt early white, black Provence, Cyprian, Ford's ſeedling, green Naples, large black, large blue Marſeilles, Milward, ſmall black Iſchia, white Iſchia, yellow Cæſar.

Thoſe which are moſt proper for a ſmall garden, according to Mr. Forſyth, are; the large white Genoa, early white Murray, ſmall brown Iſchia, and the black Iſchia.

It is aſſerted by the ſame writer, that in a good ſeaſon the brown, or cheſnut coloured Iſchia, the black Genoa, the ſmall white early, the Murray, or brown Naples, and the common blue, or purple fig, will ripen on ſtandards.

The ſecond ſort is often here called the ſycomore-tree, and mulberry fig-tree. This, and not the great maple, is the right ſycomore.

The fifth ſort is often known by the name of banyan-tree, and is a native of the Eaſt Indies.

Method of Culture.—The firſt ſort and varieties may be readily increaſed, either by ſuckers, layers, or cuttings, but the two laſt are the beſt methods, according to Mr. Forſyth, who has had great experience in raiſing fruit-trees of this kind.

The ſuckers ſhould be taken off from the roots as low down as poſſible, and, after being trimmed, planted out in nurſery-rows, at the diſtance of two or three feet from each other, with the tops entire, to take their natural growth, when intended for ſtandards; but when for walls, eſpaliers, or dwarfs, in the ſituations where they are to remain. In the latter caſe, they ſhould be cut or headed down to ſix or eight inches in the early ſpring, to induce lateral ſhoots to be thrown out near the ground.

The layers ſhould be made from the well-ripened woody ſhoots of the bearing trees, and be laid down in the autumn, or early in the ſpring, being protected from froſt during the winter by tan or ſome ſort of ſtrawy material. When the plants are ſufficiently rooted, as in the following autumn, they ſhould be taken off and planted out in the places where they are to remain, as they do not bear tranſplanting well, being covered at the roots with dung, tan, or litter during the winter. The cuttings ſhould be taken from the well-ripened, woody ſhoots of the former year, which, without being ſhortened, may be planted out in the beginning of the autumn, on beds of loamy earth, in a warm, ſheltered ſituation, to the depth of eight or ten inches, protecting them with tanners' bark and litter during the winter; the litter being removed as the ſpring advances. When they have ſtricken good root in the following autumn; they ſhould be taken up and planted where they are to grow and remain.

Theſe ſorts of trees are moſtly cultivated as ſtandards in warm climates, but in this in general againſt walls or as eſpaliers; and only ſometimes as ſtandards.

The ſorts uſually cultivated againſt walls are thoſe of the *blue* and *white* kinds, but ſeveral of the others ſucceed well in this management, where they are duly attended to.

But for eſpaliers, and as ſtandards, the firſt, ſecond, third, ninth, and tenth varieties are probably the moſt proper.

In their culture as wall-trees, they ſhould always be placed in ſunny ſituations, for the purpoſe of the fruit being the moſt effectually ripened, as in that of a full ſouthern expoſure, but an eaſt or weſt aſpect will anſwer very well when that cannot be had with convenience.

In the planting them out, where the walls are of conſiderable height, fifteen or eighteen feet diſtance may be ſufficient; but in low walls, twenty or more are not too much ſpace. Mr. Forſyth adviſes from twenty to twenty-four feet, as the moſt ſuitable diſtance for planting theſe trees at, in general.

Where the trees are planted againſt fire-walls, they ſhould not be kept too cloſe, be drawn by glaſſes, or have the heat too great, but have at all times, when the weather is favourable, a good ſhare of free air admitted, and if the trees are young, care ſhould be taken that their roots are not extended beyond the reach of the covering; they muſt be frequently watered when they begin to ſhew fruit, otherwiſe it will drop off; but old trees, whoſe roots are extended to a great diſtance, only require to have their branches now and then ſprinkled over with water. Where theſe trees are properly managed, the firſt crop of fruit is greater than upon thoſe which are expoſed to the open air, and ripens ſix weeks or two months earlier, and a plentiful ſecond crop may alſo be obtained, which ripens early in September, and ſometimes in Auguſt; but the fires ſhould not be uſed to theſe trees till the beginning of February; as when they are forced too early, the weather is frequently too cold to admit a ſufficient quantity of freſh air to ſet the fruit; but the covers ſhould be put over the trees a month before, to prevent the ſhoots from being injured by the froſty ſtate of the weather.

The management of the trees in the common method after they have been headed down or ſhortened in the manner mentioned above, whether they be on walls or eſpaliers, is that of training them horizontally, ſo as to preſerve the branches in an equal and regular manner on each ſide, at the diſtance of from ſix to eight inches from each other, and, for the moſt part, keeping their full length without any ſhortening, that as large a proportion of young or bearing wood as poſſible may be preſerved. Some, however, adviſe their not being laid in ſo cloſe, conſidering a foot or eighteen inches as little enough room for them.

And in the pruning of theſe trees, Mr. Forſyth adviſes that it ſhould never be done in the autumn or winter, but in the early ſpring months. The beſt time, he conceives, to be about the latter end of April or beginning of the following month, as by this period it may be aſcertained what branches have been deſtroyed by the ſeverity of the winter. And as the ends of thoſe branches, the wood of which has not ripened well in the autumn, will be moſt injured, they ſhould be cut into the ſound wood as near to an eye or bud as poſſible.

In caſes where the branches have been permitted to run up, ſo as to leave the bottom in a naked ſtate, every other branch is adviſed to be cut out as near to the ground as it can be done, by which the walls or eſpaliers will be provided with good young wood, care being taken to ſtop the ends of the ſhoots in ſummer, as about the beginning of June, in order to induce ſide-ſhoots to be thrown out for fruiting the following ſummer; by which time plenty of fine wood will be provided, and then the remainder of the old branches may be cut out as before, pruning their young ſhoots as in the preceding caſe, conſtantly pinching off the ends of all the ſtrongeſt ſhoots at the top-bud, except ſuch as are leading ones.

But in the ſpring prunings, as the fruit is produced near the tops, the bearing ſhoots ſhould never be ſhortened, nor ſhould the fine ſhort ſide and fore right ſhoots be cut off, except when decayed; as they ripen better than the long ſtrong ones, and are not ſo apt to be deſtroyed by froſts in the winter ſeaſon. By this practice, it is contended that the trees will be covered with fruit from the tops to the bottoms of the wall, &c., inſtead of having a few only at the top, as is the caſe in the common method of management with theſe trees.

In ſummer, as many ſhoots are ſent off, ſome of thoſe that are irregular and uſeleſs may be rubbed off, and the others trained in for the forming of future bearing wood. The proper period for this is about the beginning of June, and in the two following months.

After the fruit has attained the ſize of ſmall nutmegs, the points of the top buds are recommended by Mr. Forſyth to be pinched or cut off with a ſharp knife, ſome of his powdery material being immediately applied, to prevent the oozing out of the milky juice, and the conſequent exhauſtion and injury of the trees.

In order to prevent the neceſſity of cutting the trees down in the above manner, they ſhould be covered in winter before the approach of froſt, which would deſtroy the ends of the ſhoots before the wood was ripened and rendered hard.

Where fig-trees are greatly injured in the winter, the beſt practice is to cut them down as near the ground as poſſible, as in the following year, by the above management, they may be got into a good bearing ſtate.

The beſt mode of protecting theſe trees is, according to Mr. Forſyth, to "cover them with bentings, or ſhort graſs, from the pleaſure-ground, which he finds anſwers the purpoſe very well; after it is thoroughly dry, it may be put in a cock, covering it with ſtraw, to prevent the rain from penetrating into it, which would cauſe it to heat and rot;" or it may be put into a ſhed. If graſs cannot be procured, ſome dry moſs may be employed. In performing the work, "firſt cover the trees with laurel, yew, fir, or ſpruce boughs, and then tuck in the ſhort-graſs or moſs among the branches, beginning at the top of the tree, tucking in the graſs, &c. as you deſcend, till you come to the bottom." Fern, when well dried, he ſays, makes an excellent covering. The trees may be thatched on the outſide with the long leaves of the common fern; and where theſe can be got, there will be no occaſion for ſhort graſs. When it can be procured, which it may in moſt country places, it will, he ſays, be found preferable to laurel.

They may alſo be ſheltered in winter by wrapping hay or ſtraw bands round the branches of the trees; and then opening the ground, laying in the branches, and covering them over with mould about nine inches deep, leaving the ends of the ſhoots about three inches out of the ground, and covering the ground over with ſome rotten leaves, or old tan, &c. to keep out the froſt. The roots of the trees may likewiſe be covered in the ſame manner. Where the walls are low, and the borders broad all the branches may be brought front ways; but when they are high, only the ſide branches can be brought forward in the above manner. It is the practice of ſome to cover with reeds and ſtraw; the latter he does not by any means approve of, as it is very apt to harbour rats and mice, on account of ſome of the grain being left in it at the time of threſhing.

In putting in the graſs, care ſhould be taken that no mice, &c. have got amongſt it; and during the winter, it ſhould be ſeen that no rats or mice get among the branches of the trees that are covered againſt the walls; as if they do they will infallibly bark the branches, and in that caſe there will be a neceſſity of heading the trees down in a complete manner.

Theſe animals may be deſtroyed by ſetting traps near the roots of the trees, as ſoon as they are covered. See Garden *Traps*.

Great care, he ſays, ſhould be taken not to uncover the fig trees too ſoon in the ſpring; and it ſhould be done partially, as there are frequently froſts and cutting winds in the months of April and May, which will infallibly kill the young fruit as they make their appearance in the ſpring.

Thoſe branches which have been laid into the ground ſhould be taken up in the month of April, having the hay or ſtraw-bands taken off, and then nailed to the wall. Some fern leaves, or any other light covering, may be ſtuck in among the branches, to protect them from the drying winds and froſts till the fruit comes to the ſize of a large walnut, or rather till the leaves are ſufficiently large to protect the fruit.

It is obſerved, that the Italians, when they wiſh to forward the ripening of figs, drop in a little ſweet oil, from a quill, into the eye of the fruit; but care muſt be taken not to hurt the ſkin, which will make the fig burſt. This will make a difference at leaſt of a fortnight in the ripening of the fruit.

It is alſo recommended, as ſoon as the leaves begin to fall, to bruſh them off with a broom, but by no means till they will come off eaſily. If they are forced off before they begin to wither and decay, the trees will bleed at the foot-ſtalks. At the ſame time the ſtalks ſhould be cleared of all the ſmall late fruit, which, if ſuffered to remain during the winter, will rot, and injure the tree, ſo as to prevent it from bearing the enſuing ſummer. If any milk be obſerved oozing from the foot-ſtalks, a little of the compoſition ſhould be uſed, which will ſtop it, and heal the injured part. See Composition.

By doing this, the ripening and hardening of the wood will be aſſiſted before the winter froſts ſet in.

In ſtandard-trees of all ſorts little pruning is neceſſary, only juſt to take out the very irregular branches and the young ſhoots, when too much crowded, and the dead ends of the ſhoots, as well as any dead wood that there may be in them.

Mr. Forſyth, however, obſerves, that as the branches of ſtandard fig-trees are very liable to be killed in ſevere winters, it will be neceſſary to lay them alſo in the ground, wrapping them up in hay or ſtraw-bands, as directed for wall-trees. It will be ſometimes impracticable to lay down the middle branches; they muſt, therefore, be well covered with hay or ſtraw-bands, and the outſide ones laid down, going regularly round the tree, and taking particular care not to hurt them with the ſpade, then to mulch them with rotten leaves, &c.

Where Mr. Forſyth has been under the neceſſity of cutting fig-trees down near to the ground, after hard winters, he has found, by the uſe of his compoſition, that "in the courſe of two years, the new wood has covered over the old ſtump, and the branches filled up the former ſpace, bearing alſo plenty of fine fruit."

The other ſpecies are eaſily propagated by cuttings during the ſummer ſeaſon. When the cuttings are taken from the plants, they ſhould be laid in a dry ſhady place for two or three days, that the wounds may be healed over, otherwiſe they are apt to rot; after which, they ſhould be planted in pots filled with ſandy light earth, and plunged into a moderate hot-bed, where they ſhould be ſhaded from the ſun, and two or three times a week gently refreſhed with water, if the ſeaſon is warm; but they muſt not have too much moiſture, as it would infallibly deſtroy them. When the cuttings have taken root ſufficiently, they ſhould be each planted into a ſeparate ſmall pot filled with undunged earth, and replunged into the hot-bed, ſhading them until they have taken freſh root; then they ſhould have a large ſhare of free air admitted to them at all times when the weather is favourable, to prevent their drawing up weak, and to give them ſtrength before the cold comes on. In autumn the pots ſhould be removed into the ſtove, and be plunged into the tan-bed, where they ſhould conſtantly remain, and be treated in the ſame manner as other tender plants from the ſame countries; for although two or three of the ſorts may be treated in a hardier manner, yet they will not make much progreſs. They may likewiſe be increaſed by layers when neceſſary.

Theſe are ſhrubs in this climate which afford variety in ſtove collections.

Ficus, in *Conchyliology*, a name given by authors to a peculiar ſpecies of ſea-ſhell. It is of the genus of the *dolium*, and has a remarkably depreſſed clavicle. See Conchology.

Ficus, or *Ficatio*, in *Surgery*, ſignifies a tubercle, or excreſcence, about the anus, or pudenda. The term is ſaid to be derived from φύω, *to produce*, or elſe from the Hebrew *phig*.

FIDARI, in *Geography*, a river of European Turkey, in Livadia, which runs into the ſea, eight miles N. of Patras.

FIDD, an iron pin uſed at ſea to ſplice or faſten ropes together; it is made tapering and ſharp at one end.

There are alſo fidds of wood, which are much larger than the iron ones.

The pin alſo in the heel of the topmaſt, which bears it upon the cheſs-tree, is called a fidd.

Fidd-*hammer*, is uſed for a hammer, the handle of which is a fidd, or tapering into that form.

FIDDES, Richard, in *Biography*, a learned divine, and polemical writer, was born at Hunmanby, in the county of York, in the year 1671, and went firſt to ſtudy at Cambridge, but afterwards was admitted of Univerſity College, in Oxford. Entering into holy orders, he obtained the living of Hulſham, in his native county, but the air of the place not agreeing with his health, he was forced to forego all thoughts of reſiding on his living; having while there loſt the uſe of his ſpeech, which he never after perfectly recovered. He was appointed chaplain at Hull, but he ſpent the latter part of his life at Putney, where he died in 1735. In 1718 and 1720, he publiſhed a Body of Divinity, in two volumes, folio; in conſequence of which, the univerſity of Oxford conferred upon him the degree of doctor in divinity. In 1721, he publiſhed two letters on the ſoul's immortality, occaſioned by the epitaph on the duke of Buckinghamſhire. In 1724, appeared a Life of Cardinal Wolſey, in which the free manner he had treated ſome opinions induced a belief, that he was favourably inclined to the Catholic tenets. The ſame year he publiſhed a treatiſe on morality, and he alſo wrote fifty-two practical diſcourſes. His firſt publication was a prefatory epiſtle concerning ſome remarks to be made on Homer's Iliad, addreſſed to Dean Swift, &c. Gen. Biog. Dict.

FIDDICHOW, or Viduchova, in *Geography*, a town of Hinder Pomerania, on the Oder, 22 miles S.W. of Stargard. N. lat. 53° 13′. E. long. 14° 33′.

FIDDLE, probably from *Fides*, Latin. This is the vulgar name for the violin, which is a modern inſtrument, as the uſe of the bow cannot be traced in antiquity. The earlieſt mention which we have found of the fiddle in England, is in the legendary life of St. Chriſtopher, MS. Vernon. Bodl. Lib. (119) written about the year 1200.

"Chriſtofre him ſerved longe.
The king loved the melody of fithele and of ſonge."

The fiddle, however, did not ſeem in common uſe in feaſts, mummeries, and proceſſions, for ſome hundred years after this period. It is mentioned by Chaucer, but was not allowed to be a concert inſtrument, till the reign of Charles II. who, in imitation of Louis XIV., eſtabliſhed a band of twenty-four violins, alias fiddles, which gave birth to Tom Durfey's ſong of "Four and Twenty Fiddlers all on a Row," &c., a humorous production in which there is a mockery of every inſtrument, and almoſt every trade; and which, in our own memory, uſed to be performed between the acts, or between the play and farce, by ſome man of humour at benefits. See Violin, Rebec, and Bow.

Fiddle-*ſhaped leaf*, in *Botany*, *folium panduriforme*, is oblong, broad at the two extremities and contracted in the middle, like a fiddle or ſome ſort of guitar, and not like the ancient *pandura* or reed-pipe, as the Latin name implies. See Leaf.

Fiddle *Wood*. See Citharexylon.

FIDDLER's Elbow, in *Geography*, a bend of Wood creek, between the outlet of South bay, and the mouth of the creek at the northern end of lake Champlain, oppoſite to the mouth of Eaſt bay. The mouth of Wood creek lies in N. lat. 43° 32′. W. long. 73° 15′ 12″.

FIDE-Jussores *Aſſidui*. See Assiduus.

Fide-*juſſor*, in the *Civil Law*, is a ſurety, or one that obliges himſelf in the ſame contract with a principal, for the greater ſecurity of the creditor or ſtipulator. See Bail and Cautionry.

FIDEI-Commissum, in the *Roman Law*, the appointing of an heir, or bequeathing a legacy to a perſon on this condition, that he ſurrender the inheritance or legacy to another perſon, for whom the ſame is originally meant; or it is an inheritance left in truſt with any one, for the uſe of another.

Fidei-commiſſa were much uſed among the Romans. In the French law the thing is become odious; as being, ordinarily, no other than an expedient in favour of perſons to whom the laws forbid any thing to be given. In order to this, ſome truſty friend is choſen to be made legal heir, under a tacit agreement to deliver the inheritance to the perſon incapacitated by law. But of later times the ſame expedient has come in uſe with regard to perſons capable of inheriting; to whom the teſtator, for particular reaſons, does not care to leave the inheritance directly.

As it happened that the fidei-commiſſioners did not always faithfully reſtore what was truſted to them, Auguſtus took proper meaſures to oblige them thereto; to this end a prætor was erected, whoſe buſineſs was reſtrained to the ſingle matter of fidei-commiſſions.

As a teſtament was null without the inſtitution of an heir, and it frequently happening that the fidei-commiſſioner refuſed to accept the truſt, upon which the teſtament fell to the ground; to engage ſomebody to accept it from a conſideration of advantage, the Pegaſian ſenatus conſultum decreed, that the fidei-commiſſioner ſhould be at liberty to retain a fourth of the fidei-commiſſion.

FIDELES, in *Church Hiſtory*. See BELIEVERS.

FIDENÆ, or FIDENA, in *Ancient Geography*, a town of Italy, upon the Tiber, N. of Rome and S. of Veii. It was founded on the territory of the Sabins, by a colony of Alba, and ſeems to have been very powerful before the foundation of Rome, as it ſuſtained a war againſt it, which laſted from the year of Rome 17 to the year 327, when the Fidenates were ſubdued by the dictator Emilius Mamercus.

FIDENTIA, a town of Gallia Ciſpadana, ſituated towards the S.E.; near which the troops of Carbon were cut to pieces by thoſe of Sylla.

FIDICULÆ, in *Antiquity*, is often uſed to ſignify the ſame with *equuleus*, a kind of puniſhment uſed among the ancients.

FIDICULÆ, in a more proper ſenſe, denotes the cords wherewith the criminals' limbs were diſtended on the equuleus.

FIDMIN, in *Geography*, a town of Egypt; five miles W. of Fayoum.

FIDRA, a ſmall iſland near the eaſt coaſt of Scotland, at the entrance of the Forth; three miles N.W. of North Berwick. N. lat. 56° 5'. W. long. 2° 49'.

FIDULEA, a ſmall iſland in the Grecian Archipelago; four miles S.W. of Stamphelia.

FIEF, the ſame with *feud* or *fee*; which ſee.

FIEF D'HAUBERT, a name given by the Normans, and adopted by the Mirrour, to that ſpecies of tenure denominated *knight-ſervice*, which ſee.

FIEGO, or FIJOOGO, in *Geography*, a ſea-port town of Japan, on the S. coaſt of the iſland of Niphon, with a large harbour in the bay of Oſaca; 24 miles S.S.W. of Oſaca, and 48 S.W. of Meaco.

FIELD, in *Agriculture*, is a portion of land moſtly incloſed by ſome ſort of fence, and employed either in tillage or as paſture. Fields ſhould be proportioned in ſize to the nature of the huſbandry under which they are chiefly managed; where they are of the arable kind, they may be much larger than where they are of the graſs or grazing deſcription. (See INCLOSING *of Land*.) For the method of finding the contents of a field, ſee AREA, CHAIN, and SURVEYING.

FIELD-*Fallow*, a term frequently made uſe of to ſignify a common field, which is occaſionally cultivated under the fallow ſyſtem. See FALLOW.

FIELD-*Graſs*, any ſort of graſs cultivated or grown in the field. See GRASS.

FIELD-*Huſbandry*, thoſe ſorts of huſbandry or cultivation which are practiſed in the field, whether they relate to tillage or graſs. See HUSBANDRY.

FIELD-*Well*, the name of a pit or ſmall ſort of artificial watering-place for cattle in a field. See DRINKING *Pond*.

FIELD-*Work*, that ſort of work which relates to the field, and which is of very different kinds.

FIELD-*Scabins*, the common name of a perennial weed often met with in tillage lands. The ſtem is upright and branching, riſing to the height of a foot or a foot and a half. It is ſpotted, rough, and hairy. The lower leaves are oval, and indented about the edges; but thoſe on the ſtalk are divided and pinnated. The flowers are blue, and of the compound kind, conſiſting of a great number of ſmall ones, each divided into four parts, and having one ſeed under them. The plant has a bitter diſagreeable taſte.

FIELD-*Ale*, or *Filctale*, in our *Ancient Cuſtoms*, a kind of drinking in the field, by bailiffs of hundreds; for which they gathered money of the inhabitants of the hundred to which they belonged. But this cuſtom has been long ſince prohibited.

FIELD, *Campus*, in *Antiquity*, is frequently uſed for a public place, or ſquare in a city, &c.

Such were the Field of Mars, *Campus Martius;* and Field of Flora, *Campus Floræ*, in Rome; and the Field of May, *Campus Maii*, among our anceſtors, &c.

FIELD *of Mars* was denominated from a temple of that deity, built therein; it was the ſcene or place of the aſſemblies called *comitia*. Tarquin the Proud at length appropriated it to his own uſe; but after the expulſion of the kings, the conſuls Brutus and Collatinus reſtored it to the public uſe again, for aſſemblies and elections.

Originally it was no more than a meadow on the banks of the Tiber, where horſes grazed, and the Roman youth were exerciſed to war. But it was afterwards erected into a magnificent ſquare, adorned with ſtatues, &c. See CAMPUS *Martius*.

FIELD *of Flora*, was the place where the laws, edicts, and conſtitutions, were publiſhed.

FIELD *of May*. See CAMPUS *Maii*.

FIELD *Baſil*, in *Botany*. See CLINOPODIUM.

FIELD *Baſil*, *American*. See MONARDA.

FIELD *Baſil*, *Syrian*. See ZIZIPHORA.

FIELD, *Cloſe*, was anciently a place encloſed, or railed in with a barrier, for juſts and tournaments to be performed in.

FIELD, *Elyſian*. See ELYSIUM.

FIELD, RICHARD, in *Biography*, an able champion of the doctrines and diſcipline of the church of England, was born at Hempſtead in Hertfordſhire, in the year 1561. In 1577 he was admitted a member of Magdalen college, Oxford, where he took his degrees with high reputation. His great learning and talents pointed him out as adapted to fill certain uſeful and important places in the church, till at length he was choſen divinity reader to the ſociety of Lincoln's Inn. In this ſituation his ſervices gained him many friends among the learned members, one of whom preſented him to the valuable living of Burrowclere in Hampſhire, and in a ſhort time after he was offered the ſtill more valuable rectory of St. Andrews, Holborn, but he choſe to adhere to that in the country, as affording him more ample opportunities for ſtudy, on which his mind was very intent. In 1598 he took his degree of doctor of divinity, and became chaplain in ordinary to queen Elizabeth, and was ſoon after made prebendary of Windſor. On the death of the queen he ſucceeded to the ſame office of chaplain with her ſucceſſor James; and was entruſted with the management of ſome ſpecial commiſſions iſſued for eccleſiaſtical cauſes, and the exerciſe of ſpiritual juriſdiction within the dioceſe of Wincheſter. In 1604 he obtained a prebendary of Windſor, and when the king went to Oxford to witneſs the ſcholaſtic exerciſes at that univerſity, Dr. Field was ſent for to take a part in the divinity act; and the manner in which he performed his part reflected the higheſt degree of credit on his learning, and afforded uncommon ſatisfaction to the ſplendid audience.

In 1610 the king beſtowed upon him the deanery of Glouceſter, but he continued to reſide and labour at Burrowclere, only going to Glouceſter occaſionally to preach when his particular duty required him. Some time, in the winter months, he uſually ſpent at Windſor, and was often ſelected to preach before the king, who exclaimed on firſt hearing him, "This is indeed a *Field* for God to dwell in." The monarch held Dr. Field in ſo high eſteem that he was anxious to promote him to the biſhopric of Saliſbury, but his courtiers prevailed upon him to give it to another. The king, however, determined to raiſe him to the ſee of Oxford, which was expected to become vacant in a ſhort time, but before the vacancy occurred, Dr. Field died of an apoplexy, in the year 1616, in the fifty-fifth year of his age. His principal work, as a literary man, was entitled "Of the Church," four books, folio. This was publiſhed in the year 1606, and in 1610 the author added a fifth book, with an appendix, containing a "Defence of ſuch Paſſages of the former Books that have been excepted againſt, or wreſted to the maintenance of Romiſh Errors." Dr. Field was univerſally reſpected, and at his death generally lamented. "He was," ſays Wood, "much againſt diſputing about the high points of predeſtination and reprobation, nor did he like that men ſhould be buſy in determining what God's decrees in heaven are. He was one that laboured much to heal the breaches of Chriſtendom, and was ready to embrace the truth whereſoever he found it. His deſire, his prayers, his endeavours, were for peace, to make up the breaches of the church; not to widen differences, but to compoſe them." Gen. Biog.

FIELD, in *Heraldry*, is the ſurface or face of the ſhield, or eſcutcheon; thus called, as containing the atchievements anciently acquired in the field of battle.

The field is the ground whereon the colours, bearings, metals, furs, charge, &c. are repreſented. In blazoning a coat, we always begin with the field: he bears ſable, &c.

Among the more modern heralds, field is leſs frequently uſed than ſhield or eſcutcheon.

FIELD *of Battle*, in the *Military Language*. The poſſeſſion of this, after an engagement, is generally ſuppoſed to denote which party has obtained the victory; the worſted army, for the moſt part, retiring with the view to rally, and eventually to make a freſh ſtand at ſome advantageous poſition. But it does not always follow that poſſeſſion of the field remains with thoſe to whom the greateſt merit attaches: we ſometimes ſee an inferior force repel the attacks of purſuers, and following its route, leaving to the diſcomfited aſſailants that ſcite on which a large portion of them may breathe their laſt, while the victorious band, though ſomewhat diminiſhed in numbers, effect a ſafe retreat. Retention of the field under ſuch circumſtances denotes the want of power to follow, and, according to the military phraſe, is "a ruinous victory;" uſually to be claſſed with thoſe ſad effects produced by ſevere conteſts in an enemy's country, where the latter are conſtantly obtaining both ſupplies and reinforcements, from which the invaders are, or ſhould be, completely cut off. We cannot give a ſtronger repreſentation of this poſition than is afforded by the glorious ſtruggle maintained by our Spaniſh allies, who, though certainly in the firſt inſtance by no means competent to repel their invaders, at length were rouſed to a due ſenſe of their ſituation, and diſplayed their national character for loyalty, piety, and bravery, in the moſt glowing colours.

A previous knowledge of the field on which an army is about to engage, cannot but become an object of great importance, not only to the commander-in-chief, but to all thoſe in charge of diviſions of the troops under his authority. An intimate acquaintance with various minutiæ, ſuch as broken ground in which cavalry cannot act; ſwamps in which they as well as artillery would be fixed, or at leaſt be unable to fulfil their intention; ſtrong ſituations, ſuch as natural lines made by precipices bordered by banks, or fringed with underwood; elevated ſpots, on which batteries could be placed to advantage, and behind which large bodies of cavalry might be concealed; bridges within command, by means of which a ſafe retreat might be made; and all ſuch points, are indiſpenſable towards the ſucceſsful iſſue of the day.

We do not mean to aſſert that every commander has it in his power either to chooſe the field on which he will make a ſtand, or that, when he has choſen it, he muſt be thoroughly acquainted with all localities; but it may be permitted us to obſerve, that no man, whatever rank he may have attained, or whatever ſervice he may have ſeen, is competent to be placed at the head of an army, but more eſpecially one acting upon the defenſive, whoſe eye does not moſt keenly ſearch for natural advantages, or who does not, when thoſe advantages are apparent, profit by them in a ſuitable manner. We particularize the defenſive, becauſe that ſyſtem rarely fails to afford thoſe highly valuable acquirements in regard to the ſeveral ſtrong poſitions every country affords, more or leſs; but which may not always be ſufficiently aſcertained by an invading army. Thus, it muſt be evident, that during the apprehenſion of invaſion, our generals, throughout the country, had the faireſt opportunities for moſt accurately reconnoitring every defenſible point, whereby they would have been enabled to act with the greateſt effect, and to chooſe their field on almoſt every occaſion, which could not have fallen to the lot of hoſtile troops, whoſe advance muſt invariably have been attended with ſome uncertainty, and all its train of miſchiefs.

In reviewing the great number of plans that have at times been publiſhed, wherein the poſitions of the contending parties and their ſeveral movements have been laid down, one obvious feature appears common to a very great majority; namely, that the party which awaited the attack of its adverſary, had its flanks, or at leaſt one of them, covered by woods, rivers, villages, moraſſes, or broken ground. The great object appears to have been there, to throw impediments in the way of the enemy's horſe. Hence we ſee, that ſo ſoon as any part of the centre gave way, the whole were thrown into confuſion, bearing down the ſeveral lines in ſucceſſion, and offering opportunities for a dreadful diſplay of the powers of cavalry. It appears rather doubtful how far an equal force ſhould ſo place itſelf, unleſs to defend ſome valley, &c. through which alone the enemy could penetrate into a country.

FIELD-*Fortification*, relates to the formation of ſuch temporary lines of defence, redoubts, &c. as well as of ſuch batteries, of various deſcriptions, as may be deemed neceſſary, either for the maintenance of a poſition, or for driving an enemy from that he may occupy. It would be utterly impracticable to afford inſtructions ſuited to every caſe; there being ſuch varieties of locality, as well as of circumſtance, which can only be provided for on the ſpot, and never could come under any general deſcription. Although we are apt to conſider the ſcience of fortification, in all its branches, to appertain, rather excluſively, to the corps of engineers, yet no general ſhould be entruſted with the command of an army, unleſs poſſeſſing either an intimate acquaintance with that ſcience, or ſuch a ready conception of the advantages and diſadvantages of every poſition he may aſſume, as ſhould enable him, as it were by inſpiration, to adopt or reject it without heſitation. We fear that this excellent quality rarely comes, as Dogberry ſays, "by nature,"

ture," and that few nations can boaſt any great liſt of ſuch "heaven-born generals." Not but that many individuals poſſeſs this admirable talent: the misfortune is that its poſſeſſors too often are placed in ſituations totally unſuited to their genius; or, if they do enter within the pale of military orders, either linger in ſubaltern capacities, or eventually fall among the too many victims immolated at the ſhrine of what we call glory, long before their abilities could be duly appreciated!

Field-fortification is generally divided under two heads; the offenſive, and the defenſive: the former of courſe relates to attacks, principally ſieges, and the latter to the covering of armies, or poſts, ſo as to render them ſtronger, and to throw every obſtacle in the way of aſſailants. The offenſive branch affords the greateſt latitude for deliberation, but requires no leſs judgment than the defenſive; it is uſually confided entirely to the management of the engineer department, by whom the diſtances, bearings, and extent of the ſeveral batteries are determined. Thus, when an army inveſts a fortreſs, the engineers, eſpecially if not previouſly furniſhed with a correct plan of its defences, proceed to reconnoitre, in the moſt exact manner, the ſeveral lines of fire to which certain ſpots would be expoſed, and the effects likely to be produced by batteries, both of cannon and of mortars, erected thereon. Two great objects muſt always be held in view; namely, to obtain a *direct* fire, as near as may be practicable to the work to be battered, and the placing the neceſſary batteries in ſuch manner, that, while the beſt effects may be produced, the cannon and their portion of artillery-men, together with every neceſſary apparatus, may not be ſubjected to enfilade. (See Enfilade.)

Field-works are rarely conſtructed in a durable manner; they are for the moſt part formed by the excavation of the ſoil, correſpond in figure with the parapet to be formed, and, from the reſemblance of the ditch, are called *trenches*. The ſoil thrown up being arranged in a proper manner, and ſecured by means of *faſcines* (which ſee), from falling back into the excavation, occaſions the ſhelter to become duplicate in its ratio to the actual depth excavated. Thus, in digging a trench of four feet in depth, there will be formed a covert-way of eight feet in depth, in conſequence of the height to which the ſoil is thrown. The lower four feet, that is, ſo far as the trench reaches, will be ſolid; the reſt, being looſe ſoil, juſt thrown up, will for a while be leſs competent to reſiſt heavy ſhot. Thoſe parts intended for cannon will demand an ample ſtock of faſcines, for the purpoſe of keeping the merlons in proper form and duly compacted. The places of arms, &c. which are generally made at the extremities of parallels, in order that the beſiegers may take advantage of any ſorties, as well as to guard the flanks of the trenches, will uſually require ample epaulements for the inſuring of ſafety to thoſe on duty. Where mortar batteries are made, they will not require any obvious embraſures, though the interior ſlope of the parapet may be made with a much ſmaller angle from the horizon oppoſite each piece, provided the works be ſufficiently thick to allow ſuch a diminution; otherwiſe the mortars muſt be brought back until they may bear depreſſion to a proper angle for throwing grape, ſay about 12° or 15°, without endangering the creſt of the parapet.

In this ſpecies of fortification little or no attention is paid to any arrangement of the batteries for the purpoſe of cauſing them mutually to become flanks, as muſt be done on defenſive principles. The beſiegers being generally far more numerous than the beſieged, and the greateſt attention to the prevention of enfilade being imperiouſly requiſite, induce to paying attention chiefly to one object; namely, the obtaining a *direct* fire. However, as enfilading batteries are generally neceſſary, and as it is always expedient to ſilence thoſe which flank the battered angle, it very generally occurs that ſuch a croſs-fire can be obtained as ſerves to give every neceſſary ſupport to contiguous lines of approach. The batteries raiſed for the purpoſe of breaching any part of the *principal*, cannot well be too cloſe thereto; provided their elevation be ſuch as not to be commanded from the principal. This approximation is, however, the work of time, and cannot be attempted until the fire of the tenaillons, lunettes, ravelines, and generally the counter-guards be ſilenced; after which the approaches may be carried up to the very creſt of the glacis, there to make a lodgment, as well as in the covert-way. This being effected, it is uſual for the beſiegers to ſtorm, unleſs owing to weakneſs of the garriſon, or the timidity of its commandant, the place ſhould ſurrender.

In defenſive field fortification a few general rules ſhould be well underſtood. 1. Never to occupy a poſition, by choice, whereof any important part is commanded by places of which the adverſary can take poſſeſſion: this applies far more ſtrictly to permanent defences; which, in ſuch caſe, would be of little or no avail. 2. Always to make the weaker points the firſt objects of attention; afterwards ſtrengthening the ſtronger parts, ſo as to ſecure the others, and forming ſuch a general connection of the whole as may, ſo far as practicable, render the wholly equally formidable. 3. To avoid all poſitions which are deficient in ſupplies, eſpecially of water; and never, on any account, to extend beyond the means of a firm defence; obſerving, that however much the reverſe may have been practiſed, rather to leave one flank weak, than to hazard any thing in the centre; where, if the enemy ſhould ſucceed in penetrating, ruin to both flanks muſt follow in detail.

The expert engineer never fails to render ſuch mills, houſes, churches, &c. as may be within his ſcope, ſubſervient to the purpoſes of defence. Where ſmall parties are to be covered, the interiors of ſuch edifices ſhould be fitted up in the beſt manner that may be practicable for enabling the occupants to do execution among the aſſailants. A trench may be dug within the whole circumference, and loop-holes be made for the purpoſe of allowing one row of the defenders to gall the enemy from nearly a level with the exterior; a poſition not eaſily to be overcome, while others fire ſtanding: every angle in a building becomes more or leſs a flank, and enables the occupants to make a deſperate ſtruggle. When time admits, various flanking walls ſhould be thrown up, either of maſonry or of thick planks: the laſt are beſt. A good breaſt-work, made on a flanking principle around any church, or ſolitary houſe, and eſpecially a brick-built wind-mill, having many floors or ſtories, in each of which loop-holes can be cut, or even cannon of ſmall calibre be mounted, as in a block-houſe, will enable a handful of men to ſtand out againſt a great ſuperiority of force.

The paſſage of a ford, a detroit, and a bridge, may all be covered, much in the ſame manner, by what is uſually called a *tête de pont* (*i. e.* bridge-head), of which a ſketch is given in *fig.* 6. *Plate* I. *Tactics*: this kind of defence is uſually thrown up on that ſide of the river neareſt to the enemy, beyond the bridge, and again covered by works on the hither ſide, to which the defenders can retire, and diſpute the paſſage, when the *tête de pont* may not be tenable.

Lines of defence, drawn merely as a check to cavalry, or for the generally covering an inferior army from attacks at the pleaſure of the enemy, may conſiſt of various kinds of works, according to the nature of the ground, the time allowed for conſtructing them, and the number of men that can be ſpared for their occupation. When only cavalry is to be oppoſed, nothing more is neceſſary than an abbatis, (*fig.* 7), formed by felling large trees, and after lopping off the more minute branches, placing them, ſide by ſide, in a compact manner, with their ſtems inwards; and either ſtaking the whole down, or ſecuring them together with bines, or ropes, &c. ſo as to prevent them being eaſily drawn away by an enterprizing enemy. It is, in general, found beſt to make even this kind of defence of ſuch a form as may afford flanking fires; obſerving to place a few guns along the curtains, ſo as to fire, as it were, in barbet over the upper boughs that point towards the aſſailants.

Some ſituations are naturally ſo ſtrong as to require nothing more than a breaſt-work; ſuch, for inſtance, as the borders of a precipice which cannot be taken by aſſault, and from which a direct fire in every part affords the beſt means of defeating any party that ſhould approach. In ſuch very ſtrong places a ſtraight line may anſwer, but, in moſt caſes, flanks ſhould be thrown out, as in *fig.* 8, of which the general tendency muſt be governed by local circumſtances. Whatever may be their direction or form, it is proper that no part of the lines intended to afford mutual defence ſhould exceed what is termed the point-blank range of a muſket ball; which is generally underſtood to be about 200 or 250 yards, according to the charge of powder. When within 150 yards, the advantages will be greatly augmented.

Fig. 9. repreſents a continued uniform line, compoſed of ſhort curtains, *a, a, a, a,* with the redans, *b, b, b, b, b*; theſe latter muſt bear ſuch an angle, or be placed at ſuch a diſtance from each other, as may allow a perpendicular drawn from their faces, at the point of junction, as at *c*, to paſs juſt clear of the ſaliant angle, *d*; if this be not attended to, the defenders of one redan will pour their fire into that adjoining. And, if the angle be too great, that is to ſay, more than 100° or 105°, the defences will be weakened in every part, on account of the great obliquity neceſſary in directing the fire, both in the curtain and in the redan; which, in the firing of muſketry, is always attended with bad conſequences.

Fig. 10. ſhews a line of the ſame kind as that juſt deſcribed, with independent redans, *c, c, c, c,* thrown up before the curtains, by which they are commanded. Theſe ſhould be placed at ſufficient diſtance in advance, to prevent the enemy, in caſe they ſhould be able to carry them, from aſſaulting the curtain under cover of the flanks; which they might eaſily do but for that precaution. The angles of the independent redans ſhould correſpond with thoſe of the intermediate ones, which may be about 60, or 65 degrees, according to circumſtances.

Fig. 11. ſhews a very good mode of making alternately ſhort flanks in a regular order, ſo as to reſemble the overlapping of tiles: the uſual deſignation is "en cremaillaire," from the French word *cremaillon*, ſignifying that kind of pot-hook which can be lengthened at pleaſure by means of ratchets. The termination of this ſort of indented line ought to be ſtrong; otherwiſe it would be ſubject to aſſault at the point, A, where the addition of the redan, B, adds greatly to its ſecurity.

Fig. 12. ſhews a line of obtuſe angles, called ſwallow-tails, *a, a,* which would not afford a ſufficient flanking fire; therefore it is expedient to mix them alternately with redans. This is an excellent mode for lines not finiſhed with redoubts, or with advanced redans.

Fig. 13. is a line of ſwallow-tails, *a, a, a,* mixed with obtuſe baſtions, *b, b, b,* wherein it will be ſeen there is great ſtrength. The addition of a cavalier, *c*, in each baſtion, with a *fleche*, *d*, in front of the ſwallow-tail, *e*, obviouſly renders ſuch a line truly formidable.

Fig. 14. exhibits a line of curtains, *a, a,* flanked with baſtions, and having redoubts, *c, c,* in their centres. This is alſo attended with great ſtrength, eſpecially as the latter prevent the enemy from following up any advantage. We ſhall conclude this article with obſerving, that field-fortification muſt uſually be extremely irregular; therefore on lines of any extent it may be expected to ſee the whole of the above-mentioned defences intermixed according as the ground may ſuit them reſpectively. In ſome parts, where deep fiſſures or craggs may intervene, the line will of courſe be broken; there it will be neceſſary to place batteries on the moſt commanding ſituations, as well as to ſcarp, and otherwiſe add difficulties to the aſcent, ſo as to prevent the enemy from making a puſh in ſuch ſituations; which, when well defended, may be conſidered impregnable.

In carrying field-works over riſing grounds, ſome parts of the defences will ſometimes expoſe their flank; when this happens, an epaulement muſt be thrown up, of ſufficient height to obſtruct, not only the point-blank, but the ricochet ranges of the enemy's ſhot.

Circular baſtions have been properly exploded; it being evident that the general tendency of their fire was weakened; while, at the ſame time, that portion moſt advanced towards the enemy could not poſſibly be flanked by any other work.

We ſhall now offer to the conſideration of our military readers a few practical obſervations derived from a ſmall work poſſeſſing conſiderable merit; theſe are ſelected becauſe they furniſh, in conciſe terms, the very elements of that highly important topic now under conſideration.

1. The ſpot on which works are to be conſtructed ſhould determine their figure; nor ſhould any attention be paid to preſerving a regular form, which does not occupy the ground to advantage.

2. Every line muſt be ſo diſpoſed, that the ſlope of hills all around, even to the very bottom, be open to the ſmall arms of the garriſon, and every part ſhould be diſcoverable to the diſtance of at leaſt 500 paces.

3. Works thrown up for the defence of a defile ſhould always be within muſket ſhot of it; which muſt not be more than 200 yards.

4. The beſt defence in works that are flanked, or where one ſide is defended by the fire of another, is that formed by right angles.

5. A ſaliant angle ſhould never be leſs than 60°, nor a re-entering angle leſs than 90°, nor greater than 120°.

6. The entrance into the work ſhould always be in that part leaſt expoſed to attack, and if poſſible in a re-entering angle.

7. Endeavour to preſent, if poſſible, a longer front to the enemy than he can occupy in making the attack.

8. Avoid all ground commanded by an eminence, either in front, flank, or rear.

9. Never leave your rear ſo expoſed that an enemy can attack ſo as to turn it.

10. Always make the angles of a work in the directions leaſt expoſed to attack; and conſequently endeavour to preſent a front to the enemy's batteries, &c.

11. The garriſon ſhould never be drawn up more than two deep; allowing an ordinary pace of two feet for each file, and from ſix to eight paces for each piece of ordnance.

12. If a work is ſo large as to be defended by a battalion or two, a reſerve ſhould be allowed of about one-ſixth of the number.

13. The ſpace within a work ſhould always be ſufficient

for the men to move and lie down; every ſoldier will require at leaſt 18 ſquare feet, and every piece of ordnance about 216.

14. Provided the work be not too extenſive, the more inward ſpace there is the better.

15. A parapet, to reſiſt cannon, ſhould never be leſs than 12 feet thick, and for muſket ſhot not leſs than ſix feet.

16. The height of the parapet muſt be regulated by the ſituation of the work, and of the adjoining ground; with this conſideration, that the height (of its creſt) above the banquette ſhould not exceed 4½ feet: if higher, men of rather a ſhort ſtature will not be able to fire over it.

17. The depth and breadth of the ditch muſt be regulated by the quantity of earth required for the parapet and banquette.

18. A tête de pont, or any work intended to cover the embarkation of troops, or the paſſage of a river, &c. ſhould, if poſſible, be made where the line of the river or coaſt forms a kind of re-entering angle, that the flanks of the corps, as well as thoſe of the works, may be covered. See *Field*-FORTIFICATION.

To carry on the work.—The number of workmen muſt be proportioned to the time allotted for carrying on the work, the quantity of labour, and the number of hands capable of being employed at the ſame time. When the ditches are broad, the workmen muſt be poſted in two rows; but, if narrow, only in one. In the firſt caſe the earth will be thrown by thoſe who are on the outward edge of the ditch to the ſecond row, and by them upon the parapet: for which reaſon the ſecond row, to keep pace with the firſt, ought to be twice as numerous. The workmen ſhould never be placed nearer than two paces, or four feet from each other, and two men with ſhovels ſhould be preceded by one with a pick-axe. If more than uſual expedition be required, one more with a wheel-barrow, or baſket, may be added to ſix or eight with ſhovels. Another row of workmen ſhould alſo be placed on the parapet, to ſpread the earth and beat it down as it is thrown up. In fixing the faſcines, three men will ſuffice for every 24 feet of the work; theſe ſhould be provided with two mallets, one ſaw, and one hand-bill or hatchet.

In order to form ſome idea of the time in which a field-work may be completed, compute the number of cubic feet of earth to be excavated, thus; multiply half the ſum of the breadth of the ditch, at top, by the depth, for the number of ſquare feet in the profile; this multiplied by the diſtance between the workmen in feet, will ſhew the number of cubic feet each man has to dig: or being multiplied by the length of the ditch (in feet) will give the cubic contents of the ditch. Now, one man is ſuppoſed to be able to move 216 cubic feet of earth in a day during the ſummer; but this is not always the caſe. If a field-work be completed in 24 hours, it will be as much as the moſt diligent workmen are capable of. This time is generally allowed for the formation of a weak profile; 48 hours for that of a ſtronger, with a revetement of faſcines; and 72 for the ſtrongeſt.

The different ſlopes for the works muſt depend upon the nature of the ſoil, and the materials of which the work is compoſed. The interior ſlope of the parapet, though it be faſcined, ſhould be one-ſixth of its height, and the ſlope of the banquette equal to its height. The ſlope of the ſcarp, or counterſcarp of the ditch, ſhould be from half its height to its full height, according to the ſoil. The ſuperior ſlope of the parapet muſt depend entirely upon the ſituation of the work, and that of the ſurrounding country. The interior ſlope of the parapet is generally lined with faſcines, to keep up the earth; but it is not abſolutely neceſſary to faſcine the exterior ſlope, if the ſoil be tolerably ſtiff. The embraſures are commonly made 20 inches wide within, and nine feet on the outſide. They muſt always be lined with ſomething to retain the earth; turf is generally preferred, as faſcines are ſo apt to take fire. The manner in which *faſcines* are made may be ſeen under that head.

It ſometimes happens that the ſoil is ſo hard as to render it impoſſible to throw up works by the means of excavation; and where it is a looſe ſand, equal difficulty would occur regarding its retention, even when kept up by revetements of faſcines. In either of theſe caſes, the batteries, &c. muſt be formed by placing *gabions* (which ſee) in ſuch order, and contiguous, as may ſerve to give a proper form to the merlons. The gabions may be either lined with leaves, ſacking, &c. where the ſoil is a running ſand, or they may be rammed full of clay, or whatever ſtiff ſoil may be at hand; wool, cotton, chips of leather, bark, or whatever may ſerve to confine the ſand, may anſwer according to circumſtances, obſerving that, in ſome inſtances, the whole interior muſt be gabioned. It will be evident that on a bad ſoil, ſuch as above deſcribed, no ditch could be rendered both efficient and permanent; if lined with faſcines, they might prove the deſtruction of the whole work, ſhould the enemy throw carcaſſes or ſhells into it. A battery formed of gabions may be run up with great celerity, provided proper materials for filling them be at hand, and plenty of labourers at command. In very hard, rocky ſoils, there is great difficulty in fixing gabions, on account of the impracticability of driving the neceſſary ſtakes. To reſiſt muſketry, ſand bags are often found ſufficient. Theſe are particularly ſerviceable in ſituations where the oppoſing troops are very cloſe; being placed ſo as to lean towards each other, but leaving a ſmall interval, like a loop-hole, and being again crowned with an entire layer of the ſame kind; they offer an excellent ſkreen, from behind which the aſſailants may be galled in the moſt diſheartening manner. Sand bags, arranged along the top of a low wall, add conſiderably to the means of defence, eſpecially where the wall is ſo irregular as to offer the means of flanking.

FIELD-*Piece*, a ſpecies of artillery intended for ſervice in the field, in contradiſtinction to ſuch pieces of ordnance as are appropriated to the defences of fortified places, to naval warfare, and to battering in breach. Field-pieces are in general made of braſs, or rather of gun-metal, which conſiſts of from 8 to 10lbs. of tin to 100lbs. of copper; the largeſt proportion of tin being uſed for mortars. The ordnance under deſcription is uſually divided into three claſſes, *viz.* battalion guns, artillery of the park, and horſe artillery. The battalion guns include all light pieces attached to regiments of the line, which they accompany in all manœuvres, to cover and ſupport them. The following natures of field ordnance are attached to battalions of infantry, by the different powers in Europe:

The French have	two	4-Pounders	*per* battalion.
Engliſh	two	6 do.	do.
Danes	two	3 do.	do.
Auſtrians	three	6 do.	do.
Pruſſians	two	6 do. in the 1ſt line	
———	two	3 do. in the 2d line	
Hanoverians	two	3 do.	*per* battalion.

The artillery of the park is compoſed of every claſs of field ordnance. It is intended to form batteries of poſition, that is to ſay, to occupy advantageous ſituations, independent of the movements of the troops, but with the view to ſupport them, and to produce the greateſt effects. Sometimes the park is divided into the ſeveral parts of the line; ſometimes it is advanced under cover of cavalry, which, ſuddenly retiring, at a proper moment, unmaſk the battery, and ſurpriſe the enemy by the fatal diſcloſure.

The park ſhould be ſufficiently numerous to afford ſupplies in the event of any pieces being taken by the enemy; but, on the other hand, it is bad policy to burthen an army with too large a train, which not only occupies a great length of line, which in ſome inſtances expoſes the whole to injury, but demands ſo large a ſtock of forage for the horſes, &c. as to occaſion conſiderable inconvenience on the ſcore of proviſions. The common rule is, to attach to the park twice as many field-pieces, of various natures, as there may be battalions of infantry in the army. The moſt approved proportions are theſe: 2 fifths of the whole to be 12-pounders; 2-fifths to be 6-pounders, and 1-fifth to be 3-pounders. But in different countries it is found neceſſary to lower the eſtabliſhment to the following ſtandard; *viz.* only 1-fourth to be 12-pounders; 2-fourths to be 6-pounders, and 1-fourth to be 3-pounders. For every 100 pieces of cannon it is ſuppoſed that four howitzers ſhould be added; but we generally ſee a much larger proportion of the latter; perhaps as far as 18 or 20 to the 100: the French even exceed that proportion, and claſs their field-pieces into 12, 8, and 4-pounders; which, as their pound weight exceeds our's conſiderably, their ordnance may be rated at about 1-fifth heavier than the Britiſh.

Horſe artillery.—In the French ſervice this conſiſts of 8-pounders, and 6-inch howitzers; a weight of metal requiring the greateſt exertions to move with due rapidity, and rather tending to ſubject this department to delays, or even to capture. With reſpect to the latter point, the French ſeem to entertain fewer ſcruples about relinquiſhing their ordnance than we do; they rarely make exigency ſubſervient to honour, but look principally to effects; being certain that a few field-pieces may always be ſupplied from their park of artillery.

The Engliſh horſe artillery conſiſts of light 12-pounders, light 6-pounders, and light 5½-inch howitzers. It remains to be proved how far this ſelection is eligible; but, in addition to the foregoing comment on the French eſtabliſhment, we may perhaps be correct in hazarding an opinion, that, except in the diſcharge of grape, in which branch the howitzers poſſeſs a decided ſuperiority, the French 8-pounders may be conſidered as very nearly on a par with our 12-pounders; the former weigh only 10 cwt. 3 qrs. while the latter amount to 8 cwt. 3 qrs. 4 lbs.; or, upon the new ſcale now chiefly in uſe, to 12 cwt. But our medium 12-pounders have only a very ſmall limber-box, lately added, which carries 6 round, and 6 caſe ſhot, with a proportion of ſmall ſtores. They are attended each by two waggons, having the ammunition, generally about 150 rounds, divided equally between them. The light 6-pounders carry 34 round and 16 caſe ſhot in their limbers, and for each pair of guns about 260 rounds of ſorts in one waggon. The 5½-inch howitzers carry 22 ſhells, 4 caſe-ſhot, and 2 carcaſſes, in their reſpective limbers, and are attended by two waggons, carrying 24 caſe-ſhot, 24 ſhells filled, and 120 empty, and 4 carcaſſes. The horſe artillery pieces have waggons on a peculiar conſtruction, which carry as follow:

For 12-Pounders, light, on the limber—	12 round,	4 caſe,	4 ſhells		total 92.
— do. —— in one waggon—	52 ——	10 ——	10 ——		
For 6-Pounders, light, on the limber—	32 ——	8 ——	——		total 150.
— do. —— in one waggon—	97 ——	13 ——	——		
For 5½-inch howitzers, on the limber—	——	5 ——	13 ——		total 73.
— do. —— in one waggon—	——	10 ——	41 ——	and 4 carcaſſes	
For 3-Pounders, heavy, with curricle—	6 ——	6 ——			total 136.
— do. —— in one cart—	100 ——	24 ——			

The Britiſh parks of artillery are compoſed of the following ordnance: medium 12-pounders, 4; Deſagulier's 6-pounders, 4; and light 5½-inch howitzers, 4. Theſe are called brigades, according to their reſpective calibres, or natures; each brigade conſiſting of 4 or 6 pieces, with a reſerve of about ⅙th of the whole number, which ſhould be placed behind the firſt line; but if the front be extenſive the reſerve muſt be divided.

All field-pieces are mounted on carriages, ſtanding on one pair of wheels five feet in height, and when travelling have their trails, or rear, (which then precedes the gun itſelf,) hooked up to the rear of the *limber*, or carriage, on equal ſized wheels, allotted to the conveyance of the ammunition in cheſts; thence called *limber-boxes*.

FIELD-*Staff*, is a ſtaff carried by the gunners, in which they ſcrew lighted matches, when they are on command; which is called arming the field-ſtaffs. See LINSTOCK.

FIELD-*Marſhal*, is the denomination of the modern military rank in England, but ſuperior to all others; having the chief command of the whole army.

FIELD *Officers*. See OFFICERS.

FIELD *of Viſion*, in *Optics*, is that conical ſpace indefinitely extended before us, ſo as to include all objects that can be ſeen at one view, or without turning the eyes. The preciſe limits of this ſpace are not eaſily aſcertained. In looking at a ſmall diſtance, we have an imperfect glimpſe of objects through almoſt the extent of a hemiſphere, or at leaſt for above ſixty degrees each way from the optic axes; but towards the extremity of this ſpace objects are very imperfectly ſeen; and the diameter of the field of diſtinct viſion does not ſubtend an angle of more than five degrees at moſt, ſo that the diameter of a diſtinct image on the retina is leſs than .06 of an inch; but it is probably much leſs. See VISION.

FIELD-*Fare*, in *Ornithology*, the Engliſh name of a bird of the thruſh kind, called by authors TURDUS *pilaris*, which ſee.

It is a bird of paſſage, and viſits us in England toward the end of autumn in vaſt flocks, and leaves us in ſpring; it is not certainly known where theſe birds breed. They feed on berries, particularly thoſe of the holly, and are well taſted birds.

This bird is eaſily taken with water bird-lime in the following manner: take out a gun, and kill two or three field-fares with it; by that time the gun has been diſcharged two or three times, the reſt of theſe birds will be ſo ſhy, that there will be no coming near them; then tie one or two of thoſe that were ſhot to the upper branches of a buſhy tree, in ſuch manner, that they may ſeem alive and ſitting there. Then prepare two or three hundred twigs, covering them well with the water bird-lime, made warm for that purpoſe; take a good birchen bough, and in that place all the twigs; tie this faſt to the tree, juſt underneath where the other field-fares are tied, and let this be in a place where they come in a morning to feed, for they always uſe one haunt for feeding ſo long as there is any food left there. By this means the field-fares will ſettle in whole flocks, near thoſe which they ſee tied to the buſh; and two or three dozen may be in this manner taken at a time.

Field-*Fare, American.* See Turdus *Migratorius.*

Field-*Lark.* See Alauda *Arvenſis.*

Field-*Book*, in *Surveying*, a book uſed for ſetting down angles, diſtances, and other things; remarkable in taking ſurveys.

The pages of the field-book may be conveniently divided into five columns. In the middle column the angles at the ſeveral ſtations taken by the theodolite are to be entered, with the diſtances from the ſtations. The diſtances taken by the off-ſet ſtaff, on either ſide of the ſtation line, are to be entered into the columns on either ſide of the middle column, according to their poſition with reſpect to that line. The names or characters of the objects, with proper remarks, may be entered in the columns on either ſide of theſe laſt mentioned. See Surveying.

Field *of a Painting*, &c. is more uſually called the *ground* thereof.

FIELDING, Henry, in *Biography*, a diſtinguiſhed writer, was born in 1707 at Sharpham, near Glaſtonbury in Somerſetſhire. After receiving the rudiments of education at home, he was removed to Eton ſchool, where he laid in a reſpectable ſtock of claſſical learning. From Eton he went to Leyden, where he ſtudied the civil law, but ſoon after his return he commenced writer for the ſtage. His firſt piece was a comedy, entitled "Love in ſeveral Maſks," and the ſucceſs which he obtained in this inſtance led him to make numerous efforts in the ſame way; but his early comedies are all forgotten: many of them were little more than tranſlations from the French.

At the age of about twenty-ſix, or twenty-ſeven, he married a young lady of great beauty, and with ſome fortune, which, with what he obtained by the death of his mother, put him in poſſeſſion of an eſtate of rather more than 200*l. per annum.* With this fortune he aſſumed the ſtyle of a country gentleman, with a retinue of ſervants, horſes, and dogs. In three years he had exhauſted his property, and involved himſelf in conſiderable difficulties. He now reſolved to ſtudy the law, with a view to future ſupport, and entered himſelf in the Temple. While he was keeping the terms required, he ſupported himſelf and family by his pen. He wrote for the ſtage, and publiſhed many eſſays which diſplayed a fund of good ſenſe, and acquaintance with mankind. His firſt attempt at the humorous and ſatiric delineation of character, was in the "Hiſtory of Jonathan Wild," which diſplays a familiarity with the ſcenes of low profligacy, which it is wonderful that a perſon in decent life ſhould ever acquire; but his early courſe laid the foundation of too much knowledge of this kind. In 1742 he publiſhed his firſt proper novel, entitled "The Hiſtory and Adventures of Joſeph Andrews, and his friend Mr. Abraham Adams." The ſcenes introduced in this piece are chiefly thoſe of low life: the grave Cervantic humour is imitated, and the principal character, parſon Adams, is rendered the Quixote of the piece. His ſucceſs as a novel-writer was not favourable to his profeſſional purſuits, and he did not attain to any conſiderable eminence at the bar. He received little emolument from his legal practice, and his other ſupplies were inadequate to the demands of his family. In the midſt of anxious cares and broken health, he had the misfortune to loſe his wife. By this ſtroke he was ſo far overwhelmed as to be unequal to all exertion. At length, the love of liberty and the cauſe of proteſtantiſm re-animated his fervour, and, in 1745, during the rebellion, he wrote and publiſhed a periodical paper, entitled "The true Patriot," which was followed by "The Jacobite Journal." Theſe efforts in favour of the government and conſtitution, obtained for him the appointment to the office of a Middleſex magiſtrate, in the diſcharge of the duties of which he was very exemplary, and took every method for preventing crimes, and for improving the police. In 1749 he publiſhed "A Charge to the Grand Jury," containing an accurate account of the inſtitution and particular duties of grand juries. This was followed by an "Enquiry into the Cauſes of the late increaſe of Robbers," dedicated to the lord chancellor Hardwicke; and by "A Propoſal for the maintenance of the Poor:" both theſe pieces were eſteemed judicious and uſeful performances, and as exhibiting much diligent reſearch into difficult ſubjects. While he was thus employed in the ſerious avocations of his magiſterial office, he found leiſure to write his "Tom Jones," which muſt ever be regarded as a maſter-piece of art, replete with the moſt ſtriking delineation of manners, and exhibiting extraordinary ſkill in managing the intricacies of a plot ſo as to wind up with the happieſt effect. His third novel was entitled "Amelia," which came out in 1751; after the publication of this his conſtitution began to give way very rapidly, but the powers of his mind were ſtill in high vigour, and he engaged in a new periodical work, entitled "The Covent Garden Journal," which continued with much ſucceſs for about a year, when the author's ill-health obliged him to ſuſpend his literary labours. As a laſt reſource, he was adviſed to try the climate of Portugal, but the voyage did not contribute to his recovery: he lived long enough to deſcribe the occurrences which he had witneſſed in paſſing from London to Liſbon, and died October 8th, 1754, in the forty-eighth year of his age. Fielding was poſſeſſed of many ſolid virtues of the heart, and the powers of his underſtanding were unqueſtionable. His novels, though liable to objections, afford many valuable moral leſſons. His ſcenes are often drawn from low life, and diſplay too much of the vices and crimes of mankind, yet they are relieved by a conſiderable admixture of nobler matter, and contain many affecting pictures of moral excellence. His fame as a writer has not declined ſince his death. He is ſtill regarded as much at the head of the department of comic romance as Richardſon is at that of the ſentimental. His ſiſter, Sarah Fielding, is known for two novels, entitled "David Simple," and "The Cry;" and for a tranſlation of the "Memorabilia" of Xenophon: and his half-brother, ſir John Fielding, was long at the head of the public office, London. Biog. Brit.

FIELEWEER, in *Geography*, an iſland near the W. coaſt of Norway, about 22 miles long and 4 broad, with a town. N. lat. 63°. 30'.

FIELSIA, a town of Swediſh Lapland; 45 miles S.S.E. of Aſela.

FIEN, a town of Perſia, in the province of Irak; 5 miles S.W. of Caſhan.

FIENVILLE, in *Geography*, a town of France, in the department of the Somme; five miles S.W. of Dourlens.

FIENUS, or Fiens, Thomas, in *Biography*, a phyſician of eminence in the ſixteenth century, was born at Antwerp, where his father exerciſed the ſame profeſſion, on the 28th of March, 1567. He purſued his medical and mathematical ſtudies at Leyden, and afterwards at Bologna, which he viſited in 1590. On his return to his native country his talents were ſoon made known: in 1593 he was invited to Louvaine, in order to fill one of the vacant profeſſorſhips of medicine in that univerſity, in which he took the degree of doctor about the end of that year. He reſigned his chair after ſeven years of reſidence in that ſchool, and went to Munich, having been appointed phyſician to Maximilian, duke and afterwards elector of Bavaria; but he returned to his poſt at the end of one year. In 1616, he was offered the profeſſorſhip of medicine in the univerſity of Bologna, with a ſalary of a thouſand ducats; but the archduke Albert immediately increaſed his ſalary at Louvaine to the ſame ſum, in order to do away the temptation of leaving that city. Accordingly he remained there until his death, which occurred on the 15th of March, 1631, at the college of Breughel, of which he had been for a long time preſident. Fienus has been ever regarded as an intelligent and able phyſician; he had few equals among his contemporaries in the knowledge of natural hiſtory and ſurgery; not to mention his acquaintance with the Greek, and mathematics. His works likewiſe contributed greatly to advance his reputation; they were as follows. 1. "De cauteriis Libri quinque," Louvaine, 1598. 2. "Libri Chirurgici XII., de præcipuis Artis Chirurgicæ controverſiis," Francfort, 1602. This work, which paſſed through many editions, treats of the principal ſurgical operations. 3. "De viribus Imaginationis Tractatus," Louvaine, 1608. 4. "De Cometa anni 1618," Antwerp, 1619. In this tract he combats the opinions of Copernicus reſpecting the motion of the earth. 5. "De vi formatrice fœtûs Liber, in quo oſtenditur animam rationalem infundi tertiâ die," ibid. 1620. This work was attacked by Louis du Gardin, a profeſſor of Douay, who maintained the better ground in this undeterminable argument. Fienus replied in, 6. "De formatrice fœtus adverſus Ludovicum du Gardin, &c.," Louvaine, 1624. His opinion was alſo impugned by Santa Cruz, the phyſician of Philip IV., which produced, 7. "Pro ſua de animatione Fœtûs tertiâ die opinione Apologia, adverſus Antonium Ponce Santa Cruz, Regis Hiſpaniarum Medicum Cubicularem, &c.," Louvaine, 1629. 8. "Semiotice, ſive de ſignis medicis Tractatus," Leyden, 1664. The father of the preceding, Dr. John Fienus, publiſhed a treatiſe at Antwerp in 1582, entitled, "De Flatibus humanum corpus moleſtantibus Commentarius novus ac ſingularis," which paſſed through many editions. Eloy. Dict.

FIERAS, in *Geography*, a town of Sweden, in the province of Aland; twelve miles N.N.W. of Wardberg.

FIERI FACIAS, in *Law*, a judicial writ, which lies at all times within the year and day, for him that hath recovered in an action of debt and damages; it is directed to the ſheriff, commanding him to levy the debt and damages on him, againſt whom the recovery was had. This ſpecies of execution is called *fieri facias* from the words in it which command the ſheriff, *quod fieri faciat de bonis*, that he cauſe to be made of the goods and chattels of the defendant the ſum or debt recovered. This lies as well againſt privileged perſons, peers, &c., as other common perſons; and againſt executors or adminiſtrators with regard to the goods of the deceaſed. The ſheriff may not break open any outer doors (5 Rep. 92.) to execute this writ; but muſt enter peaceably, and may then break open any inner doors, belonging to the defendant, in order to take the goods. (Palm. 54.) And he may ſell the goods and chattels, even an eſtate for years, which is a chattel real (8 Rep. 171.) of the defendant, till he has raiſed enough to ſatisfy the judgment and coſts: firſt paying the landlord of the premiſes, upon which the goods are found, the arrears of rent then due, not exceeding one year's rent in the whole. (Stat. 8 Ann. c. 14.) If part only of the debt be levied on a *fieri facias*, the plaintiff may have a *capias ad ſatisfaciendum* for the reſidue. (1 Roll. Abr. 904. Cro. Eliz. 344.) See EXECUTION.

FIESCO, JOHN LEWIS, in *Biography*, count of Lavagna, a noble Genoeſe, was born in 1525. He became poſſeſſed of a large eſtate at the age of eighteen, and, ſurrounded with flatterers, began, at their ſuggeſtions, to aſpire after that power and diſtinction in the ſtate to which his birth and opulence ſeemed to entitle him, but from which he was precluded by the ſuperior influence of the Doria family. (See DORIA, *Andrew*.) Fieſco, who poſſeſſed all the talents proper to ingratiate himſelf with a party, reſolved to attempt a revolution in Genoa which might raiſe him to the ſtation that Doria now occupied. His courteous manners rendered him a favourite with the people. He obtained the intereſt of the court of France, and the concurrence of the Pope, who accommodated him with ſome galleys. Notwithſtanding the preparations that he was making, Doria did not, and would not, ſuſpect any thing to the prejudice of Fieſco, though the deſtruction of himſelf and family formed an eſſential part of the conſpiracy. The day fixed for the bloody enterprize was January the 2d, 1547, and, on the preceding morning, Fieſco prepared a galley under the pretext of a cruiſe againſt the corſairs, and then paying a viſit to Doria, he requeſted permiſſion to depart early from the harbour, and took his leave with much apparent reſpect, and every demonſtration of affection. In the evening he aſſembled his adherents, and having exhorted them to join him in an attempt to free their country from its oppreſſors; he went to make known his project to his wife, who, diſtracted with the idea of the impending danger, entreated him, on her knees, to deſiſt from his deſperate undertaking. He had, however, made up his mind, and was immoveable; ruſhing from her apartment, he exclaimed, "Madam, you ſhall never ſee me again, or you ſhall ſee every thing in Genoa beneath you." In the dead of night he ſallied forth at the head of 500 armed men, ſurrounded by his fellow conſpirators. He diſpatched parties to all quarters, and proceeded himſelf to ſecure the dock in which the galleys lay. In paſſing over a plank, placed between two veſſels, it gave way and he fell into the water. The weight of his armour ſunk him to the bottom, from whence he never roſe, and thus, at the early age of twenty-two, his life was ſacrificed at the ſhrine of ambition. The confederates had gone too far to recede with ſafety; they determined therefore to ſtrike the deſperate blow, but the death of their leader was fatal to the attempt. Doria eſcaped unhurt; the ſenate recovered its authority, and the family of Fieſco paid the penalty of the crimes of their leader by ruin and proſcription. Mod. Univer. Hiſt.

FIESCO, in *Geography*, a town of Italy, in the department of the Upper Po; 4 miles E. of Crema.

FIESOLE, GIOVANNI DA, in *Biography*, an hiſtorical painter, who was born at Fieſoli, in 1387. His real name was Montorioli; from his excellence in painting the expreſſions of ſaints and angels, he was alſo called Giovanni Angelico. He was firſt placed as a diſciple with Giottino; He afterwards became a Dominican friar. His firſt works of conſequence were painted at Florence, by order of Coſmo di Medici; who having built the church and convent of St. Mark, commiſſioned Fra. Giovanni to paint the Chapter-houſe, in which he repreſented, in freſco, on the walls, three ſubjects. 1ſt, The Paſſion of Chriſt. 2d, All the Saints, Founders of Religious Orders, weeping at the foot of the Croſs, and on the other St. Mark the Evangeliſt with the Virgin, the three Maries, and Saints Coſimo and Damiani, preſent at the Crucifixion. Under theſe, by way of frieze, he repreſented a tree, at the foot of which was St. Dominico ſupporting the branches, which in their turn upheld portraits of all the popes, cardinals, biſhops, ſaints, and doctors in theology, who were of the Dominican order. His fame procured him an invitation to Rome from pope Nicholas V., who employed him to paint his chapel and ornament manuſcripts. He became ſo warm an admirer of Giovanni, that he offered him the archbiſhopric of Florence, which his humility and perhaps love of his art, led him to decline accepting for himſelf, and the perſon whom he recommended was inſtalled in his ſtead. He generally painted his pictures ſmaller than life: Vaſari ſpeaks of them with great delight, but they are not of a grand claſs, and are often defective. He died in 1445, aged ſixty-eight, having been exceedingly induſtrious, and leaving behind him an immenſe number of works, principally at Florence and Rome.

FIESOLI, in *Geography*, a town of Etruria, the ſee of a biſhop, ſuffragan of Florence, three miles N.E. of Florence. This is the antient *Fæſulæ*, one of the twelve cities of Etruria.

FIFE, a ſmall ſhrill flute, blown at the ſide, like a German flute. It is in almoſt every muſical band, and as the tabor and pipe enliven the dance, the fife and drum animate the ſoldier, particularly in the quick ſtep. The fife has ſix notes, and furniſhes two octaves from the loweſt D in the treble, to D in alt. The Swiſs firſt brought this inſtrument into France, after the battle of Marignan, under Francis I.; ſince which time it has been admitted into regimental muſic, in preference to the common octave flute, being made leſs falſe from its having a key which the *fife à bec* has not. Laborde.

The *fife* is an inſtrument, particularly intended for the uſe of regiments, and forms, in conjunction with the drum, the only muſic with which many corps are provided. This little ſhrill tube is uſually about fourteen inches in length, and of one piece, though ſome are made to take to pieces; but ſuch are not ſuited to military uſe: it may be conſidered a ſmall kind of flute, eſpecially if provided, as ſome are, with a key; but ſuch are rare, the generality being confined to only ſix finger holes, and an embouchure, or mouth-hole. The want of a key neceſſarily occaſions a difference in the fingering of many notes; but the compaſs, or extent, is about the ſame as that of the German flute; namely, from D below the treble ſtaff, to D in alt.; but all beyond B in alt. are more or leſs harſh, and cruelly piercing to a ſenſible ear. Fifes are made of three ſeveral ſizes, denominated A, B, and C, reſpectively; A being the largeſt and deepeſt toned, and one minor third below concert pitch; the next ſize is made to correſpond with the B ♭ of the muſical ſcale, and is generally uſed when playing with military bands, uſing what are called B ♭ clarionets. The C fifes are thoſe at concert-pitch, and are chiefly uſed for the ordinary ſervice of theſe inſtruments. Such an aſſortment requires ſome vehicle or receptacle; accordingly we find that where ſuch a diverſity is allowed, each fifer is provided with a

Fife-*caſe*, which is a tin tube, about twenty inches long, and three in diameter, having two diaphragms of tin pierced for the ſeveral fifes to paſs through, ſo as to be kept ſeparate. There is a tin lid which faſtens down, and either locks or is fixed by a ſpring pin. This caſe is generally painted to conform with the ornaments on the drums of the regiment, and is ſlung over the ſhoulder by means of a cord with taſſels. Though certainly decorative, we cannot but view this appendage as both uſeleſs and extravagant.

Fife-*rails*, in a *Ship*, are thoſe that are placed on baniſters on each ſide of the top of the poop, and ſo along with hances or falls. They reach down to the quarter-deck, and to the ſtair of the gangway.

Fife's *Paſſage*, in *Geography*, a channel in Broughton's Archipelago, about eleven miles in length and two in breadth. N. lat. 50° 50′. E. long. 233° 11′.

FIFENESS, a cape of Scotland, on the E. of the county of Fife, with a village of the ſame name; a ridge of rocks, called the Car rocks, extending a conſiderable way into the ſea, renders the paſſage of the cape dangerous to ſeamen. N. lat. 56° 15′. W. long. 2° 39′.

FIFER, a perſon who plays on the fife: of theſe one is generally appointed to each company of infantry, who, in company with the drummer, plays to the corps while marching for the relief of guard, or when the arms are carried; alſo at the times of beating the reveillez, the aſſemblez, the retreat, the tattoo, and other regular or incidental duties. The moſt diſagreeable part of the duty of the fifers and drummers, conſiſts in the infliction of ſuch puniſhments as offenders are ſentenced by courts-martial to undergo in preſence of their companions in arms, occaſioning this claſs of perſons to be often treated with marked odium, and to receive the opprobrious deſignation of "Bloody Thumbs." This term is derived from the ſtains of blood attaching to their hands, in conſequence of their occaſionally ſtraightening the ſeveral cords of which a cat-'o-nine-tails is compoſed, and which in the act of flagellation are apt to become entangled, ſo as to fall heavily, en maſſe, upon the delinquent's ſhoulders. We cannot let paſs this opportunity of expreſſing our conviction, founded on the beſt authorities, that corporal puniſhments are as unneceſſary as they are diſgraceful; and that it is not only very practicable, but has in many inſtances been found very effectual, to ſubſtitute moderation for ſeverity, and an attack on the pride of an offender, for one on his fleſh. Under the exiſting ſyſtem we can never be led to envy the feelings of the fifers and drummers of a regiment; nor can we entertain the opinion that this claſs of our ſoldiery will be exempted from thoſe opprobious epithets, and thoſe ſarcaſtic reflections, which affix a ſtigma of the moſt obnoxious deſcription.

FIFESHIRE, in *Geography*, is a county of Scotland, almoſt ſurrounded by the rivers Forth and Tay, the friths or eſtuaries of which nearly form it into a peninſula. The former river on the ſouth divides it from the Lothians; and the latter ſeparates it from the ſhires of Perth and Angus; on the eaſt it is bounded by the ſhires of Kinroſs and Clackmannan; and on the weſt by the German ocean. The length is 60 miles by 18 in breadth, compriſing about 480 ſquare miles. The rivers by which it is watered, beſides the two already mentioned, are the Eden and the Leven. The Eden has its riſe on the borders of Perthſhire, between the towns of Strathmiglo and Abernethy; and taking a courſe of 17 miles due eaſt, falls into the ſea in the bay of St. Andrew's. Though a tide river, its ſtream is comparatively placid, and its fine ſalmon fiſhery is greatly annoyed on this account with the notorious enemies of that fiſh, the phocæ or ſeals, which is elegantly alluded to by the poet Johnſtone.

> "Arva inter nemoroſque umbras, et paſcua læta
> Lene fluens, vitreis labitur Eden aquis."

The Leven flows out of Loch Leven, a beautiful lake of nearly 12 miles in circumference, partially included in the ſhires of Fife and Kinroſs, the fertile plain of which forms its weſt and northern boundary, and to the eaſt and north it is overlooked by the towering Lomond hills. Theſe and other intereſting ſurrounding objects, particularly the royal reſidence of the ancient line of Scottiſh or Pictiſh kings, will be noticed in their reſpective places. This river, after running 17 miles in an eaſterly direction, falls into the ſea near the village of Leven. It has frequently been confounded, by the admirers of Smollet for his beautiful ode on Leven Water, with a river of the ſame name in the ſhire of Dumbarton.

This diſtrict anciently formed part of the provincia invicta Caledonia, which name the Romans had given to the country north of the river Tay, previous to their taking poſſeſſion; for Camden obſerves, the Tay was the utmoſt northern boundary of the Roman empire in this part of Britain. Julius Agricola, the beſt of generals under the worſt of emperors, Domitian, though he was enabled to penetrate further by incurſive inroads, even into the heart of the highlands; yet ſagaciouſly perceiving no benefit could ariſe by conquering a country, naturally unproductive, and thinly peopled, wiſely withdrew his army from what he termed the Barbarians; and to reſiſt retaliations erected a chain of forts acroſs this part of the iſland, and eſtabliſhed the Tay for his hoſtile frontier. Some Roman remains have been diſcovered northward in Perthſhire, but many more in thoſe parts of ancient Fifeſhire, which now conſtitute the counties of Clackmannan and Kinroſs. The face of this part of the country is agreeably diverſified; towards the weſt, it is mountainous, and a ridge of hills extends north-eaſtward nearly the whole of its length, dividing the county into two natural diſtricts; on each ſide the country gradually falling to the reſpective friths of Forth and Tay. The low lands exhibit a fine fertile country, the high lands moſt extenſive and beautiful proſpects; and both are tolerably well wooded. The two conical hills, called the Lomonds, ſtand very conſpicuous, and are viſible out at ſea to a great diſtance. The eaſtern Lomond, the moſt regular and beautiful in its ſhape, is about 1650 feet above the level of the town of Falkland, which ſtands at its baſe. On the ſummit of this hill is a ſmall lake, which has the appearance of a volcanic crater, ſimilar to thoſe deſcribed by Spallanzani in his travels through Sicily. The weſtern Lomond is leſs regular in its form, but has greater elevation; and on the ſummit is a heap of looſe ſtones, denominated by antiquaries a cairn.

The natural productions are numerous and varied. The whole of the ſouth ſide of the county abounds in coal, and the pits are numerous. The weſtern and midland diſtricts produce iron; lead has been diſcovered in the eaſtern Lomond, and mines of this ore are profitably worked in the pariſh of Kemback. Limeſtone is abundant, and of an excellent quality; there are valuable freeſtone quarries, and plenty of marle. The pebbles, much admired for the high poliſh they take, have been diſcovered in different places; and various kinds of agates, with rubies of a fine water, highly valued by lapidaries.

Agriculture appears to have early occupied the attention of the inhabitants of Fifeſhire; and its artificial productions evince a ſpirit of induſtry and improvement, ſurpaſſed in few parts of Scotland. The property is pretty equitably divided; there being few large eſtates, and the proprietors in general reſide and cultivate their own. From this kind of equitable diſtribution of land, its value is increaſed, ſelling from 25 to 30 years purchaſe. To enumerate the ſeats of the nobility and gentry is not a part of our plan; but thoſe of Aberdour, Leſlie, Melville, and Ely, are particularly deſerving notice. In ſeveral parts of the county are the remains of royal ſeats; at Dumferline, Falkland, Kinghorn, and St. Andrew's. Theſe ruins will ſoon ceaſe to be intereſting; for in the words of lord Rocheſter, "they are in the full perfection of decay." Almoſt ſurrounded by the ſea, this county is furniſhed with ſeveral good harbours; particularly Burntiſland, in the frith of Forth, oppoſite Leith, which is inferior to none in the iſland. From the circumſtance of the towns principally lying upon the coaſt, king James VI. compared this county to "a grey mantle with a gold fringe." Theſe towns were regarded by that monarch with peculiar attention, who endeavoured to make them ſubſervient to his grand and wiſe deſign of raiſing Scotland high in the ſcale of commercial nations; a rank her natural capabilities entitled her to hold. For this purpoſe he granted the inhabitants divers privileges and immunities; and by every inducement encouraged them to cultivate their local advantages. And though many of thoſe privileges by the union have been rendered unimportant, yet they remain a ſtanding monument of the juſt diſcernment and political ſagacity of the royal grantor. The county ſends one member to the Britiſh ſenate. The number of royal burghs or parliament towns, as they are uſually called, is thirteen, *viz.* Cupar, the county town, St. Andrew's, Inverkeithing, Dumferline, Burntiſland, Kinghorn, Kirkaldy, Dyſart, Pettenweem, Anſtruther, Kilrenny Eaſter, Kilrenny Weſter, and Crail. Several others, formerly privileged with elective franchiſe, have loſt it, from having been unable to defray the expence of repreſentation, by ſending a commiſſioner to the Scottiſh parliament. Among this number may be mentioned, the towns of Auchtermuchty, Strathmiglo, Newburgh, Falkland, Kilconquhar, Elie, Earlsferry &c. which, though not very large places, deſerve notice from their former importance. The county is divided into ſixty-three parochial diſtricts, and by the enumeration returned to parliament in 1801, the number of houſes was 17,065, and inhabitants 93,743, being 196 upon every ſquare mile; a much greater population than is to be found in any other part of Scotland. In its eccleſiaſtical diſtribution it contains one full ſynod and four ſeats of preſbytery. The people are variouſly employed. Many in the ſalmon, herring, and eſpecially what is denominated the white fiſhery, which is very productive on this part of the coaſt; others in digging coals, great quantities of which are carried coaſtwiſe, and by the Caledonian canal, to other parts of Scotland. The iron mines employ numbers, the ore of which ſupplies the Calder, Carron, and other iron works; and ſtill more are engaged in manufacturing linen, and cotton cloths; with a kind of the latter, under the name of green cloth, the London calico printers have been long ſupplied from the markets of Fife. This county anciently conſtituted an earldom, and the honour was poſſeſſed by the family of Macduff; a title conferred on the thane of Fife, by Malcolm III. for the ſervices the former had done that monarch, in reſtoring him to the throne, which had been previouſly poſſeſſed by the uſurper Macbeth. This title having become extinct, was recently revived in the Duffs of Braco, lateral deſcendants of the ancient family. General Statiſtical Account of Scotland.

FIFTEENTH, *Decima quinta*, or *Quinzieme*, an ancient tribute or impoſition of money, laid upon any city, borough, or other town, through the realm: not by the poll, or upon this or that man, but in general upon the whole city or town.

It is ſo called, becauſe it was ſuppoſed to amount to a fifteenth part of that which the city had been valued at of old; or to a fifteenth part of every man's perſonal eſtate, according to a reaſonable valuation.

This was impoſed by parliament, and every town through the realm knew what a fifteenth for themſelves amounted to, becauſe it was always the ſame; whereas the ſubſidy, which was raiſed of every particular man's lands, or goods, muſt needs be uncertain.

The fifteenth ſeems to have been a rate anciently laid upon every town, according to the land or circuit belonging to it. Camden mentions many of theſe fifteenths in his Britan. *viz.* p. 171. "Bath geldabat pro viginti hidis, quando ſchira geldabat, &c." And p. 181. "Old Sarum pro quinquaginta hidis geldabat, &c." Which rates are according to Doomſday. But in after-times the fifteenth came to be underſtood as impoſed only on goods and chattels, not on lands. It was firſt granted by parliament, 18 Edw. I. *viz.* "Computus quintæ decimæ regi, an. 18. per archiepiſcopos, epiſcopos, abbates, priores, comites, barones, & omnes alios de regno, de omnibus bonis mobilibus conceſſæ." The city of London paid that year for the fifteenth 2860*l.* 13*s.* 8*d.* and the abbot of St Edmund's 666*l.* 13*s.* 4*d.* which was by compoſition; and thereupon had all the temporal goods of their diſtrict diſcharged of the fifteenth.

In the 8th of Edw. III. it was reduced to a certainty, when, by virtue of the king's commiſſion, new taxations were made of every townſhip, borough, and city, in the kingdom, and recorded in the exchequer; which rate was, at the time, the fifteenth part of the value of every townſhip, and the whole amounted to about 29,000*l.*; and, therefore, it ſtill kept up the name of a fifteenth, when, by the alteration of the value of money and the increaſe of perſonal property, things came to be in a very different ſituation. So that when of later years the commons granted the king a fifteenth, every pariſh in England immediately knew their proportion of it; that is, the ſame identical ſum that was aſſeſſed by the ſame aid in the 8th of Edward III.; and then raiſed it by a rate among themſelves, and returned it into the royal exchequer.

The way of collecting it was by two aſſeſſors appointed in every county by the king, who appointed twelve more in every hundred to make a true valuation of every man's perſonal eſtate upon which the fifteenth part was levied.

Fifteenth, in *Muſic*, is an interval whoſe ratio is $\frac{1}{4}$th, or the double octave or replicate thereof $= 1224\,\Sigma + 24f + 106m$; ſee table of Concords.

Fifteenth *Stop* on an organ, is a range of pipes, ſo called becauſe each note therein is tuned a double octave or fifteenth above the diapaſons, which are reckoned the ſtandard. In accompanying choral parts in a concert, or in church ſinging, this ſtop, the twelfth, the principal, and the two diapaſon ſtops, are generally uſed together.

Fifteenth-*Mile creek*, in *Geography*, a river which riſes in Pennſylvania, and runs into the Potomack, in Maryland. N. lat. 39° 40′. W. long. 78° 25′.

FIFTH, in *Muſic*, is a perfect concord, the next in perfection to the uniſon and octave; in the diviſion of the monochord its ratio is 3 : 2, that is, the third part of a ſtring is a 5th to the octave of the whole ſtring. (See Monochord and Fundamental *Baſe*.) The 5th is a principal ſound in the triad or common chord. It is made a diſcord by the 6th; the falſe 5th *is* a diſcord in itſelf, and muſt be prepared and reſolved. The perfect 5th is ſeven half notes above the baſe. It is ſo perfect a concord that no ſucceſſion of 5ths with the baſe, or any of the other parts, can be borne, aſcending or deſcending together. Dr. Pepuſch has given all the warrantable means of preparing and reſolving it as a diſcord; and for the unwarrantable ſucceſſion of 5ths, ſee Padre Sacchi delle quinte ſucceſſive. The 5th of a key, falling to the key-note, in the baſe, being regarded as a full cadence or cloſe, has given birth in France to the denomination of dominant, as it governs or leads to the key-note or tonic of every key. Thus, G is regarded as the dominant of C, and D of G, &c.

The *fifth*, or *major Fifth*, is one of its moſt important intervals, and the moſt perfect or agreeable in its harmony of any other interval within the octave; it is uſually marked V in writings on the theory of muſic, and conſiſts of ſeven of the half-notes of keyed inſtruments, which have 12 ſounds in the octave. Its ratio is $\frac{2}{3} = 358\,\Sigma + 7f + 31m$; its common logarithm is .8239087,4094, and its binary or Euler's log. = .584962, which is its decimal relation to the octave (1) of which it is nearly the $\frac{3}{5}\frac{1}{4}$d part: it contains 32.639526 major commas, is compoſed of a major and minor third, and is the complement of a minor fourth to the octave: it is equal to the ſum of a major tone and minor fourth, a ſemidiapente and a medius ſemitone, a tritone and major ſemitone, three major tones and a limma, three apotomes and four limmas; two major tones, one minor tone, and a major ſemitone alſo compoſe it, (ſee Quint.) Two circumſtances have concurred to render this concord the moſt proper to be uſed in the tuning of keyed and ſtringed inſtruments, *viz.* its great perfection, by which much facility is given in tuning, and it being the only concord which will bear repeating 12 times in ſucceſſion (with, or without deſcending octaves) and each time produce a note anſwering nearly to the 12 notes in common uſe, and on the 13th repetition fall very nearly on an octave of the note firſt ſtarted from: which circumſtances occaſion this concord, tempered in different degrees, to be almoſt excluſively uſed in the tuning of inſtruments. Beſides the above, various other intervals bear the names of fifth, as

Flat fifth, the ſemidiapente of the ancients, or falſe fifth of ſome, being leſs than a tone or major-fifth by the medius ſemi-tone, and conſiſts of ſix half-notes; its ratio is $\frac{45}{64} = 311\,\Sigma + 6f + 27m, = \frac{3^2 5}{2^6}$; its common logarithm is .8470325,3979: its binary log. = .508148, and it is = 28.353400 major commas. It is the complement of a tritone, is equal to a minor fourth and a major ſemitone, a tritone and minor comma, to the difference between two minor thirds and a major comma; a major, a minor, and two major ſemitones alſo compoſe it; and it is the difference between two 4ths, and a IIId, whence it may be tuned on an organ.

Sharp fifth, or dieſis defective minor ſixth, the ſuperfluous fifth of Tartini, conſiſts of eight half notes; it exceeds the true fifth by a minor ſemitone; its ratio is $\frac{16}{25}, = \frac{2^4}{5^2} = 394\,\Sigma + 8f + 34m$; its common logarithm is .8061799,7398; its binary log. = .643856, and it is = 35.92564 commas; it is the complement of the flat fourth; it is equal to two major and two minor tones, and is equal to the difference of a minor ſixth and enharmonic dieſis, alſo to 2 VIII − 2 6ths, 2 V − 2 3ds, 2 VI − 2 4ths, or to 2 III: whence it may be tuned.

Comma deficient fifth, or leſſer fifth of Holder, and deficient fifth of others, is leſs than a true fifth by a major comma, as its name imports; its ratio is $\frac{27}{40}, = \frac{3^3}{2^3 5} = 347\,\Sigma + 7f + 30m$; its common logarithm is .8293037,7283, and its binary log. = .567042: it is = 31.639524 major commas. It is equal to one major, two minor, and one major ſemitone,

tone, and to a minor fourth and minor tone; it is alſo equal to the difference between two 4ths and a 3d, whence it may be tuned.

Comma-deficient flat fifth, is an apotome leſs than a true fifth: its ratio is $\frac{729}{1024}$, $= \frac{3^6}{2^{10}}$, $= 300\Sigma + 6f + 26m$: its common logarithm is .8524275,7167, and its binary log. = .490228; it is = 27.35340 major commas. It is the complement of three major tones; is equal to two comma-deficient minor thirds: to two major tones and two limmas, and is alſo the difference between four 4ths, and two Vths, whence it may be tuned.

Comma redundant fifth, or greater fifth of Holder, is a major comma larger than a true fifth; its ratio is $\frac{160}{243}$ $= \frac{2^5 5}{3^5}$, $= 369\Sigma + 7f + 32m$; its common logarithm is .8185137,0905, and its binary log. = .602881, it is = 33.639526 major commas, three major tones, and a major ſemitone, and is the difference between two Vths and a 3d and two 4ths, whence it may be tuned.

Comma-redundant ſharp fifth, or ſuperfluous fifth of ſome, is a ſemitone medius larger than a true fifth; its ratio is $\frac{256}{405}$, $= \frac{2^8}{3^4 5}$, $= 405\Sigma + 8f + 35m$; its common logarithm is .8007849,4209, and its binary log. = .661776: it is 36.92564 major commas, two major thirds, and a major comma; it is the difference between a major ſixth and a limma; and between two Vths and a IIId and two 4ths, by which it can be tuned.

Comma-redundant flat fifth, or tritone maximum of Euler, alſo the diminiſhed fifth of ſome, is a minor ſemitone leſs than a true fifth; its ratio is $\frac{25}{36}$, $= \frac{5^2}{2^2 3^2}$, $= 322\Sigma + 6f + 28m$, its common logarithm = .8416375,0790, and the binary log. .526068: it is = 29.35340 major commas: it is equal to two major tones and two major ſemitones, alſo to two 3ds, whence it may be tuned.

Diaſchiſma-defective fifth, is a diaſchiſma leſs than a true fifth; its ratio is $\frac{177,447}{262,144} = \frac{3^{11}}{2^{18}}$, $= 346\Sigma + 7f + 30m$; its common logarithm is .8297938,7996, and its binary log. = .565417; it is = 31.548683 major commas: it is equal to the difference of four minor tones and a chromatic dieſis; to the ſum of a minor fourth and two limmas, to five limmas and two apotomes; to the difference between ſeven octaves and eleven fifths, or ſeven minor fourths and four fifths, whence it may be tuned. It is the reſulting fifth, or that between the *bearing notes*, when eleven ſucceſſive *perfect* fifths are tuned in an octave.

Double deficient fifth, is two major commas leſs than a true fifth; its ratio is $\frac{2187}{3200}$, $= \frac{3^7}{2^7 5^2}$, $= 336\Sigma + 7f + 29m$; its common logarithm is .8346988,0472, and its binary logarithm = .549121: it is = 30.63952 major commas, and to a major tone, two minor tones, and a limma; and it is the difference between two VIths, two 4ths, and three Vths, whence it may be tuned.

Double ſuperfluous ſharp fifth, is an apotome greater than a true fifth, and two major commas greater than a ſharp fifth: its ratio is $\frac{4096}{6561}$, $= \frac{2^{12}}{3^8}$, $= 416\Sigma + 8f + 36m$; its common logarithm is .7953899,1021, and its binary log. = .679696: it is = 37.92564 major commas, alſo to four apotomes and four limmas, to two major thirds and two major commas; to four major tones; to the difference between eight Vths and four VIIIths, or between four Vths and four 4ths, from either of which laſt, this interval may be tuned.

Minimum fifth of M. Henfling, or extreme diminiſhed fifth of ſome, is exceeded by a true fifth, the quantity of two minor ſemitones and a major comma: its ratio is $\frac{375}{512}$, $= \frac{3\,5^3}{2^9}$, $= 275\Sigma + 5f + 24m$; its common logarithm is .8647613,0675, and its binary or Euler's logarithm = .449253, and it is = 25.06728 major commas: it is equal to the difference between a XIth and three IIIds, whence this interval may be tuned.

FIFTH-*monarchy Men*, in *Eccleſiaſtical Hiſtory*, the denomination of wrong-headed and turbulent enthuſiaſts, who ſprang up in England during Cromwell's uſurpation; and who expected Chriſt's ſudden appearance on earth to eſtabliſh a new kingdom; and, acting under the influence of this illuſion, they aimed at the ſubverſion of all human government, and were for turning all things into confuſion.

FIG, in *Botany*, See FICUS.

FIG, *Indian*. See CACTUS.

FIG, *Infernal*. See ARGEMONE.

FIG, *Pharaoh's*. See FICUS and MUSA.

FIG, *Marygold*. See MESEMBRYANTHEMUM.

FIG *tree, Cochineal*. See CACTUS.

FIG-*wort*, the common name of a plant of the weed kind, which is frequently met with in paſture lands. The roots are of the oblong knobby kind. The leaves are heart-ſhaped, cornered, and placed on foot-ſtalks. The flowers have much reſemblance to thoſe of crow-foot, but differ in having the cup divided into three parts only, the petals being about eight in number, and narrower. It is a low plant, which runs very much by the roots, choaking up moſt others which are near it. It has likewiſe the names of pile-wort, leſſer centaury, &c. See SCROPHULARIA.

FIG, *Petrified*, in *Natural Hiſtory*. Among the numerous pyritic ſubſtances of Sheppy iſland, Mr. Jacob collected two which he thought to be figs; which Dr. Parſon afterwards referred to a recent fungus, but perhaps with not much better reaſon.

FIGS, in the *Materia Medica*. They are moderately nouriſhing, grateful to the ſtomach, eaſier of digeſtion than any of the other ſweet fruits, and ſoften the aſperities of the breaſt, &c. and accordingly are uſed in medicine, to make gargariſms againſt diſorders of the throat and mouth; and as an ingredient in pectoral decoctions, and in lenitive electuaries. They are alſo applied externally to ſoften, digeſt, and promote maturation.

Figs are dried either by a furnace, or in the ſun, having firſt dipped them in ſcalding hot ley, made of the aſhes of the fig-tree. The Latins call them *caricæ*, or *ficus paſſæ*, when thus dried.

In this condition they are uſed both as medicine and food; being both the wholeſomer, and eaſier of digeſtion, when thus cleared of a quantity of their aqueous and viſcid parts.

FIGS, in *Commerce*. The beſt figs are the produce of Turkey, Italy, Spain, Provence, &c. The iſlands of the Archipelago yield figs in great abundance; but they are much inferior in goodneſs to thoſe of Europe. Yet the Greeks in thoſe iſlands cultivate them with wonderful care and attention; as making the principal food, and a conſiderable part of the riches of the country.

They have two kinds of fig-trees; the firſt, called *ornos*, or the *wild fig-tree*; the ſecond, the *domeſtic fig-tree*.

The method of cultivating and ripening theſe figs makes a peculiar art, by the ancients called *caprification*: often ſpoken of among them in terms of admiration. Some of the modern naturaliſts have looked on it as a chimera; but Monſ. Tournefort has aſſured us of the contrary, and given us that proceſs, as he learnt it upon the ſpot. See Caprification.

Figs, in *Antiquity*, were uſed in divination. See Sycomantia.

Fig, in the *Manege*, is a ſort of wart, or ſpongy excreſcence, on the fruſh, and ſometimes all over the body of a horſe. The figs that appear in the fruſh or ſole make an evacuation of ſtinking malignant humours, that are very hard to cure. The only effectual remedy for theſe excreſcences is extirpation.

Fig, *Inſect*, in *Natural Hiſtory*, a name given by the Engliſh to the creature called by the French, after Mr. Reaumur, the *faux puceron*, or *falſe puceron*, from its very much reſembling the puceron in external appearance, but being extremely different from it when nearly examined. Theſe inſects are, when at their full growth, of the bigneſs of the head of a pin of the largeſt ſize, but there are uſually found among them ſeveral that are ſmaller, down to ſuch as are ſcarce perceivable to the naked eye. They are found in great plenty on the back, or under-ſide of the leaves of the fig-tree, but they never are ſeen in cluſters like the puceron.

The body and breaſt of this inſect are green, and the caſes of the wings are white, and beſet with hairs. This creature has two antennæ or horns, which it can exert at pleaſure; but they uſually are lodged under the furrows of the wings, and are not to be ſeen, unleſs the animal be turned belly upwards; the head alſo is bent downwards, and the eyes ſeem directed to look at objects only placed under them.

It has ſix legs, and a fine ſmall trunk iſſuing from the extremity of the head; this is but ſhort, and is of a lively green; it is terminated by a ſharp point, and has a fine brown filament like a hair, which it thruſts out of the body of the trunk at pleaſure, and which ſeems a ſort of engine or organ deſtined to convey into the body the juices extravaſated by the wound and ſuction of the trunk. The creature uſually remains in perfect quietneſs on the leaf on which it is found; but has this peculiarity, in its poſition, that it is always found with its head reſting upon one of the ribs of the leaf, and its body on the plain part; by this means, the anterior part of the head is raiſed above the ſurface of the plain part of the leaf, and the creature can, by that advantage, move his trunk about at pleaſure, and fix it into different parts of the leaf, while his body is perfectly ſtill at the time.

Theſe creatures throw off their ſkins many times in their growth, the furrows marking the places where their wings are, and the protuberances made by their caſes are always ſeen, however young they are examined.

In the months of May and June theſe inſects all become winged, and afford a peculiar ſpecies of a four-winged fly, which is remarkable for hopping; but as its hinder legs are not greatly larger than the reſt, it leaps but a little way at a time. The body of this fly is green, its wings are bordered with yellow, and its legs are white; it has a trunk of the ſame nature with that of the creature before its winged ſtate, and with this it continues to ſuck the juices of the leaves of the fig-tree as it did before.

The manner in which theſe animals propagate their ſpecies is not yet known. The pucerons, to which they more approach in figure than to any other animals, have always young ones found within them; but theſe, if examined in whatever ſtate, never have any ſuch appearance, not even ſo much as eggs being found in them; it ſhould ſeem that their eggs are too minute for our inſpection, but that they are oviparous, not viviparous animals. Reaumur's Hiſt. vol. vi. p. 98.

Fig-*ſhell*. See Dolium.

Fig-*tree cloth of Otaheite*, in the South ſea, is a coarſe and harſh cloth, of the colour of the darkeſt brown paper, made of the bark of a tree which reſembles the wild fig-tree of the Weſt Indies. This cloth has the quality of reſiſting water; and the greater part of it is perfumed, and worn by the chiefs as a morning dreſs. For the method of manufacturing and colouring this cloth, ſee Aouta. Hawkeſworth's Voyage. vol. ii. p. 210, &c.

Fig-*wort Worm*, in *Natural Hiſtory*, the name of an inſect which feeds on the leaves of the ſcrophularia, or fig-wort, and which is uſually eſteemed a caterpillar, but is one of thoſe inſects called by the French *fauſſe chenilles*.

Fig-*eater*, in *Ornithology*, a name given by Albinus and Latham to the Motacilla *nævia*, which ſee.

FIGALO, Cape, in *Geography*, a cape on the coaſt of Epire, at the entrance of the gulf of Arta. N. lat. 39° 20′. E. long. 20° 34′.

FIGARUOLO, an iſland in the gulf of Venice, near the coaſt of Iſtria. N. lat. 45° 10′. E long. 13° 43′.—Alſo, a town of Italy, in the department of the Lower Po; 13 miles N.W. of Ferrara.

FIGEAC, a town of France, and principal place of a diſtrict, in the department of the Lot, ſeated on the Selle; 40 miles N. E. of Montauban. The place contains 6452, and the two cantons 23,800 inhabitants, diſtributed on a territory of 275 kiliometres, in 23 communes. This was originally a Benedictine abbey, founded by Pepin, A. D. 755, and ſecularized by Paul III. It was formerly a place of ſome ſtrength, but falling into the hands of the king, during the religious war, A. D. 1612, its citadel and fortifications were demoliſhed. N. lat. 44° 37′. E. long. 2° 8′.

FIGER, or Fiſju, a rich and extenſive province of Japan, on the W. coaſt of Ximo.

FIGGING, in the *Manege*, a kind of cant term among dealers in horſes for thruſting "a corn" (as they call it) of ginger into the fundament of a horſe, or vagina of a mare, at the time of their being led out for ſhow, for the purpoſe of producing irritation, and cauſing them to lift up the tail. The London dealers, it is ſaid, are in general ſo much in the habit of recurring to this artifice, that they permit no ſervant to ſhew a horſe without having previouſly figged him, under a certain forfeit.

FIGHIG, in *Geography*, a town of Africa, ſituated on the ſouth ſide of the Atlas, in the country of Biledulgerid. The women manufacture woollen cloth of exquiſite fineneſs, much valued in Barbary, and ſold at a high price. The inhabitants carry on a great trade with Fez and Morocco, and with the negroes: 240 miles E. S. E. of Mequinez. N. lat. 32° 5′. W. long. 1° 5′.

FIGHT. See Battle and Engagement.

Fights, in a *Ship*, are the waſte-cloths which hang round about her in a fight, to hinder the men from being ſeen by the enemy.

Fights, *Cloſe*, denote thoſe bulkheads afore or abaft the ſhip, which are put up for men to ſtand ſecure behind, and fire on the enemy, in caſe of boarding. See Cloſe.

Fights, *Running*, at *Sea*, thoſe where the enemy do not ſtand the battle, but are continually chaſed.

FIGHTING, in the *Military Art*. Under the head of Engagement we have given a deſcription of the ordinary occurrences in both military and naval warfare, and we have endeavoured to give a popular idea of thoſe fluctuations which muſt ever be expected to attend every conteſt, even where the ſuperior numbers of one party ſhould ſeem to threaten the other with complete deſtruction. We ſhall, in this place, add, that every circumſtance tends to render the concluſion of a fight the moſt awful and moſt deciſive. The cannonade, which generally uſhers in the conflict, is rarely very deſtructive, though, as approximation takes place, and that caſe or grape-ſhot are ſubſtituted for round-ſhot, the carnage is certainly increaſed beyond all proportion. It is nevertheleſs curious to obſerve, that even in thoſe late battles in the neighbourhood of Vienna, wherein not leſs than 800 pieces of ordnance, and full 250,000 men were engaged, for at leaſt 30 hours, in which it is aſſerted the Auſtrians alone diſcharged more than 3,000,000 of muſket ammunition, the killed and wounded (ſetting the priſoners apart) did not amount to 80,000 men. Conſequently not one in forty of the latter took effect; even if we ſuppoſe the vaſt trains of artillery attached to both armies to have remained inactive. But when we conſider that a very large portion, commonly two-thirds of the whole number killed and wounded, are ſtruck with cannon-ſhot of ſome deſcription, and that of the remainder many are wounded by the bayonet only, we muſt feel our aſtoniſhment excited to the higheſt pitch at the comparative inſignificance of muſketry. Such, however, is the fact.

Buſh-fighting, which relates to a more deſultory and ſecret mode of oppoſition, is far more deſtructive. In this, each individual acts independently as a rifle-man; he conceals himſelf under banks, behind trees and buſhes, and either fires at the enemy, or aſſails him with the bayonet, or ſword in hand, according as circumſtances may demand, the great art being to deſtroy without being ſeen. To this kind of hoſtility all uncivilized nations at firſt reſort, uſing ſpears, ſlings, ſwords, and clubs of various deſcriptions, and particularly uſing their bows with great dexterity. In general, regular troops are not much employed in buſh-fighting, except in cloſe countries, where banditti harbour, and eſpecially when popular inſurrections take place. It is a ſpecies of ſervice very trying both to the courage and the conſtitution, and though even performed in the higheſt ſtyle by our gallant ſoldiers, is conſidered by them as a moſt arduous and hazardous duty.

Prize-fighting, however much it may be upheld by amateurs, as conducive to the ſupport of a certain kind of courage among the lower claſſes, cannot be noticed by the more enlightened, as teeming with barbarity, and often with the moſt wanton acts of cruelty. The man who, merely for paſtime, or as a ſpeculation, can encourage two of his fellow-creatures to enter the liſts, and to do all in their power to maim, or even to murder each other, muſt in his heart be a complete ruffian. That every individual ſhould, in theſe days, be able to defend himſelf, will not be denied; but, in admitting thus much, we paſs a moſt ſevere cenſure on the diſpoſitions of thoſe who are too often indiſcriminately termed peaceable citizens, and who, we are apt to think, if leſs induced by a certain kind of emulation, towards which prize-fighting greatly contributes, might perform their ſeveral duties in life, and paſs each other in the ſtreets without either provoking others, or pretending to have received inſults from others of a more praiſe-worthy diſpoſition. Without attempting to enter on their merits in other reſpects, as we reſerve ourſelves for a full expoſition of their principles in its proper place, we cannot refrain from remarking that the poſſibility, as well as the good policy, of refraining from blows, is conſpicuouſly proved by that claſs of diſſenters generally called quakers.

Fighting *Iſland*, in *Geography*, called by the French "Groſe iſle aux Dindes," lies about four miles below *Detroit* (which ſee); it is valuable for paſture, but has very little wood. In the ſummer the Indians make it a place of encampment, and ſome of them plant a little corn.

FIGHTWITE, Fithwita, in the Saxon times, ſignified a mulct for making a quarrel, to the diſturbance of the peace. "Mulcta ob commiſſam pugnam in perturbationem pacis, quæ in exercitu regis 10 ſolidorum erat." Blount and Jacob, in tranſcribing this paſſage, have inſerted 120 ſols.

FIGI, in *Geography*, a town of Japan, in the iſland of Ximo; 10 miles N.E. of Funai.

FIGIN, a river of Norway, which runs into the North ſea, 10 miles S. of Stavanger.

FIGLINÆ, in *Ancient Geography*, a town of Gallia Narbonnenſis, marked in the Itinerary of Antonine between Valence and Vienne.—Alſo, a town of Gaul, belonging to the Allobroges, ſituated upon the left of the Rhone.

FIGMAN, in *Geography*, a town of France, in the department of the Upper Garonne; 7 miles N. N. W. of Toulouſe.

FIG-TREE Bay, a bay on the N. E. coaſt of the iſland of Jamaica. N. lat. 18° 18'. W. long. 76° 29'.—Alſo, a bay on the W. coaſt of the iſland of St. Chriſtopher, near Sandy Point.

FIGUERAS, a town of Spain, in Catalonia, containing 4640 inhabitants, where the Spaniards, in 1786, began to erect a fortreſs, which they deſigned ſhould be impregnable. It was to contain quarters for 150 companies of infantry, with 500 horſe, apartments for 60 officers, with ſuitable accommodations; one long range of magazines for proviſions, and four for powder. The works were made bomb-proof. The glacis is for the moſt part formed of the rock, and the whole is protected by proper baſtions. It is ſaid that 12,000 men are ſufficient to defend theſe works. Nevertheleſs, the place was taken by the French in 1794; three leagues from Janquera, and ſeven from Gerona. The adjacent country is agreeable; the hills are ſhaded with evergreen woods; the plains are well cultivated, and divided by hedges of aloes and wild pomegranate. The road from hence to Gerona is diverſified with gentle eminences and fruitful plains. Two of theſe hills exhibit ſome volcanic appearances.

FIGUERO-dos-Vinhos, a town of Portugal, in the province of Eſtremadura, ſituated near ſome lofty mountains, on a ſmall river, which runs into the Zezere; celebrated for its wine: 20 miles north of Thomar.

FIGURA, in *Muſic*. See Figure.

FIGURAL, or Figurate *numbers*, ſuch as do or may repreſent ſome geometrical figure, in relation to which they are always conſidered; as triangular, pentagonal, pyramidal, &c. numbers. See Numbers.

FIGURATE, or Figurative, that which has a relation to figure, or that teaches under ſome obſcure reſemblance. Thus a figurative ſtyle is that which abounds in figures. (See Figure and Style.) The figurative ſtyle, F. Bouhours obſerves, is neither the moſt juſt, nor the beſt. For this reaſon Cicero directs us to the ancients, who not having yet bethought themſelves to *uſe* figurative expreſſions, but keeping to the moſt proper and natural way, have almoſt all wrote well. "Sunt enim illi veteres, qui nondum ornare poterant ea, quæ dicebant, omnes prope præclare locuti."

Long uſe, ſay the grammarians, renders that proper in all languages, which at firſt was figurative. The ſame thoughts appear more lively when expreſſed by a figure, than when in ſimple terms. The reaſon is, that figurative expreſſions denote not only the principal matter, but alſo the emotion and paſſion of the perſon who ſpeaks.

Figurative is alſo much uſed in ſpeaking of the myſteries and figures of the old law. In this ſenſe manna is ſaid to be figurative of the euchariſt.

Figurative is alſo uſed in the Greek grammar for what we otherwiſe call characteriſtic, *viz.* a letter that characterizes certain tenſes of the Greek verbs; or that diſtinguiſhes and ſpecifies them.

In the firſt conjugation of the barytonous verbs, the φ is characteriſtic, or figurative of the præter tenſe, and the ψ of the future.

Figurative, or *Figurative counter-point*, in *Muſic*, is that wherein there is a mixture of diſcords along with the concords. See Counter-point and Supposition.

Where the diſcords are uſed as a ſolid and ſubſtantial part of the harmony, the counter-point is properly called the harmony of diſcord.

FIGURE, Figura, in a general ſenſe, denotes the ſurface of terminating extremes of a body.

All bodies have ſome figure; whence figurability is generally ranked among the eſſential properties of body or matter. A body without figure would be an infinite body.

The corpuſcular philoſophers account for every thing from the figure, bulks, and motions of the atoms, or primary corpuſcles of bodies.

For the figure of bodies, conſidered as objects of ſight, ſee Vision.

The ſchoolmen diſpute whether or no the quality of figure be the ſame with that of form; and if they differ, what it is that conſtitutes the difference? Boëthius will have figure only predicated of inanimate bodies, and form of animate. Others extend figure to all natural things, and form to all artificial ones; whence the verſe,

> "Formam viventis, picti dic eſſe figuram."

Others apply figure indifferently to all kinds of bodies, but not in all relations. If only the bare circumference, or circumſcription, be conſidered, they call it figure; but if the circumference be conſidered as endowed with colour, they then call it *form*, which ſee.

Figure *of the Earth and Planets*.—This ſubject has been ſo fully treated under Degree and Earth, that very little remains to be ſaid in this place. The general ſpherical form of the earth ſeems to have been known in ages of the moſt remote antiquity, but this knowledge was often confined only to philoſophers and mathematicians; during the middle ages, the doctrine was even diſputed, and the ſpherical figure denied by ſome of the fathers of the church; and it is only ſince the revival of learning in modern Europe that it has been univerſally received and acknowledged by every claſs of people. It is now nearly 100 years, that the firſt mathematicians of Europe have directed their particular attention to the exact determination of the real figure of the earth; an hiſtorical account of theſe labours, and of the reſult obtained from them has already been given under the articles above mentioned. Since theſe were written, the meaſurement of the arc of the meridian has been continued in our own country, and our continental neighbours have likewiſe occaſionally publiſhed ſome additional documents, relative to their great ſurvey. Nothing however has occurred to alter any of the principal reſults which we have given; every thing ſeems to confirm the opinion, that though the mean figure of the earth approaches very nearly to the ſpheroid, whoſe ellipticity is $\frac{1}{336}$, yet that the irregularities in the denſities of the different maſſes are very great, ſo as to render all the partial meaſurements entirely unſatisfactory. Europe, in general, appears to be much flatter than accords with the general form: other parts of the globe muſt of courſe be more protuberant; but obſervations are ſtill wanting to enable us to pronounce in what manner theſe irregularities are diſtributed, ſo as to compenſate each other; nor can we flatter ourſelves this queſtion will ſoon be determined, conſidering the uncivilized ſtate of the great portion of the globe, compared with that requiſite to conduct the operations neceſſary for theſe inveſtigations. It appears that the project, once entertained, of determining the exact difference of latitude and longitude by geodetical meaſurement, muſt now be abandoned, or at leaſt confined to very ſmall tracts of country, as the errors of aſtronomical obſervation, when well conducted with perfect inſtruments, are leſs than thoſe which ariſe from the irregularity of the earth's figure. This obſervation, however, only applies to particular caſes, where extreme accuracy is required; for, in general, the ſituation of places, determined by national ſurvey, is always extremely near the truth, and the limits of error may almoſt always be known. Our knowledge of the natural hiſtory of the earth has not yet been very materially improved by the inveſtigations which have been made relative to its figure. It does not appear that the earth has ever been in a ſtate of entire fuſion or fluidity, for then it would probably have taken a more regular figure; yet it approaches much nearer to the figure aſſigned by theory than could have ariſen from the crumbling of its ſolid particles, as ſome have ſuppoſed. This intermediate ſtate ſeems conſiſtent with the information derived from our chemical knowledge, and other ſources of information. Though a ſatisfactory ſolution of theſe difficulties is at preſent beyond our reach, yet ſcience is advancing towards this object with rapid ſtrides, and many years will not probably elapſe before the myſtery is removed, that at preſent obſtructs our reſearches into the original nature and conformation of the earth.

Figure *of the Planets*. See the planets reſpectively.

Figures, in *Architecture* and *Sculpture*, denote repreſentations of things made in ſolid matters; ſuch as ſtatues, &c. Thus we ſay, figures of braſs, of marble, of ſtucco, of plaſter, &c.

But, in this ſenſe, too, the term is more uſually applied to human repreſentations than to other things. Thus we ſay, an equeſtrian figure, for a man on horſeback.

Daviler obſerves, that thoſe, either repreſented ſitting, as popes, &c. or kneeling, as on monuments, &c. or laid all along, as rivers, &c. are more properly called figures than ſtatues.

Figures, in *Architecture*, are ſaid to be detached, when they ſtand ſingly, in oppoſition to thoſe compoſitions which are called *groupes*.

Figures, in *Arithmetic*, are the numeral characters; or the characters whereby numbers are expreſſed, or written.

Thus the number of four hundred and fifty is written, or expreſſed, by three figures, 450.

The figures in arithmetic are the nine digits; 1, 2, 3, 4, 5, 6, 7, 8, 9, and 0.

Theſe figures were firſt brought into Europe by the Moors of Spain, and into England, as Dr. Wallis apprehends, about 1130. See ARITHMETIC and CHARACTER.

However, from ſome ancient dates, ſuppoſed to conſiſt wholly or in part of Arabian figures, ſome have concluded, that theſe figures originally Indian, were known and uſed in this country at leaſt as early as the tenth century. The moſt ancient date diſcovered by Dr. Wallis was that on a chimney-piece at Helmdon, in Northamptonſhire, M 133, *i.e.* 1133. Other dates diſcovered ſince, are 1090, at Colcheſter, in Eſſex; 1016, with the Roman M for a thouſand, at Widgel-Hall, near Buntingford, in Hertfordſhire; 1011 on the north front of the pariſh-church of Rumſey in Hampſhire; and 975 over a gate-way at Worceſter. Dr. Ward has urged ſeveral objections againſt the antiquity of theſe dates. As no example occurs of the uſe of theſe figures in any ancient manuſcript, earlier than ſome copies of Johannes de Sacro Boſco, who died in 1256, he thinks it ſtrange, that workmen ſhould have made uſe of theſe figures ſo long before they appear in the writings of the learned; and he alſo diſputes the fact. The Helmdon date, according to him, ſhould be 1233; the Colcheſter date 1490; that at Widgel-hall has in it no Arabian figures, the 1 and 6 being I and G, the initial letters of a name; and the date at Worceſter, he ſuppoſes to conſiſt of Roman numerals, and to be really MXV. Martyn's Abridg. of Phil. Tranſ. vol. ix. p. 420, &c.

FIGURE, in *Aſtrology*, a deſcription, or draught, of the ſtate and diſpoſition of the heavens, at a certain hour; containing the places of the planets and ſtars, marked down in a figure of twelve triangles, called *houſes*.

This is alſo called a *horoſcope* and *theme*.

FIGURE *of an Eclipſe*, in *Aſtronomy*, denotes a repreſentation of the path or orbit of the ſun, and the moon, during the time of the eclipſe, upon paper; with the number of digits eclipſed, and the beginning, middle, and end, of darkneſs. See ECLIPSE.

FIGURE, or *Delineation*, of the full moon, ſuch as viewed through a teleſcope with two convex glaſſes, is of conſiderable uſe in obſervations of eclipſes, and conjunctions of the moon with other luminaries. In this figure of the moon are repreſented the maculæ, or ſpots, of the moon, marked by numbers; beginning with the ſpots, which uſually enter firſt within the ſhade at the time of the great eclipſes, and alſo emerge the firſt.

FIGURE, *in Conics*, denotes the rectangle made under the latus rectum and tranſverſum, in the hyperbola and ellipſis.

FIGURE *of the Diameter*. The rectangle under any diameter, and its proper parameter, is in the ellipſis and hyperbola, called the figure of that diameter.

FIGURES *of Plants*, ſince botany became a ſtudy, have come into general uſe to promote a knowledge of the various ſpecies and genera of the vegetable kingdom. The oldeſt drawings of plants of which we have any knowledge, are in a manuſcript of Dioſcorides, in the Imperial library at Vienna, of which we have already given an account. (See DIOSCORIDES.) Theſe are ſuppoſed to be as ancient as the third century of the Chriſtian era, and ſerve at leaſt to ſhew what was underſtood concerning the plants of this writer at that period. After the invention of printing, figures of plants were very ſoon introduced into botanical or medical books, and were at firſt cut on wooden blocks, and printed in the pages of letter-preſs. Fabius Columna, in his *Phytobaſanos*, publiſhed at Naples in 1592, gave the firſt copper plates of plants. We know not exactly how ſoon the practice began of colouring the figures in books; but from ſome copies of Dorſtenius and Tragus in our poſſeſſion, it appears to have been uſual about the middle of the 16th century. The above-mentioned drawings at Vienna are coloured, but in the rudeſt poſſible ſtyle. Engravings in botanical books were not coloured till the early part of the 17th century. Beſler's *Hortus Eyſtellenſis*, publiſhed in 1613, was perhaps one of the earlieſt; but it is always difficult to ſay whether ſuch works were actually publiſhed coloured, or whether, as often happened, they were painted ſubſequently by ſome of their poſſeſſors. All theſe old works were painted by hand, and not printed in colours. This laſt method was firſt introduced, we believe, by the late profeſſor Martyn, in his ſplendid *Hiſtoria Plantarum rariorum*, publiſhed at London in 1728, the drawings of which came from no leſs a hand than Van Huyſum. But the execution of the plates in mezzotinto, and the colouring, are far inferior to the apparent merit of the drawings. The French at preſent excel in this art of printing in colours, as may be ſeen by the exquiſite publications of Redouté and Ventenat, not to mention others of birds and quadrupeds. Bulliard led the way in his *Herbier de la France*, which is now far excelled by other ſimilar works in this reſpect.—Nor are the French leſs eminent at preſent in their engraved uncoloured botanical figures. Some admirable performances of this kind appeared in the reign of Louis XIV. In our days the works of l'Heritier have juſtly been admired, and are now even excelled.

In Germany and England the greater part of botanical plates are ſlight engravings, coloured by the hand, though ſome of Dr. Thornton's figures, and thoſe very well executed, are printed in colours. The German figures are uſually altogether deficient in pictureſque beauty, or colouring, properly ſo called, but are expreſſive, and tolerably cheap, ſo as to be uſeful to the ſcience. This however can only be ſaid of their beſt works, ſome, the ſecond-rate, though popular, ones, being coloured not much unlike the varniſhed Dutch toys ſeen at a fair. On the other hand, Germany has produced ſome exquiſitely delicate botanical works in colours, as the *Plantæ Lichenoſæ* of Hoffmann, and the cryptogamic works of Schrader and others.

It is much to be wiſhed that the public were not burthened with repetitions of the ſame plant over and over again, at leaſt by authors who publickly profeſs to publiſh new ones only. In books deſtined to exhibit the entire plants of any one country, or excluſively the exotic plants of any particular garden or gardens, ſuch a ſcheme being avowed, there is no impoſition. But ſtill the moſt valuable and reſpectable are ſuch as figure only entirely new plants, or at moſt what are badly or erroneouſly figured before. If this were attended to, the repreſentations of all known plants might in time be acceſſible ſomewhere or other. However perfect the ſcience of botanical definition may have become, few writers are competent to keep it up to its higheſt ſtandard, who yet may be able to ſpeak to the eyes by a picture. No painting indeed, however excellent, ought to ſuperſede, or be unaccompanied by, deſcriptions and definitions, which alone render botany a ſcience; for who can argue from a picture? Language is the current coin of rational beings. Neverthelеſs, the two modes of inſtruction may advantageouſly go hand in hand. If every known plant were to be found delineated in ſome work or other, the ſtudy of botany would be much facilitated, and even ſuch an attempt as that of Schkuhr of Wittenberg, to furniſh an univerſal ſet of botanical figures in as compendious a form as poſſible, merits great praiſe, though it may be doubted whether the rude colouring of ſuch a work adds any thing to its value, though unfortunately too much to its price. It has often been remarked that the uncoloured wooden outlines of

Brunfelſius, Fuchſius, and a few here and there in other authors, expreſs the plants intended better than many finiſhed plates. Hence outlines of Plumier and other botaniſts have been publiſhed in imitation, but none come near the merit of their prototypes. The truth is, that to make one of thoſe admirable outlines, requires the ſkill of a firſt-rate painter, if not a ſpark of the genius of a Grecian ſtatuary. Hence they are likely to remain unrivalled, as they have hitherto been. Of exquiſite preciſion, without that ſublime degree of art, Leers's figures of graſſes in his *Flora Herbornenſis* are matchleſs examples.

Some perſons have attempted, and even publiſhed, figures made by an impreſſion taken from the dried plant with printer's ink on paper. Theſe might be ſuppoſed likely to prove peculiarly accurate, but they generally fail in execution. They may indeed give the unnatural ſtiff outline of a dried ſpecimen, but the prominent parts of the ſurface being neceſſarily what give the darkeſt impreſſion, they of courſe totally miſlead the eye, and all but the moſt ſlender and expanded ſubjects produce a maſs of confuſion and deformity.

As we are on the ſubject of figures of plants, we beg leave to correct an error in our account of Doræna *japonica.* A plate of that ſhrub is extant in Thunberg's *Icones Pl. Japonicarum, dec.* 3, a work which however indifferently executed, ranks very high for the originality and rarity of its contents. S.

Figure, in *Dancing*, denotes the ſeveral ſteps which the dancers make in order and cadence; conſidered as they mark certain figures on the floor.

Figures, in *Fencing*, are the divers guards, poſtures, attitudes, or diſpoſitions, of the body, arm, or ſword. See Fencing.

Figure, in *Fortification*, is the plan of any fortified place; or the interior polygon, &c.

When the ſide and angles are equal, it is called a *regular;* when unequal, an *irregular figure.*

Figure, in *Geomancy*, is applied to the extremes of points, lines, or numbers, thrown or caſt at random: on the combinations or variations whereof the ſages of this art found their fantaſtical divinations.

Figure, in *Geometry*, denotes a ſurface incloſed, or circumſcribed with one or more lines.

Such are triangles, ſquares, polygons, circles, ellipſes, &c.

Wolfius defines figure a continuum terminated by a perimeter. In which ſenſe figure is applicable both to ſuperficies and ſolids. In the former caſe, the perimeter is of lines; in the ſecond, of ſurfaces.

Figures are either rectilinear, curvilinear, or mixt, according as the perimeter conſiſts of right lines, curve lines, or both.

The ſuperficial parts of a figure are called its *ſides;* the loweſt ſide, its *baſe;* and the angle oppoſite to the baſe, the *vertex.*

The height of a figure is the diſtance of the vertex from the baſe.

Figure, in *Grammar*, is an expreſſion that deviates from the common and natural rules of grammar; either for the ſake of elegance or brevity.

The beſt grammarians only reckon four figures; the ellipſis, pleonaſm, ſyllepſis, and hyperbaton. Others add two more; *viz.* antiptoſis, and enallage.

Figure, in *Heraldry*, a bearing in a ſhield. Of theſe figures there is almoſt an infinite variety: ſome are natural; ſuch as the celeſtial figures of the ſun, moon, ſtars, &c. and their parts; the effigies of men, women, &c. and their parts: animals, as lions, ſtags, foxes, boars, &c. and their parts; birds, as eagles, ſwans, ſtorks, pelicans, &c. and their parts; fiſhes, as dolphins, whales, ſturgeons, trouts, &c. and their parts; reptiles, and inſects, as tortoiſes, ſerpents, graſshoppers, &c. and their parts; vegetables, as trees, plants, flowers, herbs, &c. and their parts; and ſtones, as diamonds, rubies, pebbles, rocks, &c. Theſe charges, as well as ordinaries, have divers attributes or epithets, which expreſs their qualities, poſitions, and diſpoſition. Thus, the ſun is ſaid to be *in his glory*, *eclipſed*, &c. the moon *in the complement*, *in creſcent*, &c. Animals are ſaid to be *rampant*, *paſſive*, &c. Birds have alſo their denominations; fiſhes are deſcribed to be *hauriant*, *naiant*, &c. Beſides theſe natural figures, there are alſo artificial figures; the principal of which are warlike inſtruments, as ſwords, arrows, battering rams, gauntlets, helmets, ſpears, pole-axes; ornaments uſed in royal and religious ceremonies, as crowns, coronets, mitres, wreaths, croſiers; towers, caſtles, arches, columns, plummets, battlements, churches, portcullis, borrowed from architecture and fortification; and ſhips, anchors, rudders, pendants, ſails, oars, maſts, flags, gallies, lighters, &c. derived from navigation; all theſe bearings have different epithets denoting their poſition, ſtructure, &c.

There are likewiſe chimerical or imaginary figures uſed in heraldry, that are the reſult of fancy and caprice; ſuch as centaurs, hydras, phœnixes, griffons, dragons, &c. Porny's Elem. Herald. p. 132, &c. 172, &c.

Figure, in *Logic*, denotes a certain diſpoſition of the terms of a ſyllogiſm; particularly of the medium, with regard to the extremes.

Hence it follows, that there are as many figures of ſyllogiſms, as there are different connections of the extremes with the medium; ſo that, though the ſchoolmen ordinarily only reckon three, yet a fourth might be admitted.

In the *firſt* figure the medium or middle term is the ſubject of the major propoſition, and the predicate of the minor. This contains four moods, and applies to the proof of all ſorts of queſtions, whether univerſal or particular, affirmative or negative. In the *ſecond* figure the middle term is the predicate of both the premiſſes, and this contains four moods, admitting only of negative concluſions. The *third* figure requires that the middle term be the ſubject of both the premiſſes, and has ſix moods, admitting only of particular concluſions. The ſpecial rules of theſe three figures are the following: in the firſt, the major propoſition muſt always be univerſal, and the minor affirmative; in the ſecond alſo the major muſt be univerſal; and one of the premiſſes, together with the concluſion, muſt be negative; in the third figure the minor muſt be affirmative, and the concluſion always particular.

In the *fourth* figure, called by the Peripatetics the *indirect*, and by others the *Galenical* figure, as varying too much from the natural form, the middle term is predicated in the major propoſition, and ſubjected in the minor. Some logicians will allow this to be nothing elſe but a mere inverſion of the *firſt* figure. It has five moods. Watts's Logic, part iii. chap. 2. § 3.

Figure, in the *Manufactures*, is applied to the various deſigns repreſented or wrought on velvets, damaſks, taffaties, ſattins, and other ſtuffs and cloths.

The moſt uſual figures for ſuch deſigns are flowers, imitated from the life; or groteſques, and compartments of pure fancy. Repreſentations of men, beaſts, birds, and landſcapes, have only been introduced ſince the taſte for the

Chineſe ſtuffs, particularly thoſe called *ſurees*, began to prevail among us.

It is the woof of the ſtuff that forms the figures; the warp only ſerves for the ground. In working figured ſtuffs, there is required a perſon to ſhew the workman how far he muſt raiſe the threads of the warp, to repreſent the figure of the deſign with the woof, which is to be paſſed acroſs between the threads thus raiſed. This ſome call *reading the* DESIGN, which ſee.

For the figures *on tapeſtry, brocade,* &c. See TAPESTRY, &c.

For thoſe given by the *calenders, printers,* &c. See CALENDER, &c.

FIGURE, in *Muſic*. In general, figure includes all the characters uſed in muſic to expreſs ſounds, their place in the ſcale, with their duration and equivalent reſts: whence *contrappunto figurato*, to diſtinguiſh it from *contrappunto ſemplice*, plain counterpoint, which Zarlino defines common chords of note againſt note, all of the ſame length, and without diſcords. Figurative harmony, ſometimes called florid counterpoint, is that in which the chords are broken into melody, and expreſſed by figures or notes of different lengths. See TIME-TABLE.

FIGURE, *Mute*; mute figures, in Italiam muſic, imply reſts, or characters denoting ſilence.

FIGURE, *Apparent*, in *Optics*, that figure, or ſhape, which an object appears under when viewed at a diſtance, being often very different from the true figure; for a ſtraight line viewed at a diſtance may appear but as a point; a ſurface as a line; and a ſolid as a ſurface: and each of theſe of different magnitudes, and the two laſt of different figures, according to their ſituation with regard to the eye. Thus an arch of a circle may appear a ſtraight line; a ſquare or oblong, a trapezium, or even a triangle; a circle, an ellipſis; angular magnitudes, round; a ſphere, a circle, &c.

Alſo any ſmall light, as a candle ſeen at a diſtance in the dark, will appear magnified, and farther off than really it is. Add to this, that if ſeveral objects are ſeen at a diſtance, under angles that are ſo ſmall as to be inſenſible, as well as each of the angles ſubtended by any one of them, and that next to it; then all theſe objects will appear not only to be contiguous, but to conſtitute and ſeem but one continued magnitude.

FIGURE, in *Painting* and *Sculpture*, is uſed to ſignify the form, the contour, or outline of the ſurface of bodies of whatever kind they may be. In conformity with this, we ſpeak of a drawing, as repreſenting the figure of a tree, a houſe, a book, a horſe, &c. &c. And in ſculpture we ſpeak of figures of bronze, of marble, of plaſter, &c. As however man is the principal ſubject on which artiſts who purſue the ſtudy of the higher branches of theſe arts are called to exert their talents, the *human form* is therefore by way of pre-eminence called the *figure*.

A picture wherein the repreſentation is given of a great number of men, women, or children, is ſaid to be full of figures. On the contrary, a landſcape wherein there is only the repreſentation of mountains, trees, &c. and not of human beings, is ſaid to be without figures. For further illuſtration ſee HUMAN *figure*.

FIGURE, is alſo applied to repreſentations, or images of things in prints, &c.

Some readers chuſe to have the figures, eſpecially the mathematical ones, in wood, for the convenience of having them immediately annexed to the matter they refer to: others rather chuſe to be at the pains of turning over, and having recourſe to another part of the book, that they may have the figures more neat and accurate on copper.

The author of a collection of diſſertations, printed at Paris in 1715, ſhews, in the firſt diſſertation on the Hebrew medals, p. 66, that the Jews were allowed to make any kind of figures, or images of trees, plants, buildings, flowers, &c. but not thoſe of animals, or of the ſun, moon, and ſtars.

FIGURES, *Brimſtone*. See BRIMSTONE.

FIGURES, *Caſting of*. See CASTING.

FIGURE *Circumſcribed*, and *Inſcribed*. See CIRCUMSCRIBING, and INSCRIBED.

FIGURES, *Equal*. See EQUAL.

FIGURE, *Equilateral*. See EQUILATERAL.

FIGURES, *Plain*. See PLAIN.

FIGURE, *Regular*, and *Irregular*. See REGULAR and IRREGULAR.

FIGURE, *Similar*. See SIMILAR.

FIGURE, in *Rhetoric*, is a phraſe, or turn of ſpeech or diſcourſe, more beautiful and emphatical than what is uſed in common or ordinary ſpeaking. Accordingly it implies ſome departure from ſimplicity of expreſſion; but at the ſame time this deviation from what may be reckoned the moſt ſimple form of ſpeech, by no means ſuppoſes any thing uncommon or unnatural; the caſe is ſo far otherwiſe, that, on many occaſions, figures are the moſt natural, and the moſt common method of uttering our ſentiments. Nor ſhould it be imagined that every alteration from the common manner ought to be eſteemed a figure, or deſerving of that character. It muſt contain ſome beauty, or expreſs ſome paſſion, to merit a place among rhetorical figures, and be marked out for imitation.

Figures, by the Greeks called σχηματα, *ſchemata*, are the enrichments of diſcourſe, and we only uſe them when raiſed and moved with the conſideration of ſomething extraordinary.

The term *figure*, as Dr. Ward obſerves, ſeems to have been borrowed from the ſtage, where the different habits and geſtures of the actors, ſuitable to the ſeveral characters they ſuſtained, were by the Greeks called σχηματα, and by the Latins *figuræ*. Nor is it unuſual with us to ſay of a perſon, both with reſpect to his dreſs and actions, that he makes a very bad, or a very graceful figure. And as language is the dreſs, as it were, of our thoughts, in which they appear and are repreſented to others; ſo any particular manner of ſpeaking may, in a larger ſenſe of the word, be called its figure, in which latitude orators ſometimes uſe it (ſee Cic. De Orat. l. iii. c. 52.); but rhetoricians have reſtrained the ſenſe of the word to ſuch forms of ſpeech, as differ from the more common and ordinary ways of expreſſion; as the theatrical habits of actors, and their deportment on the ſtage, are different from their uſual garb and behaviour at other times. Or, as the figure or ſhape of one body diſtinguiſhes it from another, ſo figures are forms of ſpeech, having, each of them, a caſt or turn peculiar to itſelf, which both diſtinguiſhes it from the reſt, and diſtinguiſhes it from ſimple expreſſion. Simple expreſſion juſt makes our ideas known to others; but figurative language, more than this, beſtows a particular dreſs upon that idea; a dreſs which both makes it to be remarked, and adorns it.

Some have erroneouſly imagined, that figures of ſpeech ſhould be claſſed among its chief refinements not invented till language had advanced to its later period, and mankind were brought into a poliſhed ſtate; and that, then, they were deviſed by orators and rhetoricians. Whereas the contrary to this is the truth. Mankind never employed ſo many figures of ſpeech, as when they had hardly any words for expreſſing their meaning. For, firſt, the want of proper names for every object, obliged them to uſe one name for many; and, of courſe, to expreſs themſelves by compariſons, metaphors, alluſions, and all thoſe ſubſtituted forms of ſpeech which render language figurative. Next, as the objects with which they were moſt converſant were the ſenſible, material objects around them, names would be given to thoſe objects long before words were invented for ſignifying the diſpoſitions of the mind, or any ſort of moral and intellectual ideas. Hence, the early language of men being entirely made up of words deſcriptive of ſenſible objects, it became, of neceſſity, extremely metaphorical. For to ſignify any deſire or paſſion, or any act or feeling of the mind, they had no preciſe expreſſion which was appropriated to that purpoſe; but were under a neceſſity of painting the emotion or paſſion which they felt by alluſion to thoſe ſenſible objects which had moſt relation to it, and which could render it, in ſome ſort, viſible to others. Other circumſtances, alſo, beſides neceſſity, contributed to the uſe of this figured ſtyle at the commencement of language. In the infancy of all ſocieties, men are much under the dominion of imagination and paſſion; every thing will appear new and ſtrange to them; fear and ſurpriſe will be their prevalent paſſions; and their language will neceſſarily partake of this character of their minds; they will incline to exaggeration and hyperbole; and they will be apt to deſcribe every thing with the ſtrongeſt colours and moſt vehement expreſſions. Beſides, wherever ſtrong exclamations, tones, and geſtures blend themſelves much with converſation, the imagination is always more exerciſed, and a greater effort of fancy or paſſion is excited, conſequently the fancy kept awake, and rendered more ſprightly by this mode of utterance, operates upon ſtyle and enlivens it more. Facts might be eaſily cited in confirmation of theſe reaſonings.

Figures, in general, may be deſcribed to be that language which is prompted either by the imagination or the paſſions. Rhetoricians have commonly divided them into two great claſſes; *viz.* figures of words, and figures of thought. The former are generally called tropes, and conſiſt in a word's being employed to ſignify ſomething that is different from its original and primitive meaning; ſo that if you alter the word, you deſtroy the figure. Some writers, however, have diſtinguiſhed between figures and tropes. (See Trope.) Figures of thought ſuppoſe the words to be uſed in their proper and literal meaning, and the figure to conſiſt in the turn of the thought; as is the caſe in exclamations, interrogations, apoſtrophes, and compariſons: with reſpect to which, though you vary the words that are uſed, or tranſlate them from one language into another, you may, nevertheleſs, ſtill preſerve the ſame figure in the thought. Other rhetoricians have diſtributed figures into the following two kinds, differing leſs in ſenſe than expreſſion from the former; the one of *ſentences*, and maintained in the ſenſe itſelf, without any immediate dependance on any particular words; the other are only in the words themſelves. As to Figures *of ſentences*, ſome are principally adapted for reaſoning and inſtruction, and others to move the paſſions, and hence figures have been called the "language of the paſſions."

Among the ancients, Demoſthenes is moſt celebrated for expreſſing the force and energy of theſe figures, and Iſocrates excelled in the beauties and delicacies of verbal figures.

Cicero lays ſo great ſtreſs on theſe figures, that he repreſents them as the brighteſt parts of oratory; and makes the power and efficacy of the art to depend in a great meaſure on a thorough knowledge and application of them.

Of the firſt kind, and of thoſe that are principally adapted for reaſoning, the moſt conſiderable are ſix; *viz.* Prolepsis, or *anticipation*; Hypobole, or *ſubjection*; Anacoinosis, or *communication*; *epitrope*, or Concession; *parabole*, or Similitude; and Antithesis, or *oppoſition*. Thoſe of the ſecond kind, or ſuch as are fitted for moving and influencing the paſſions, are Epanorthosis, or *correction*; Paralepsis, or *omiſſion*; Parrhesia, or *reprehenſion*; Aparithmesis, or *enumeration*; Exergasia, or *expoſition*; Hypotyposis, or *imagery*; Aporia, or *doubt*; Aposiopesis, or *concealment*; *eroteſis*, or Interrogation; *ecphoneſis*, or Exclamation; Epiphonema, or *acclamation*; Apostrophe, or *addreſs*; Prosopopeia, or *the fiction of a perſon*. See each under its proper head.

Of Figures *of words*, ſome are tropes, i. e. tranſlations of words from their proper ſignification, to ſome more remote and extraordinary one. See Trope.

Others are *figures of words*, more properly ſo called, and not tropes; being ſo inherent in the words, that upon changing of the words, or ſometimes only their ſituation, the figure is deſtroyed: as in *amantes ſunt amentes*, where the figure would be loſt, if inſtead of *amentes* you ſhould put *ſtulti*.

Thus alſo, *to loſe all reliſh of life*, is *in effect to loſe life*; the figure is loſt by changing the order of the words; as, *to loſe all reliſh of life*, is *to loſe life in effect*.

The principal of theſe verbal figures may be arranged into three claſſes; ſuch as conſiſt in a deficiency of words, in a redundancy, or a repetition. To the firſt claſs belong the Ellipsis and Asyndeton. Under the ſecond diviſion are comprehended the Pleonasmus and polysyndeton. The third kind of verbal figures includes thoſe by which the ſame word in ſound, or ſenſe, is repeated; or one of a like ſound or ſignification, or both. Of the firſt ſort in this diviſion there are ten, called Antanaclasis, Ploce, Epizeuxis, Climax, Anaphora, Epistrophe, Symploce, Epanalepsis, Anadiplosis, and Epanodos. To the ſecond claſs belong the Paronomasia, the Homoioptoton, the Synonymia, and Derivatio; the two firſt of which reſpect words that are ſimilar in ſound only, the third in ſenſe, and the laſt in both.

With regard to the proper uſe of figures, we may obſerve, that they ſhould always be accommodated to the ſentiments, and riſe in proportion to the images deſigned to be conveyed by them; it is alſo better, in general, to be nervous than copious, that the images, by their cloſer union, may impreſs the mind with greater energy, though in ſuch figures as are deſigned for ornament or illuſtration, a more diffuſive way of painting is ſometimes agreeable. The too frequent uſe of figures ſhould be avoided; and they ſhould be ſo interwoven in a diſcourſe as not to render the ſtyle rough and uneven, ſometimes high and at other times low; now dry and jejune, then pompous and florid. In every caſe they ſhould ſeem to riſe more from nature than art, to offer themſelves rather than to be the effect of ſtudy. Finally, it ſhould be duly conſidered, that neither all the beauties, nor even the chief beauties of compoſition, depend upon tropes and figures. For a further account of the uſe and effects of figures on language, ſee Style. See alſo Metaphor, and each of the articles above noted. Ward's Orat. Lect. 30, 31, 32, 33, 34. Blair's Lect. vol. i. ii.

Figures *of Proſody* comprehend the Synaloepha, Ecthlipsis, Crasis, Synæresis, Diæresis, Systole, and Diastole. See each article.

Figure is uſed, in *Theology*, for the myſteries repreſented or delivered obſcurely to us under certain types or actions in the Old Teſtament.

Thus, manna is held by ſome to be a figure or type of the euchariſt; and the death of Abel a figure of the ſuffering of Chriſt.

Many divines and critics contend, that all the actions, hiſtories, teries, ceremonies, &c. of the Old Teſtament, are only figures, types, and prophecies, of what was to happen under the New. The Jews are ſuppoſed to have had the figures or ſhadows, whilſt we poſſeſs the ſubſtance.

Figure is alſo applied in a like ſenſe to prophane matters; as the emblems, enigmas, fables, ſymbols, and hieroglyphics of the ancients.

FIGURED, in *Heraldry*, is an epithet applied to thoſe bearings which are depicted with a human face.

Figured, in the *Manufactures*. A figured camlet, ſtuff, tabby, &c. is that whereon there are divers deſigns of flowers, figure, branches, &c. impreſſed by means of hot irons. Figured ribbands firſt came into faſhion about the year 1680. The method of performance was by ſucceſſively applying ſteel plates engraven with divers ornaments, as flowers, birds, groteſques, &c.

But one Chandelier, a ribband-maker of Paris, invented a much better and readier way of doing it, by a machine not unlike the flatter uſed in coining, to flatten the pieces of metal, only much ſimpler.

The principal parts thereof were two ſteel cylinders, engraven with the figures intended to be repreſented. Theſe cylinders were placed over each other like the rolls of a rolling-preſs, having each of them, at one of its extremes, a little dented wheel, one of which catching into the other, the whole was put in motion by means of a winch or handle faſtened to the firſt.

The machine thus prepared, the workman heats the cylinders, and places the ribband in the little place remaining between the two, which he contracts yet farther by a ſcrew that preſſes the upper part down upon the lower; the turning the rolls by the handle, a whole piece of ribband was figured in leſs time than a ſingle yard could be done in the ordinary way.

Figured *Velvet*. See Velvet.

Figured, in *Muſic*, is an adj. in thorough baſe, when the harmony of a compoſition is expreſſed by figures over the baſe to denote ſuch ſounds as differ from common chords. See Chords, Thorough *Baſe*, and Accompaniment.

FIJOAGO, in *Geography*, a town of Japan, in the iſland of Niphon; 45 miles S.W. of Meaco.

FIJIXASAKI, or Firosaki, a town of Japan, in the iſland of Niphon; 50 miles N.E. of Achita.

FILABRES, a ſtupendous mountain of Spain, in Granada, between Moxacer and Guadix, which is a ſolid block of white marble, without any mixture of ſtones or earth, about a league in circuit and 2000 feet high; it is flat on the ſummit, and its front towards the N.W. is about 1000 feet high, and nearly perpendicular.

FILAGO, in *Botany*, from *filum*, thread, and *ago*, to produce, or have to do with, in alluſion to the cottony web connected with every part of the plant. Cud-weed.—Linn. Gen. 450. Schreb. 587. Willd. Sp. Pl. v. 3. 2387. Mart. Mill. Dict. v. 2. Juſſ. 179. (Evax; Gærtn. t. 165.) Claſs and order, *Syngeneſia Polygamia-neceſſaria*. Nat. Ord. *Compoſitæ nucamentaceæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common calyx* of numerous, chaffy, imbricated ſcales, containing ſeveral perfect florets in the diſk, and numerous female ones in the circumference, among the ſcales of the calyx. *Cor.* in the perfect florets funnel-ſhaped, with a four-cleft upright border; in the female ones hardly diſcernible, extremely narrow, cloven at the top. *Stam.* Filaments in the perfect florets four, capillary, ſmall; anther cylindrical, four-toothed at the top. *Piſt.* Germen moſt perfect in the female florets, ovate, depreſſed, rather large; ſtyle thread-ſhaped; ſtigma acute, cloven. *Peric.* none, except the permanent calyx. *Seeds* to the female florets only, obovate, compreſſed, ſmall, ſmooth; down none. *Recept.* cylindrical, naked, except the permanent ſcales of the calyx, which ſeparate the ſeeds.

Eſſ. Ch. Receptacle cylindrical, clothed with the calyx-ſcales. Seed-down none. Female florets among the calyx-ſcales; perfect ones four-cleft, in the diſk.

1. F. *pygmæa*. Linn. Sp. Pl. 1311. Cav. Ic. t. 36. (Gnaphalium umbellatum minimum; Bauh. Hiſt. v. 3. p. 1. 162. Evax umbellata; Gærtn. v. 2. 393.) Found in the ſouth of Europe, in waſte ſandy ground, particularly in places occaſionally inundated. The *root* is annual. *Stems* either entirely wanting, or more or leſs elevated, ſolitary or numerous, ſimple or branched, at moſt three or four inches high. Whole plant clothed with a white cottony tenacious web. *Leaves* ſcattered, obovate or ſpatulate, entire, many of them ſurrounding the little heads of flowers in a radiating manner, and making an elegant roſaceous appearance.

Profeſſor Willdenow rightly retains this as the only ſpecies of *Filago*, the reſt being beſt referred to *Gnaphalium*. It is alſo the original one.

FILAMENT, Filamentum, a word though not of claſſical authority, yet well ſupported by analogy, is technically applied to the uſually ſlender thread-like part which ſuſtains the anther of a flower; ſee Antheræ. This part, however, is not eſſential to all ſpecies of flowers, though the anther itſelf, being the male organ, is ſo. But the latter in ſome caſes is immediately affixed to the corolla, receptacle, or piſtil, on which it is ſeſſile, without any filament.

The filaments differ in number, from one to ſeveral hundreds, in different genera, or even ſpecies of the ſame genus, though the latter caſe is rare. They, however, vary in this reſpect occaſionally, in the ſame ſpecies or individual. They differ alſo, but vary leſs, in their inſertion, or origin, with reſpect to other parts of the flower, proceeding either from the receptacle, as in the Poppy; the calyx, as in the Roſe; or the corolla, as in the Jaſmine. Their form is uſually ſimple, each filament bearing one anther; but in the Orange and St. John's Wort many filaments are united into one, and in moſt of the Papilionaceous family one filament only is ſeparate, nine others being united from their baſe almoſt to the ſummit. In the natural order of *Rutaceæ*, ſee Dioſma and Erioſtemon, the filaments are more elaborate in ſtructure than uſual, being tuberculated and glandular, and ſometimes bearing their anthers on a ſort of appendage, or pedicle. Indeed the extremity of each filament, in many inſtances, tapers into a fine flexible point, like an additional ſtalk, allowing of a free or rotatory motion in the anther; witneſs the Paſſion flower, and White Lily. Such flowers are ſaid to have verſatile anthers. Filaments are extremely different in proportion, ſome being prominent far beyond the verge of the bloſſom, expoſing their anthers to the wind and weather, while others lie concealed in the bottom or tube of a flower, carefully protected from wet. Some are long and capillary; others ſhort, broad, or thick.

A very curious circumſtance reſpecting filaments is, that in ſome inſtances they appear endued with a ſpontaneous motion, as in *Ruta* (Rue) *Saxifraga* and *Parnaſſia*. In theſe flowers the filaments bend in their turn over the ſtigma, that the anthers may more certainly drop their pollen upon it, and ſubſequently retire. In the Barberry bloſſom the ſame thing is accompliſhed by an exquiſite irritability in the inner ſide of each filament at the bottom, in conſequence of which it contracts when touched, ſcattering the pollen over the ſtigma, and after a while, reſuming its original poſition, makes way for others. Some filaments are very ſenſible hygrometers, as in the Cock's-comb, *Celoſia*, contracting in dry weather and ſo approaching the ſtigma, and retiring,

tiring for ſhelter under the corolla in wet. See Fecundation *of Plants*.

The word *filamenta* is alſo uſed for the fronds of the genus *Conferva*, which ſee; theſe being of a fine thread-like, or rather capillary, form and ſize. Roth contends that, to avoid ambiguity, *fila* ſhould be uſed in the latter caſe, which expreſſes the ſame thing ſtill more correctly. This is certainly an improvement, though it is ſcarcely poſſible that the ambiguity in queſtion ſhould cauſe any confuſion. S.

Filament, in *Medicine, Anatomy, Natural Hiſtory*, &c. a term uſed in the ſame ſenſe with fibre for thoſe fine threads whereof fleſh, nerves, ſkins, plants, roots, &c. are compoſed.

FILANA, in *Geography*, a river of Benin, which runs into the Atlantic; N. lat. 4° 40′. E. long. 5° 22′.

FILANDERS, in *Falconry*, a diſeaſe in hawks, &c. conſiſting of filaments or ſtrings of blood coagulated and dried, occaſioned by a violent rupture of ſome vein, by which the blood extravaſating hardens into the figures above-mentioned, to the great annoyance of the reins, hips, &c.

The word is French, *filandres*, formed from *fil, thread*.

Filanders are alſo a ſort of fine ſmall worms which greatly incommode the hawk in the gorge, and about the heart, liver, and lungs; but which, on ſome occaſions, are ſuppoſed to be of ſervice, and to feed on the ſuperfluities of certain parts. See Black *Worm*.

There are four kinds of theſe filanders or vermiculi. The firſt, in the gorge or throat; the ſecond, in the belly; the third, in the reins: the fourth are called needles, on account of their exceeding fineneſs. The ſymptoms that diſcover the diſeaſe are the bird's gaping frequently, ſtraining the fiſt or perch with her pounces, croaking in the night, ruffling her train, rubbing her eyes, wings, noſtrils, &c. As the worms are very reſtleſs, the bird is frequently endeavouring to caſt them up; and in opening its mouth you will readily diſcover them. From the throat, &c. they will aſcend to the larynx, brain, &c. and finally over the whole body.

The ordinary cauſe is bad food. The proper remedy, they ſay, is not by killing them, for fear of impoſthumes from their corruptions; but chiefly by ſtupefying them, that they may be offenſive but ſeldom.

This is beſt effected by making the bird ſwallow a clove of garlic, after which ſhe will feel nothing of the filanders for forty days. Others uſe rue, worm-ſeed, aloes, vervain, ſaffron, &c.

FILANGERI, Gaetano, in *Biography*, a celebrated political writer, was born at Naples on the 18th of Auguſt 1752. His parents intended him for the army, but his own genius pointed out to him the ſciences as moſt adapted to his future purſuits. Politics, moral philoſophy, and legiſlation engaged his mind, and ſeemed to abſorb all his attention. He ſoon diſcovered the defects of the exiſting laws by which moſt of the European nations were governed. In 1771, he drew up the plan of a treatiſe on private and public education, which, however, he never completed. In 1774 he publiſhed a ſmall work, in which he defended a new law againſt the arbitrary deciſion of a judge, with great judgment and the nobleſt enthuſiaſm. After this he determined to retire from public life, in order that he might prepare himſelf for important duties, by diligent and uninterrupted ſtudy. But in 1777 he entered into the ſervice of the court, and was appointed a gentleman of the bed-chamber, and an officer of the marine. Theſe avocations did not prevent him from devoting many of his days, and frequently whole nights, in philoſophical reſearch. In 1780 he publiſhed the firſt part of his work "On Legiſlation," which was intended to conſiſt of ſeven books; but of which only four, and a part of the fifth, made their appearance during the author's life. The early parts of this work were received with the warmeſt approbation; and the celebrity of the author continued to increaſe; but as he had indulged in liberties which were new in Italy, he was open to the attack of venal and bigoted writers. His work was oppoſed by profeſſor Joſeph Grippa, who publiſhed a letter under the title of "Scienza della Legiſlatione Vindicata," with obſervations againſt Filangeri's propoſal reſpecting feudal and criminal laws. Soon after a decree was iſſued by which the treatiſe "On Legiſlation" was declared among the number of prohibited works, on account of the advice given in the ſecond book, to aboliſh eccleſiaſtical property, and the propoſal promiſed in the fifth for reforming abuſes in the power of the church. Filangeri was, however, protected by the court, and various diſtinguiſhed marks of favor were conferred upon him. In 1783 he married an Hungarian lady ſent to Naples by the empreſs Mary Thereſa, as governeſs to the ſecond of the princeſſes. With the permiſſion of his ſovereign, he retired from civil and military employment, that he might devote his whole time to the completion of his work at his country houſe near the town de la Cava, a few miles from Naples, where he reſided till March 1787, when he was appointed to a place in the royal college of finance. In this ſituation he appeared with great advantage as a ſtateſman, and many wiſe and very uſeful eſtabliſhments were formed in conſequence of hints which he ſuggeſted. Scarcely had he arranged his plans of economy and reform, when he was arreſted by the hand of death. He died in July 1787, in the 37th year of his age. His death was lamented by the monarch, who ſettled a penſion on his infant family, to be employed in their education. The demand for his great work on legiſlation was ſo great, that it went rapidly through ten editions in his own country, and was tranſlated into the German and French languages. Gen. Biog.

FILARIA, in *Zoology*, a genus of inteſtinal worms, which have the body round, filiform, equal, and quite ſmooth; the mouth dilated, and furniſhed with a roundiſh concave lip.

The genus filaria, as now eſtabliſhed, unites ſome few of the Vermes, formerly referred to the genus Aſcaris, and according to its more extenſive application in the Gmelinian edition, ſome of the Gordius tribe may be included alſo in the ſame genus. The vermes, which are truly of the filaria genus, ſeem to be abundant throughout all animated nature; they are not found in man, nor has their preſence been hitherto determined in the higher claſs of domeſtic animals, the horſe excepted; but there are few of the undomeſticated quadrupeds, and ſcarcely any of the bird tribe that have been attentively examined, in which they have not been diſcovered; they are obſerved in the fiſh and reptile race, and inſects are infeſted with them in inconceivable numbers. As theſe are the moſt ſimple of inteſtinal worms, the different ſpecies may not perhaps have hitherto been diſcriminated with ſufficient accuracy; they do not ſeem to afford any very deciſive characters by which the ſpecies may be readily diſtinguiſhed; and it is no doubt for this reaſon that ſyſtematic writers deſcribe and claſs them merely according to the reſpective animals in which they are obſerved. Gmelin inſerts that highly dangerous creature, the *hair-worm* of the Indies, at the head of this genus, becauſe it infeſts man: in this inſtance he deviates from the example of Linnæus, who conſidered that kind of vermes as a ſpecies of gordius, and not without reaſon. The two genera, filaria and gordius, are indeed analogous, and correſpond in every eſſential particular, except the ſtructure of the mouth, and the difference in this reſpect is not expreſſed with due preciſion either by Linnæus or Gmelin; the filaria genus have the mouth terminal, and more or leſs perceptibly dilated, of a ſimple form, and furniſhed with a rounded lip; to the Gmelinian character of the gordius we ſhould add that the mouth conſiſts only of a dent or inciſion, and is ſo very minute as to be imperceptible to the naked eye.

Species.

* *Infeſting the Mammalia.*

Equi. Body tapering behind, tail finely pointed, and incurved. Abildgeard.
Found in the cellular membrane of horſes.

Leonis. In the lion. Redi.

Martes. In the martin. Redi.

Lepores. In the cellular membrane of hares. Pallas.

** *Infeſting Birds.*

Falconis. In the cellular membrane about the abdomen and thighs of hawks. Redi.

Strigis. In the cellular membrane about the head and ears of owls. Pallas.

Cornicis. In the crop and lungs of crows. Pallas.

Ciconia. In the cellular membrane of the ſtork. Redi.

Gallinæ. In the ſmaller inteſtines of poultry. Goeze. The body is capillary, and about two inches long.

*** *Infeſting Inſects in their perfect State.*

Scarabæi. In the ſcarabæus fimetarius. Phil. Tranſ.

Silphæ. In the ſilpha obſcura. Goeze.

Carabi. In the carabus. Liſter.

Grylli. In the gryllus. Roeſel.

Monoculi. In the monoculus apus. Walch.

**** *Infeſting the Larvæ of Inſects.*

Lepidopterorum. Tail hooked. Schranck.

Papilionum. In butterflies. Werner.

Polychlori. White. In papilio polychloros. Werner.

Urticæ. Body yellowiſh-grey. In papilio urticæ. Werner.

Betulæ. Body white. In papilio betula. Werner.

Quercus. Body white. In papilio quercus. Werner.

Sphingum. In the ſphinx euphorbiæ. Roeſel.

Phalænarum. In the phalæna. Mannigf.

Quercus. White. In phalæna quercus. Werner.

Cajæ. Cheſnut. In phalæna caja. Werner.

Ziczac. In phalæna ziczac. Degeer.

Nuptae. In phalæna nupta. Goeze.

Psi. In phalæna pſi. Roeſel.

Pellionella. In phalæna pellionella. Goeze.

Theſe creatures are found under the ſkin of the larvæ, ſometimes ſolitary, from four to ſeven inches long, and very deſtructive.

Tenthredinis. Found in the larvæ of the tenthredo. Act. Stockh.

Phryganeæ. Found in the larvæ of the phryganea. Degeer.

FILAWS, among the modern Ægyptians, villages inhabited by the original natives of the country.

FILAZER, Filacer, *Filizer*, an officer in the court of common pleas, ſo called becauſe he *files* the writs whereon he makes out proceſs.

Of theſe there are nine in the ſeveral diviſions and counties of England. They make out all writs and proceſſes upon original writs, iſſuing out of chancery, as well real as perſonal and mixed, returnable in that court. In actions merely perſonal, where the defendants are returned ſummoned, they make out pones or attachments, which being returned and executed, if the defendant appears not, they make out a *diſtringas*, and ſo *ad infinitum*, or till he does appear.

If he be returned *nihil*, then proceſs of *capias* infinite, if the plaintiff will, or after the third *capias* the plaintiff may proceed to outlawry in the county where his original is grounded, and may have an exigent with proclamation.

The filazers likewiſe make out all writs of view in real actions where the view is prayed; and upon replevins and recordaris, writs of retorno habendo, ſecond deliverance, and writ of withernam. In real actions they make out writs of grand and petite cape before appearance.

They enter all appearances and ſpecial bails upon any proceſs made by them. They make the firſt *ſcire facias* upon ſpecial bails, writs of *habeas corpus*, *diſtringas nuper vicecomitem vel ballivum*, and *duces tecum*; and all *ſuperſedeaſes*, upon ſpecial bail or appearance, &c. writs of habeas corpus cum cauſa upon the ſheriff's return that the defendant is detained with other actions, and writs of adjournment of a term, in caſe of peſtilence, war, or public diſturbance.

Till an order of court made 14 Jac. I. which limited the filazers to all matters and proceedings before appearance, and the prothonotaries to all after, they alſo entered declarations, imparlances, judgments, and pleas, whereto a ſerjeant's hand was not requiſite, and made out writs of execution, and divers other judicial writs after appearance. The filazers of the common pleas have been officers of that court before the ſtat. 10 Hen. VI. c. 4. in which they are mentioned; and in the king's bench, of later times, there have been filazers who made out proceſs upon original writs returnable in that court on actions in general.

FILBERT, a common name frequently applied to the beſt ſort of the hazel-nut. It is often written *filberd*, and ſometimes *filbud*.

Filbert-*tree*, the name of the tree from which the filbert nut is obtained. It is the low, ſhrubby tree uſually planted out in gardens, orchards, and other places. See Corylus.

Theſe trees may be raiſed by planting the nuts, by layers, by ſuckers from the roots, and by grafting upon *hazel ſtocks*; but the beſt methods are thoſe of layering, and planting the off-ſets or ſuckers. The layers ſhould be laid down in the early autumnal ſeaſon, and when they are become fully rooted, be taken off, and planted out in rows at the diſtance of two feet and twelve inches apart, in the rows. After they have attained ſufficient growth in theſe rows, they may be carefully taken up and planted where they are to remain.

The off-ſets or ſuckers may be taken off with good radical fibres, and be immediately planted out where they are to remain.

They anſwer beſt where the ſoil is of the light, mellow, friable kind, but will ſucceed in moſt, when well protected from cold winds.

They may be planted in the ſtandard method, in rows, at ten, fifteen, or twenty feet diſtance, by twelve feet in the lines; or be trained to ſingle ſtems, to the height of four, five, or ſix feet, with full branches, ſpreading heads, and in the hedge manner, either in ſingle or double rows, ten or twelve feet between; but the ſtandard mode is moſt probably the beſt, as producing the fineſt nuts.

In Kent they never ſuffer theſe trees to riſe higher than ſix feet, regularly pruning them in the manner of the gooſeberry buſh.

There are two ſub-varieties of this tree, namely, the white-ſkinned, and the red-ſkinned, the former being in general the moſt eſteemed.

Filberts, *Petrified*, in *Natural Hiſtory*, and filbert-trees alſo, have been deſcribed by different authors, as found in the ſtrata of the earth. Mr. John Ray mentions ſuch as being found under the city of Modena and its neighbourhood, at twenty-ſix feet beneath its ſurface; but Mr. Whitehurſt, who quotes this paſſage at length, in his Enquiry concerning the Earth (1ſt ed. p. 172.) obſerves, that theſe are not original ſtrata, but modern accumulations of alluvial ſoil, which have buried the briars, corn, filberts, &c. in the alterations which the ſuperficial parts of the ground about Modena have undergone; and ſimilar remarks might, we believe, be applied to every other inſtance of real filbert-trees or nuts being found beneath the ſurface of the earth, or in accumulations of calcareous tufa, (ſee Nuts;) and the ſame will be found to belong to the claſs of *recent* foſſils, mentioned in our article Coal.

FILE, an inſtrument uſed for reducing, and for giving ſhape and ſmoothneſs to a number of articles made of wood or metal.

It is divided into two varieties from the form of their teeth, namely, files and raſps. The former are cut upon the ſurface with a ſharp-edged chiſſel. In the latter, the tooth is raiſed with a triangular punch. The file is adapted for working metals, but the raſp is more fitted for wood, bone and horn. Files again are diſtinguiſhed by being ſingle or double cut. The ſingle cut file is ſimply cut once over, and is employed for filing braſs, and the ſofter metals. A ſecond courſe of teeth is cut to form the double cut file, croſſing the firſt diagonally. This kind is beſt ſuited to iron and ſteel.

Files are alſo called by different names, from the various degrees of fineneſs of their teeth, as ſmooth, ſecond cut, baſtard cut, and rough files.

And again, from their ſhape, they are called flat, half-round, ſquare, three ſquare, round, and ſome having two round ſides.

The ſteel employed for files requires to be very hard, and in conſequence undergoes a longer proceſs in the converſion: it is ſaid to be double converted.

The very heavy files, ſuch as ſmiths' rubbers, are made of the inferior marks of bliſtered ſteel: the more delicate kind, ſuch as watch-makers' files, being made of caſt ſteel. The ſteel is previouſly drawn at the tilt, into rods of ſuitable ſize.

Forging of Files.—The flat and the ſquare files are made wholly with the hammer, and the plain anvil. Two workmen, one called the maker, and the other ſtriker, are required in the forging of heavy files; the ſmaller being forged by one perſon only.

The anvil is provided with a gate, or groove, for the reception of certain boſſes, or dies, which are uſed for the purpoſe of forging the half-round and three-angled files. The half-round boſs contains a hollow which is the ſegment of a ſphere, much leſs than half a circle. That uſed for the triangular files has a gate or hollow, conſiſting of two ſides, terminating in an angle at the bottom.

In forging the half-round file, the ſteel is firſt drawn out, as if intended to make a flat file. It is then laid in the boſs, and hammered, till the underſide becomes round. The ſteel for the triangular file is tilted into ſquare rods. The part to form the file is firſt drawn out with the hammer, as if intended to form a ſquare file. It is then placed in the boſs with one of the angles downwards, and by ſtriking upon the oppoſite angle, two ſides of the ſquare are formed into one, and conſequently a three-ſided figure produced. By ſucceſſively preſenting the different ſides to the action of the hammer, the figure is rendered ſtill more compleat

In forming the tangs of moſt files, it is neceſſary to make the ſhoulders perfectly ſquare and ſharp. This is performed by cutting into the file a little on each ſide with a ſharp ſate or aggron, and afterwards drawing out the part ſo marked off, to form the tang.

After forging, and previous to being ground and cut, the files require to be annealed. This proceſs is generally performed by piling up a great quantity together, in a furnace for the purpoſe, and heating them red hot; ſuffering them afterwards to cool ſlowly. This method of annealing files, or indeed any other articles, in which great hardneſs is requiſite, is very objectionable, ſince the ſurface of ſteel, when heated red hot in the open air, is ſo liable to oxydation. Two evils reſult from this circumſtance, beſides the loſs by waſte. Firſt, the ſcaly oxyd is very hard, and difficult to remove; and ſecondly the ſteel, particularly on the ſurface, is deprived of a portion of its carbon, and thereby rendered leſs ſuſceptible of hardening.

A ſuperior method of annealing is practiſed by ſome file makers, and ſince hardneſs in a file is ſo eſſential a property, the proceſs ought to be generally adopted.

This method conſiſts in placing the files in an oven or trough, having a cloſe cover, and filling up the interſtices with ſand. The fire is made to play on every ſide of this veſſel, as gradually, and as uniformly as poſſible, till the whole maſs becomes heated red hot. The fire is then diſcontinued, and the whole ſuffered to cool, before the cover is removed from the trough. Another evil may however ariſe from keeping ſteel red hot even in a cloſe veſſel, for too great a length of time. It aſſumes a kind of cryſtallization under which its tenacity is much impaired. Hence, it will be proper not to anneal too many at once, and not to heat them too hot. Steel, annealed in this way, is perfectly free from that ſcaly ſurface acquired in the open air; and if each corticle be perfectly ſurrounded with the ſand, and the cover not removed before the ſteel is cold, the ſurface will appear of a ſilvery white colour.

If the ſteel be ſuſpected to be too kind, from containing too little carbon, powdered charcoal may be employed inſtead of ſand, or ſand mixed with charcoal. In this caſe the files ſhould be ſtratified alternately with the charcoal, in order that the extra-converſion may be uniform.

The next thing is to prepare the files for cutting, by making the ſurface, to contain the teeth, as level as poſſible. This was formerly effected by means of files; and the proceſs is called ſtriping. The ſame is ſtill practiſed by the Lancaſhire file makers, and by others not having convenience for grinding. The greateſt quantity of files, however, are ground to prepare them for cutting. The ſtone employed for the purpoſe is of the ſandſtone kind, the texture of which is compact and ſharp, but rather rough. They are of as great diameter as can be uſed with convenience; and about eight inches broad over the face. When uſed, the ſurface is kept immerſed in water. The grinder ſits in ſuch a poſition as to lean over the ſtone, while its motion is directly from him. Its ſurface moves at about the ſame ſpeed with thoſe uſed in grinding cutlery. Since the object in grinding files is to make the ſurface as even and flat as poſſible, and as this cannot be done ſo completely upon a ſmall ſtone, the ſtones of the file-grinder are laid aſide when they are reduced to a certain ſize, and are employed for grinding other articles. Though grinding is by far the moſt expeditious method, it does not give that truth to the ſurface which can be effected by filing. If the price of the articles would admit, however, it would be well to render the ſurface more even by the file after grinding. If the ſurface be not flat, it is obvious, that when the file is uſed for filing a large ſurface, thoſe teeth in the hollow parts of the file will not be brought into action. It is from attention to this circumſtance, and to the care in annealing and hardening, that the Lancaſhire file-makers have generally excelled. They are, however, confined chiefly to the ſmall articles, ſince the larger files would not pay for the proceſs of ſtriping.

Cutting of Files.—If the vaſt number of teeth contained in a file, and their requiſite uniformity are conſidered, a machine capable of effecting a buſineſs ſo apparently mechanical, may be conſidered a deſideratum.

Though many attempts have been made to accompliſh this object by machinery, and ſeveral varieties of machines have been conſtructed for the purpoſe, no one has yet been ſufficiently general in its application, to render the proſecution of ſuch an object very deſireable. Among thoſe who have diſtinguiſhed themſelves in this enquiry, Mr. Nicholſon, the publiſher of the Philoſophical Journal, we believe, invented the moſt likely machine for file cutting, for which he took out a patent. We do not know, however, that either Mr. Nicholſon's, or any other machine, is at preſent uſed for the purpoſe. A file, which is of the ſame breadth and thickneſs throughout, of any form, may be cut by the machine, becauſe the ſame magnitude of ſtroke is required for every tooth; but if the file be conical, it is obvious that a machine, capable of giving all the varieties of ſtrokes required in cutting even one ſide of a file, would be too complicated to be of any great utility. Again, the chiſſel employed for cutting a file is frequently liable to ſnip, or be otherwiſe out of order. This the workman, in the common way of cutting, can eaſily feel, and immediately ſtops to repair it. A very great evil would ariſe from this ſource, in cutting with the machine; and this evil would be greater in proportion to the number of chiſſels which one perſon had to overlook. It has alſo been ſaid, but we cannot affirm the fact, that the teeth raiſed by machinery are not ſo full and ſharp as thoſe formed by hand. Till the above inconveniences can be obviated, in all probability the common method will be continued; the different apparatus and mode of performance of which we will endeavour to deſcribe.

The tools of the file-cutter conſiſt of an anvil placed upon a block of ſuch a height, that the man ſits to his work. He has alſo a piece of lead, or lead alloyed with tin, on which he lays the files when one ſide is cut. The chiſſel and hammer are of ſuch ſize, as the ſize and cut of the file require. He is alſo provided with a leather ſtrap, which goes over each end of the file, and paſſes round his feet, which are introduced into the ſtrap on each ſide, in the ſame manner as ſtirrups are uſed. The file-cutter, therefore, ſits as if he were on horſeback, holding his chiſſel with one hand, his hammer in the other, at the ſame time he ſecures the file in its place by the preſſure of his feet in the ſtirrups. A, *fig.* 1. (*Plate* XIII. *Miſcellany*,) is the block; B, the anvil; *a b*, the file, laid upon the piece of lead; C, C, the ſtirrups paſſing over the ends of the file; D, the ſeat on which the workman ſits. *Fig.* 2. is the form of one of the chiſſels for cutting the files. *Fig.* 3. repreſents the chiſſel or punch for raiſing the tooth of the raſp. *Fig.* 4. the hammer uſed to ſtrike the head of the chiſſel. Theſe people have found by experience that there is an advantage in having the head of the hammer hooked inwards. This is eaſily accounted for, when we obſerve that the ſtroke will be made pretty near the centre of percuſſion. Great pains ought to be taken in preparing the edge of the chiſſel. It is, in the firſt place, hardened and tempered by heating it gradually till it appears of a yellowiſh brown. It is next ground very true to form the edge, which is afterwards finiſhed upon a Turkey ſtone, with oil. It is not required to be very ſharp, the bottom of the tooth requiring to be rather open, to prevent the file from clogging with the ſubſtance to be filed. The edge is alſo required to be very ſmooth, in order that it may ſlip eaſily upon the ſurface of the files: this is alſo facilitated by ſlightly greaſing the ſurface. From this advantage, the worker, after making one tooth, is enabled, by feeling only, to form, at its proper diſtance, the ſucceeding tooth, by ſliding the chiſſel cloſe up againſt the back of the preceding one. All theſe motions are performed with aſtoniſhing rapidity, firſt the chiſſel and then the hammer. We obſerved a boy, in cutting three-ſided files of five inches long, baſtard cut, make 225 ſtrokes, which produced as many teeth, in one minute. And the whole file being double-cut, contained 1350 teeth, or ſix times the above quantity. The ſecond cut file, of the ſame ſize, contains 2025 teeth, and the ſmooth file 2700, conſequently, the difference in labour between the baſtard-cut and the ſmooth files is about as two to one. Larger files, from the greater ſurface, require a much greater ſtroke to raiſe the tooth, and conſequently fewer ſtrokes will be made in the ſame time.

In the double-cut files, the firſt ſet of teeth, which the workmen call *up-cutting*, are, previous to cutting the ſecond courſe, filed ſlightly upon the face, in order to allow the chiſſel to ſlide freely.

The ſingle-cut file is more durable than the double-cut, and ought to be preferred for all purpoſes, excepting for iron and ſteel.

The ſame method is employed in cutting the raſp. The workman is however guided completely by his eye, in regulating the diſtance of the teeth from each other. The raſp ought to be cut in ſuch a manner that no one of the teeth may ſtand oppoſite to another. This not only allows the raſp to cut faſter, but makes the ſurface, either of wood or other ſubſtance, much ſmoother.

Hardening of Files.—This is the laſt and moſt important part of file-making. Whatever may be the quality of the ſteel, or however excellent the workmanſhip, if it is not well hardened, all the labour is loſt.

Three things are ſtrictly to be obſerved in hardening; firſt, to prepare the file on the ſurface, ſo as to prevent it from being oxydated by the atmoſphere, when the file is red hot, which effect would not only take off the ſharpneſs of the tooth, but render the whole ſurface ſo rough, that the file would, in a little time, become clogged with the ſubſtance it had to work. Secondly, the heat ought to be very uniformly red throughout, and the water in which it is quenched freſh and cold, for the purpoſe of giving it the proper degree of hardneſs. Laſtly, the manner of immerſion is of great importance, to prevent the files from warping, which in long thin files is very difficult.

The firſt object is accompliſhed by laying a ſubſtance upon the ſurface, which, when it fuſes, forms as it were a varniſh upon the ſurface, defending the metal from the action of the oxygen of the air. Formerly, the proceſs conſiſted in firſt coating the ſurface of the file with ale grounds, and then covering it over with pulverized common ſalt, (muriat of ſoda.) After this coating became dry, the files are heated red hot, and hardened; after this, the ſurface is lightly bruſhed over with the duſt of cokes, when it appears white and metallic, as if it had not been heated. This proceſs has lately been improved, at leaſt ſo far as relates to the economy of the ſalt, which, from the quantity uſed, and the increaſe of duty, had become a ſerious object. Thoſe who uſe the improved method are now conſuming about one-fourth the quantity of ſalt uſed in the old method. The proceſs conſiſts in diſſolving the ſalt in water to ſaturation, which is about three pounds to the gallon, and ſtiffening it with ale grounds, or with the cheapeſt kind of flour, ſuch as that of beans, to about the conſiſtence of thick cream. The files only require to be dipped into this ſubſtance, and immediately heated and hardened. The grounds, or the flour are of no other uſe, than to give the maſs conſiſtence, and by that means, allowing a larger quantity of ſalt to be laid upon the ſurface. In this method, the ſalt forms immediately a firm coating. As ſoon as the water is evaporated, the whole of it becomes fuſed upon the file. In the old method the dry ſalt was ſo looſely attached to the file, that the greateſt part of it was rubbed off into the fire, and was ſublimed up the chimney, without producing any effect.

The carbonaceous matter of the ale-grounds is ſuppoſed to have ſome effect, in giving hardneſs to the file, by combining with the ſteel, and rendering it more highly carbonated. It will be found, however, upon experiment, that vegetable carbon does not combine with iron, with ſufficient facility, to produce any effect, in the ſhort ſpace of time a file is heating, for the purpoſe of hardening. Some file makers are in the habit of uſing the coal of burnt leather, which doubtleſs produces ſome effect; but the carbon is generally ſo ill prepared for the purpoſe, and the time of its operation ſo ſhort, as to render the effect very little. Animal carbon, when properly prepared and mixed, with the above hardening compoſition, is capable of giving hardneſs to the ſurface even of an iron file.

The carbonaceous matter may be readily obtained from any of the ſoft parts of animals, or from blood. For this purpoſe, however, the refuſe of ſhoe-makers and curriers, is the moſt convenient. After the volatile parts have been diſtilled over, from an iron ſtill, a bright ſhining coal is left behind, which, when reduced to powder, is fit to mix with the ſalt. Let about equal parts, by bulk, of this powder, and muriat of ſoda, be mixed together, and brought to the conſiſtence of cream, by the addition of water. Or mix the powdered carbon with a ſaturated ſolution of the ſalt, till it become of the above conſiſtence. Files which are intended to be very hard, ſhould be covered with this compoſition, previous to hardening. All files intended to file iron or ſteel, particularly ſaw files, ſhould be hardened with this compoſition in preference to that with the flour or grounds. Indeed, we are of opinion, that the carbonaceous powder might be uſed, altogether, in point of economy, ſince the ammonia or hartſhorn, obtained by diſtillation, would be of ſuch value as to render the coal of no expence. By means of this method the files made of iron, which in itſelf is inſuſceptible of hardening, acquires a ſuperficial hardneſs, ſufficient for any file whatever. Such files may at the ſame time be bent into any form, and, in conſequence, are particularly uſeful for ſculptors and die ſinkers.

The next point to be conſidered is the beſt method of heating the file for hardening. For this purpoſe a fire, ſimilar to the common ſmiths' fire, is generally employed. The file is held in a pair of tongs, by the tang, and introduced into the fire, conſiſting of very ſmall cokes; puſhing it more or leſs into the fire for the purpoſe of heating it regularly. It muſt frequently be withdrawn for the purpoſe of obſerving, that it is not too hot in any part. When it is uniformly heated, from the tang to the point, of a cherry red colour, it is fit to quench in the water. At preſent an oven, formed of fire bricks, is uſed for the larger files, into which the blaſt of the bellows is directed, being open at one end, for the purpoſe of introducing the files and the fuel. Near to the top of the oven are placed two croſs bars, on which a few files are placed, to be partially heating. In the hardening of heavy files, this contrivance affords a conſiderable ſaving, in point of time, in addition to which they are more uniformly and thoroughly heated.

After the file is properly heated for the purpoſe of hardening, in order to produce the greateſt poſſible hardneſs, it ſhould be cooled as ſoon as poſſible. The moſt common method of effecting this is by quenching it in the coldeſt water. Some file makers have been in the habit of putting different ſubſtances in their water, with a view to increaſe its hardening property. The addition of the ſulphuric acid to the water was long held a great ſecret in the hardening of ſaw files. After all, however, it will be found, that clear ſpring water, free from animal and vegetable matter, and as cold as poſſible, is the beſt calculated for hardening files of every deſcription.

In quenching the files in water ſome caution muſt be obſerved. All files, except the half round, ſhould be immerſed, perpendicularly, as ſlowly as poſſible, ſo that the upper part ſhall not cool. This management prevents the file from warping. The half round file muſt be quenched in the ſame ſteady manner, but at the ſame time it is kept perpendicular to the ſurface of the water, it muſt be moved a little horizontally, in the direction of the round ſide, otherwiſe it will become crooked backwards.

When the files are hardened, they are bruſhed over with water and powdered cokes, when the ſurface becomes perfectly clean and metallic. They ought, alſo, to be waſhed well, in two or three clean waters, for the purpoſe of carrying off all the ſalt, which, if remaining, will be liable to ruſt the file. In addition to this, they ſhould be dipped into lime water, and rapidly dried before the fire, after being oiled, with olive oil, containing a little oil of turpentine, while ſtill warm, and they are deemed finiſhed.

File is alſo a thread of wire whereon writs or other exhibits in courts or offices are faſtened or filed, for the more ſafe keeping and ready turning to the ſame.

A file is a record of the court, and the filing of the proceſs of a court makes it a record of it. 1 Lil. 112.

File, or *Label*, in *Heraldry*, a bearing, ſometimes of more, and ſometimes of fewer points, being the difference or diſtinction of the eldeſt ſon.

It is ſometimes alſo borne as a charge in a coat armour, of which Gwillim gives many inſtances; but it is oftener the difference or mark of diſtinction which the elder brother bears in his coat during his father's life.

Some diſtinguiſh *file* and *label*, calling the file the upper horizontal line, and the label the points which iſſue from it.

File *of three*, or more labels. See Label.

File, in a *Military Senſe*, is a row of men ſtanding one behind another; as a rank, on the other hand, includes any number drawn up beſide each other: whether, in either reſpect, they be in cloſe or open order.

Or, file is a line or ſeries of ſoldiers, placed one before another, and thus compoſing the *depth* of a battalion; and it is thus diſtinguiſhed from the rank, which is a line of ſoldiers, drawn up ſide by ſide, forming the *length* of the battalion. A file is two or three deep; hence, a battalion or regiment drawn up conſiſts of two or three ranks, and of as many files as there are men in a rank. Files of cavalry are generally two deep. A file on horſe-back occupies in the ranks about two feet eight inches ; a file on foot occupies in the ranks twenty-two inches.

Cloſe files in cavalry are at the diſtance which was taken before diſmounting, when each man's boot-top touches, without preſſing, that of his neighbour.

Looſe files, in cavalry movements, are ſix inches diſtant from boot-top to boot-top, being calculated for the gallop as well as the walk of a ſquadron.

Open files, in cavalry, are the full breadth of a horſe from boot-top to boot-top. Recruits and horſes muſt be frequently exerciſed at this diſtance.

Flank file denotes the extreme file on the right or left of a ſquadron or troop, battalion or company, &c. *Forming* from file, is when the front file halts, and the reſt ride up at a very ſmart gallop, taking care to halt in time, and not to over-run the ground. If the formation is by doubling round the front file, (*e. g.* when a formation is made to the rear of the march, or to the right, when marched from the right) the files muſt double round as cloſely and expeditiouſly as poſſible. In all formings from file the leaders of ranks inſtantly cover each other, take the ordered front, and halt. The files which bind the right and left are called the flanks.

In the covering of files on horſeback, the ſame directions hold good as on foot. Beſides, it muſt be ſcrupulouſly obſerved, that every man's horſe ſtands exactly ſtraight to the ſame front as that of the man before him. Both in the horſe and foot drill the men ſhould be often practiſed in covering. The former are thus taught to place their horſes ſtraight under them.

Cloſe files of infantry are ſoldiers ſtanding in rank, contiguous to one another, upon any given depth of line or column. Whenever a regiment marches in front, every man ſhould feel his next man in whatever way he dreſſes; but he muſt not lean upon him, nor muſt he move his arms from his body to feel him : ſo that *arm cloſe* files mean merely that ſoldiers in the ranks ſhould lightly touch each other, without crowding or preſſing. *Open* files are ſoldiers ſtanding in rank at given diſtances without touching one another. The formation at open files is only practiſed as a preparatory drill for forming at cloſe files (which is the order for action) in order that every man may be taught to ſtand and move in a proper poſition, without getting a habit of leaning upon his neighbour. On this account every intelligent officer who has the management of recruits, will form them ſometimes at open files, and march in that order. Soldiers that have been regularly drilled ſhould likewiſe be occaſionally practiſed in advancing by open files. *Double* files are formed by the left files in each rank ſtepping to the rear of the right files. *Indian* files denote a line of men advancing or retreating from either of the flanks, from the centre, or from any proportion of a line in ſucceſſion to one another. They are ſometimes called "gooſe-files," a term vulgarly uſed among ſoldiers, and derived from a flock of geeſe, which generally follow a leader one by one We ſay, *cloſe* the files ; that is, bring the men nearer each other. *Double* the files; that is, double the depth of the battalion, and diminiſh its breadth or front by one half. The laſt or hindermoſt perſon is ſaid *to bring up the* file. To *file*, that is, to advance to, or from, any given point by files ; as to file to the front, to file to the rear, to file from the right or left flank, or to file from any given company. To *file off*, is to wheel from marching in a ſpacious front, and to march in length by files. See DEFILE.

FILE-*Leader* is the ſoldier placed in the front of any file, or the man who is to cover all thoſe that ſtand directly in the rear of him, and by whom they are to be guided in all their movements. File-leaders ſhould be very careful to preſerve their proper diſtances, from which ever hand they are to dreſs to, and the followers of each file muſt only be attentive to cover, and be regulated by their proper file-leaders. In file the rear rank invariably dreſſes by, and is regulated by the front rank.

FILE *marching on foot.* According to the printed regulations, all recruits muſt firſt face, and then be inſtructed to cover each other exactly in file, ſo that the head of the man immediately before may conceal the heads of all the others in front. The men ſhould move with the lock-ſtep. The front-rank men ſhould cover exactly, and the rear-rank men keep cloſe and dreſſed to the front rank. File-marching may be performed to the front, to the rear, and to either flank ; in all which caſes the men muſt be taught to cover well. When recruits are at drill, on the word *march*, all are to ſtep off together, gaining at the firſt ſtep thirty inches, and ſo continuing each ſtep, without increaſing the diſtance betwixt each recruit, every man locking or placing his advanced foot on the ground, before the ſpot whence the man who precedes him had taken up his. *Marching by ranks in front, open files*, is when any body of men advance by ranks at open order, and dreſs to ſome given object without touching one another. The flank-man of the flank to whom the ſoldiers dreſs, muſt be a non-commiſſioned officer, and he muſt take care that his head be kept quite ſtraight to the front, and his body erect, and that he advances without deviating in any the leaſt degree to the right or the left. In order to execute this eſſential part of the drill accurately, two perſons ſhould be preſent, one in the front, and the other on the flank, to obſerve the dreſſing. *Marching by ranks in front, cloſe files*, is when any number of men advance by ranks at cloſe order, and dreſs to ſome given object, each man lightly touching his next man, without crowding or preſſing. The march in front at cloſe files is much more eaſy than that at open files, becauſe every man feels his next man, which-ever way the rank dreſſes, and into whatever direction the rank or column moves.

FILELFO, FRANCIS, in *Biography*, a diſtinguiſhed Italian writer, was born at Tolentino in the year 1398. He ſtudied at Padua with ſo much ſucceſs, that he was invited to open a ſchool of eloquence at Venice in his 20th year. In 1420 he went to Athens, where, under the direction of John Chryſoloras, ſon of Manuel, he applied himſelf ſo vigorouſly to the ſtudy of the Greek language, as to be ſent ambaſſador to ſultan Amurath II., and alſo the emperor Sigiſmund. In this latter embaſſy he received an invitation from Ladiſlaus IV. king of Poland, to aſſiſt at his nuptials, and on that occaſion he recited an oration at Cracow, in the preſence of the emperor and princes. Returning to Conſtantinople, he occupied himſelf in literary concerns, and in 1427 he reviſited Venice on the expreſs invitation of many of the nobles. From Venice he removed, in 1428, to Bologna, where he was received with extraordinary honours, and appointed profeſſor of eloquence and moral philoſophy, with an ample ſtipend. Civil diſcord obliged him in a few months to quit Bologna, and from thence he went to Florence, where he ſoon collected four hundred ſcholars, and was admitted to the rank of citizen by a public decree. Here his life was ſometimes in danger from his enemies, among whom he reckoned the chief to be Coſmo de Medici. In 1435 he accepted of a profeſſorſhip at Sienna, where he was attacked by the ſame aſſaſſin from whoſe malice he had formerly eſcaped at Florence. The villain was detected, and puniſhed with the loſs of a hand. The reputation of Filelfo was now ſo high, that he was invited, at the ſame time, to the performance of important duties by the pope, the Greek emperor, the duke of Milan, and the univerſities of Perugia and Bologna. He accepted the latter, where he re-opened his ſchool for a few months only, when, repairing to the court of the duke of Milan, he was retained by him in his ſervice, and treated with great favour. The death of the duke, in 1447, deprived him of a powerful patron, but he was, after a conſiderable interval, received by the ſucceſſor to the dukedom, Francis Sforza, who aſſigned him an honourable ſtipend. He next went to Rome, where he experienced the liberality of pope Nicholas V. Proceeding to Capua, he was treated with extraordinary regard by Alphonſo king of Naples, who conferred upon him the honour of knighthood, allowed him the privilege of uſing the royal arms, and placed on his head the poetical crown of laurel. Upon his return to Milan, he learnt that his mother-in-law, the widow of Chryſoloras, and her two daughters, were made ſlaves in the capture of Conſtantinople by the Turks: at the earneſt requeſt of Filelfo the duke diſpatched two meſſengers to Conſtantinople, with a letter and an ode addreſſed to Mahomet II., who reſtored the female captives without a ranſom. At the ſame period Filelfo became reconciled to Coſmo de Medici, and ever after remained in friendſhip with that illuſtrious family. On the election of pope Pius II. in 1458, he ſettled a penſion on Filelfo, which being paid only one year, gave him an occaſion to declaim againſt the court of Rome and the pontiff, a liberty which was puniſhed with impriſonment. In 1469 he preſented pope Paul II. with his tranſlation of the Cyropædia, for which he received a preſent of four hundred ducats. This donation was handſome, and perhaps unexpected, and he felt it his duty to go to Rome and return thanks in perſon. In the courſe of his journey he was honourably received and treated at Florence, by Peter and Lorenzo de Medici. He continued to reſide at Milan till 1474, when he obtained leave, on the invitation of pope Sixtus IV., to become profeſſor of moral philoſophy at Rome. After this he removed three times to Milan, and back again to Rome, till at length, in the eighty-third year of his age, he accepted an invitation from Lorenzo de Medici to a Greek profeſſorſhip at Florence. In the performance of the duties of this office he died, in 1481, a very ſhort time after his arrival. He left behind many books, which conſiſt of orations, moral diſcourſes, poems, and familiar epiſtles, that afford much curious anecdote relative to the times. As a man of letters, he is more to be admired for his induſtry, and the great compaſs of his attainments, than for peculiar excellence in any one branch. Nevertheleſs he was a good hiſtorian, well ſkilled in claſſical learning, and a profound grammarian. Moreri.

FILER UN SON, *Fr.* in *Muſic*, implies the conduct of the voice in ſinging, in ſuch a manner as to be able to prolong, ſwell, or run rapid diviſions of many bars, without taking breath. The French verb *filer*, literally means to ſtring, thread, or wire-draw any ſubſtance: and, applied to the voice, it means almoſt every perfection of a great ſinger. Millico uſed to ſay that the voice, by practice, ſhould be rendered as ductile as wax when worked by the hand till it will receive any impreſſion. Rouſſeau ſays there are two ways of managing the voice which come under the term *filer les ſons:* the firſt is what we have been deſcribing; the ſecond, that of ſuſtaining a tone ſteadily, and perfectly in tune, in a long note, while the accompaniments are buſily employed. When the Gabrielli was here, during the time that the Agujari ſung at the Pantheon, after ſhe had finiſhed one of her bravura airs, with long and difficult diviſions, and ſuch high notes as had never been heard in England before, the Gabrielli ſaid to a gentleman in our hearing "mais meſſieurs, ce n'eſt pas filer les ſons;" one ſinger is never to praiſe another. Agujari was however a very great ſinger in a different ſtyle from that of the Gabrielli; who, when at her beſt, had very ſingular vocal abilities. We have juſt now recollected that Agujari was forgotten in the alphabetical order where ſhe ought to have had a niche, for which we beg pardon of her manes, and ſhall try to deſerve it, by doing her juſtice here.

LUCRETIA AGUJARI was a truly wonderful vocal performer. The lower part of her voice was full, round, of an excellent quality, and its compaſs, after ſhe quitted its natural regiſter, which it was to be wiſhed ſhe had never done, beyond any one we had then heard. She had two octaves of fair natural voice, from A on the fifth line in the baſe, to A on the ſixth line in the treble, and beyond that, in alt, ſhe had in early youth more than another octave; as Sacchini told me (ſays Burney), he had heard her go up to B♭ in altiſſimo. Her ſhake was open and perfect, her intonation true, her execution marked and rapid, and her ſtyle of ſinging, in the natural compaſs of her voice, grand and majeſtic; though the pathetic and tender were not what her manner or figure promiſed, yet ſhe had expreſſions ſometimes that were truly touching, and ſhe would have been as capable of exciting univerſal pleaſure, as admiration, if ſhe had been a little leſs violent in the delivery of her paſſages, and her looks had been more tempered by female ſoftneſs and timidity. She ſung hardly any other muſic while ſhe was here than her huſband's, Signor Colla, which, though often good, was not of that original and varied caſt which could ſupply the place of every other maſter, ancient and modern.

At this time there was no male ſinger in England with irreſiſtible attractions: Rauzzini indeed was here, who more frequently pleaſed than ſurprized his audience; but it was during this period that the proprietors of the Pantheon ventured to engage the Agujari at the enormous ſalary of 100*l.* a night, for ſinging two ſongs only! And yet, however exorbitant the demand, or imprudent the compliance with it may ſeem, the managers of this moſt elegant and ſuperb building, which would have done honour to Greece at its moſt ſplendid period of taſte and magnificence, have, ſince that period, by going a more economical way to work, involved the proprietors in diſgrace and ruin. Indeed, in ſubſequent undertakings, previous to the fatal deſtruction of the building by fire, they have more frequently had money to pay than receive; for, notwithſtanding ſo much was diſburſed to the Agujari, much was likewiſe cleared, and the dividend was more conſiderable than it has ever been ſince that memorable era. The admirable Agujari, as Sacchini told us, was in her youth called "la Baſtardella;" and being lame it was ſaid, that, as ſoon as born, ſhe had been abandoned on a dunghill by an unnatural mother, where a pig was beginning to devour her, when ſhe was unexpectedly diſcovered, and humanely protected, adopted, and ſo well educated in muſic, as to become the wonder of her age and country. This admirable ſinger died at Parma in 1783.

FILEY, in *Geography*, a ſmall fiſhing town of England, on the E. coaſt of the county of York, in a bay on the German ſea, to which it gives name; near it is a ledge of rocks, called "Filey Brigg." In 1801 the inhabitants were 505.

FILIAL, ſomething belonging to the relation of a ſon, *filius.*

The divines uſually diſtinguiſh between a ſervile and a filial fear. The moſt abandoned have a ſervile fear of God, ſuch as that of a ſlave to his maſter; but not a filial fear, *i. e.* a fear reſulting from love and reſpect.

Filial *Portion.* See Custom *of London.*

FILICAIA, Vincenzo da, in *Biography*, an elegant Italian poet, was born at Florence in 1642. He ſtudied and took his degrees at the univerſity of Piſa. He married at the age of thirty-one: he was fond of retirement, occupying himſelf in poetical compoſition, and in the duties of domeſtic life. He was firſt brought to public notice by his fine canzoni compoſed on the raiſing of the ſiege of Vienna. For this he received the moſt flattering and complimentary letters from ſeveral crowned heads; from the emperor Leopold, the king of Poland, the duke of Lorrain, and the queen of Sweden. By the latter he was adopted into her own academy, and ſhe took upon herſelf the charge of maintaining his children; at the ſame time commanding him to conceal her bounty, as being inadequate to the merits of ſo great a man. He was created a ſenator by the grand-duke, and employed in ſome important duties by that prince, which he performed with ſo much credit, as to gain the eſteem of the prince, and affection of the people. He died univerſally lamented at Florence, in the year 1707, at the age of ſixty-five. "He was," ſays his biographer, "one of the principal ornaments of modern Italian poetry, diſplaying, as well in his canzoni as his ſonnets, great ſublimity, animation and dignity, and ſcarcely ſurpaſſed by any in vigour of ſentiment and energy of ſtyle. He alſo wrote Latin verſe with elegance, and ſome of his orations and epiſtles are inſerted in the "Proſe Fiorentine." He was member of the academies of La Cruſca, and the Arcadi. His ſon Scipio gave a compleat edition of his Italian poems, under the title of "Poeſie Toſcane di Vincenzo da Filicaia, Senatore Fiorentino," 1707, 4to." Moreri.

FILICES, in *Botany*, Ferns, a very diſtinct and natural order of the claſs *Cryptogamia* of Linnæus. The name is ſuppoſed to be derived from *filum*, a thread, in alluſion to the ſlender ſegments, or rather ſtalks, of theſe plants, whence alſo they are termed capillary plants, and ſome of them have the name of Maiden-hair. They conſtitute the fifth natural order in the firſt claſs of the ſyſtem of Juſſieu, and the firſt order of the twenty-fourth claſs of the Linnæan artificial ſyſtem.

Their herbage is a frond, or leaf bearing fructification, rarely arboreſcent, involute when young, the ſtalk more or leſs ſcaly; the root perennial, and generally very long-lived. *Fructification* moſt commonly on the back of the leaf; ſometimes at the edge; ſometimes, (by a tranſformation, as it were, of a leaf or its lobes,) ſpiked and terminal, or ſolitary and axillary. *Capſules* uſually of two valves and one cell, moſtly ſtalked, and bound with a contrary elaſtic ring; ſometimes ſeſſile and aggregate; very rarely of many cells. *Seeds* extremely minute and copious.

The flowers of ferns are as yet altogether unknown, except what Hedwig has deſcribed in *Equiſetum*; ſee that article. The ſame admirable inveſtigator thought he diſcovered anthers diſperſed about the rib of the leaf in ſome common ferns, and piſtils under the cover of their young fruit, ſee his *Theoria Generationis et Fructificationis Plantarum Cryptogamicarum*, 43, &c. t. 5, 6, 7; but others have not aſſented to this theory. Bernhardi has ſuggeſted another, equally hypothetical, that impregnation is performed on the upper ſide of the leaf, the pollen being ſecreted by ſmall membranous anthers ſituated near the margin, and the ſtigmas placed directly over the point of attachment of each dot or maſs of capſules. See Sims and Konig's Annals of Botany, v. 1. [illegible]07; but this is not better ſupported by facts than the doctrine of Hedwig. Some have imagined the ring which embraces the capſule in moſt dorſiferous ferns, might perform the office of an anther; but ſuch a theory will not account for the impregnation in genera where no ſuch part is to be found.

The ſeeds of ferns, independent of poetic fancies, were early known to naturaliſts. Giſeke points out a paſſage in Cordus, denying them ſeeds indeed, but aſſerting that all ferns are propagated by the duſt at the back of their leaves. Moriſon tells us he raiſed from ſeed the Harts-tongue and the Oſmund-royal; ſee his Hiſtoria, v. 3. 555 and 593. Microſcopic obſervers, about the ſame time, readily aſcertained the ſtructure of the capſules, and appearance of the ſeeds. Ehrhart obſerved the germination of *Aſpidium ſpinuloſum*; and Mr. Lindſay of Jamaica raiſed many ferns of that iſland from ſeed, as recorded in the Tranſactions of the Linn. Soc. v. 2. 93, carefully attending to, and delineating the progreſs of their growth. Mr. Fox of Norwich firſt raiſed a *Lycopodium* from ſeed; ſee Tr. of L. Soc. v. 3. 314. Similar experiments have been repeated by various other perſons, and in hot-houſes, where the larger kinds of *filices* are cultivated, young ſeedlings, of a ſcaly pellucid appearance, like an infant *Marchantia*, may often be ſeen ſcattered over the moiſt earth, or rotten bark. Sprengel well obſerves, in his letters on Cryptogamous plants, tranſlated by Mr. Konig, and publiſhed at London in 1807, that the cotyledons of theſe plants are not always ſimple, and this raiſes another difficulty reſpecting a natural claſſification by thoſe parts. See Cotyledones and Dicotyledones.

The poſſible increaſe of ferns, if we conſider the abundance of their ſeeds, is beyond computation. A ſingle leaf will often bear one hundred millions of ſeeds. Yet we have no reaſon to think the countleſs numbers, that turn to no account as to propagating the ſpecies, afford food for animalcula of any kind, or ſerve any other ſecondary purpoſe.

Beſides the ſeminal mode of increaſe, a few ferns produce *gemmæ*, or buds, on their ſtalks or leaves, as *Woodwardia radicans*; and ſome take root at their points, as *Aſplenium rhizophyllum*.

To the botanical arrangement of ferns, much attention has been paid of late years, and with conſiderable ſucceſs. The ſyſtematic writers of the 17th century touched this ſubject but ſlightly. Ray, in his Methodus Plantarum diſtinguiſhes the ſpiked from the dorſiferous ferns, and propoſes to divide the latter according to the ſituation of the ſeeds on the edge or middle of the leaf, and according to the round or linear ſhape of the maſſes which thoſe ſeeds compoſe. He then diſtinguiſhes them further into larger and ſmaller, owning, at the ſame time that he was not well ſatisfied with ſuch a principle of arrangement; and finally ſubdivides them into ſuch as have ſimple leaves, and ſuch as have them ſimply, doubly, or triply pinnate. What concerns the ſituation of the ſeeds, or capſules, in this ſyſtem is excellent, and is juſtly claimed by Ray as original. It forms, indeed, the baſis of the Linnæan arrangement hereafter mentioned. But the ſhape or ſtructure of the frond leads to no true generic diſtinctions, and yet Ray, loſing ſight of his original principles, diſtributes ferns according to theſe faulty ones, ſcarcely obſerving how inconſiſtent they are, and retaining old names, without attempting to new-model them, or the genera which they had hitherto ſo imperfectly deſigned.

Tournefort, ſo ſtudious of the genera of plants, attempted to diſtribute ferns according to the forms of their fronds, but even this he performed in a moſt ſuperficial and imperfect way. His genus *Filix* indeed is tolerably characterized, after his principles, as having a pinnate leaf, and pinnatifid leaflets; his *Lonchitis* has auricled leaflets; and his *Trichomanes* "generally roundiſh ones;" while his

Polypodium has a ſimple pinnatifid leaf. But his *Ruta muraria* is ſtrangely defined "with leaves ſomewhat reſembling garden rue;" his *Filicula* "with leaves ſomewhat reſembling thoſe of *Filix*;" and his *Adiantum* "with leaves known from other plants by their peculiar appearance," without indicating what that appearance is. Such a looſe mode of definition indicates a truly barbarous ſtate of ſcience. He paid no attention to the ſituation of the fructification in theſe plants. Plumier, a very famous collector and delineator of the ſpecies of ferns, followed his countryman Tournefort implicitly in their generic arrangement, if it deſerves to be ſo called, nor were any improvements in this line attempted till the time of Linnæus.

The ſyſtem of the learned Swede would of courſe have been imperfect, had he not undertaken to characterize all the genera, even of his claſs *Cryptogamia*, as much as poſſible by their parts of fructification alone, as far as ſuch could be detected. Unfortunately, however, not only the eſſential organs of impregnation of ferns were then, as they ſtill are, undiſcovered, and the acceſſory parts of their flowers nearly as obſcure; while the ſtructure of the fruit in dorſiferous ferns was ſo much the ſame, in all known to Linnæus, that it was uſeleſs for the purpoſes of generic diſtinction. He was therefore obliged to have recourſe to other principles, which, in the arrangement of plants with evident flowers and variouſly-formed fruits, he had rejected as unphiloſophical; theſe were deduced from the ſituation of the fructifications, and their aggregate figure, according to the ſcheme indicated by Ray, but firſt carried into execution by Linnæus.

Thus ſix genera appear diſcriminated in the firſt edition of his *Genera Plantarum.*

Pteris. Fructifications diſpoſed in a line, running along the margin of the leaf on its under ſide.

Lonchitis. Fructif. in little creſcent-ſhaped lines, under the ſinuſes of the leaf.

Adiantum. Fructif. in oval ſpots, collected under the reflexed ſummits of the leaves.

Aſplenium. Fructif. in ſtraight lines, arranged on the under ſide of the leaf.

Polypodium. Fructif. in roundiſh ſpots, or dots, diſperſed over the back of the leaf.

Acroſtichum. Fructif. accumulated into one maſs, entirely covering the back of the leaf.

In the ſecond edition of the ſame work two other genera are added.

Hemionitis. Fructif. in lines running into or interſecting each other, or branched.

Trichomanes. Calyx turbinated, ſolitary, erect, from the margin of the leaf itſelf. Style briſtle-ſhaped, terminating the capſule.—This laſt definition is incorrect in terms, there being no authority for the uſe of the words ſtyle and capſule in this caſe, and the former being indeed merely a column, or elongated receptacle, to whoſe lower part ſeveral capſules are indeed attached, but whoſe ſummit we are not warranted, by any analogy, to ſuppoſe a ſtyle, however appearances may be in favour of ſuch a ſuppoſition.

In the 5th edition of Gen. Pl. a ninth genus is added, while the arrangement of the former is a little altered.

Blechnum. Fructif. diſpoſed in lines, parallel with, and near to, the rib of the leaf.

Nothing new on this ſubject occurs in the 6th edition of the ſame work, the laſt to which its author himſelf lent any aſſiſtance, nor did he leave any thing relative to it in manuſcript.

Schreber, in his edition of the Gen. Pl. had added three new genera, *Marattia* of Swartz, *Cænopteris* of Bergius, and *Meniſcium* one of his own.

It is proper to notice what has been done by ſome contemporaries of Linnæus towards obtaining ſatisfactory generic characters of *filices.*

Adanſon, in his Familles des Plantes, publiſhed at Paris in 1763, has noticed the membranous involucrum which covers the fructification of moſt ferns; as has Gleditſch in his Syſtema Plantarum, publiſhed at Berlin in 1764; but they have detected this part in very few genera, and have erred in ſeveral of their remarks concerning it. Thus in the common brake, *Pteris* of Linnæus (*Thelypteris* of Adanſon, *Cincinalis* of Gleditſch) whoſe involucrum is manifeſt to the moſt careleſs obſerver, the former properly deſcribes that part as of one valve, in the ſhape of a penthouſe, while Gleditſch abſolutely denies its exiſtence. They both juſtly obſerve that the involucrum of *Aſplenium Scolopendrium* of Linnæus conſiſts of two valves, but do not ſay a word of its form in *Blechnum*, *Hemionitis*, or *Lonchitis.* "They have totally deranged the Linnæan genera, but being ignorant of any true principles, have made every thing worſe than they found it; and as to nomenclature, they have gone counter to every maxim and all ſorts of authority. Both theſe writers have obſerved the elaſtic ring, which binds together the capſular valves of ferns, but they have alike both equally erred, in denying the exiſtence of any ſuch part in *Polypodium vulgare.*" It appears that both theſe authors, who profeſs great originality, are not original even in this error, for the ſlighteſt inſpection of this very common fern would have prevented it, none having a more evident ring; they therefore could only have adopted it from Tournefort, whom they do not quote, but who in his figure and deſcription has fallen into this unaccountable miſtake. Scopoli in his Flora Carniolica has made uſe of the remarks of Adanſon and Gleditſch, without correcting the above faulty particulars, which he adopts on their authority, though ſo very eaſy to be aſcertained or refuted. Haller and moſt other writers have made uſe of the Linnæan characters, with ſome occaſional variations of no great moment, either with reſpect to nomenclature, or the diſpoſition of the ſpecies.

Indeed thoſe who were converſant with European ferns, or a few well-known exotic ones, only, would ſcarcely find any neceſſity of looking further than the Linnæan generic diſtinctions. But the writer of the preſent article was indiſpenſably led to conſider the ſubject with attention, in conſequence of the vaſt collection of unſettled ferns of which he became poſſeſſed in the Linnæan herbarium, and which were ſubſequently much increaſed by the unbounded liberality of his friend ſir Joſeph Banks. Many of theſe could not be reduced to any known genus, and others, though by their technical characters poſſibly referable to ſome, were yet ſo novel in habit as to require to be kept generically ſeparate. Many of theſe novelties were ſent to the celebrated Hedwig in 1786, in hopes of his aſſiſtance; but nothing has tranſpired from him reſpecting any generic reformations, though he or his ſon have ſince publiſhed a few of the ſpecies.

The reſult of a general review of all the known as well as nondeſcript ferns that could be got together, was a Latin eſſay, communicated to the Royal Academy at Turin, and printed in the fifth volume of their Memoires in 1793, under the title of *Tentamen botanicum de filicum generibus dorſiferarum, auctore J. E. Smith.* In this the involucrum, or membranous cover of the maſſes of capſules, was firſt brought into uſe for generic diſcrimination, and particularly the direction in which it opens, whether outwards,

wards, that is, towards the margin or extremity of the frond, or inwards, towards the rib, nerve, or baſe, of the frond or its ſegment. This eaſy principle is found to lead to the moſt natural and diſtinct genera, without any exception. It does not overturn nor change one of thoſe eſtabliſhed by Linnæus, but more clearly defines them, while it affords means of aſcertaining new ones. The part in queſtion is found in almoſt every fern, covering the fructification before the latter comes to maturity. It originates ſometimes from the margin of the leaf, but more commonly from ſome nerve or vein, in which laſt caſe it is either lateral and parallel, or terminal and vertical. The involucrum adheres firmly to the frond on one ſide, whence its nouriſhment while growing is derived, and on the other is more or leſs cloſely preſſed to, or ſunk into a cavity in, its ſurface, without being really united with its cuticle, at leaſt as far as can be obſerved. Not but that even on this ſide alſo the air is altogether excluded, ſo that in whatever mode the impregnation of the germens is accompliſhed, that operation muſt go on in ſecret under this covering, without any external communication, except through the ſtalks by which the capſules themſelves are attached, as the theory of Bernhardi ſuppoſes; while Hedwig's implies an occaſional elevation of the margin of the young involucrum, which we can find no reaſon to believe. When indeed the ſeed-veſſels and ſeeds are arrived at maturity, the neighbouring parts, and eſpecially the involucrum, dry up, the latter ſeparating at the edge, and becoming criſped or reflexed, to allow of the diſcharge of the ſeeds.

In the Eſſay in queſtion the Linnæan genera of dorſiferous ferns were thus diſtinguiſhed by characters taken from the involucrum, in addition to thoſe by which they were previouſly known.

Acroſtichum. Involucrum none, except little ſcales, or hairs, interſperſed among the capſules.

Polypodium. Invol. umbilicated, ſeparating nearly all round.—Such ſpecies as have no involucrum were ſtill retained here for further examination, they being then ſuppoſed very few.

Aſplenium. Invol. originating laterally from a vein, and ſeparating inwards;—that is, towards the nerve or rib.

Hemionitis. Invol. in pairs, originating from the vein (which runs between the lines of capſules) and each ſeparating outwards.

Blechnum. Invol. originating from the ſurface, continued, ſeparating towards the nerve.

Pteris. Invol. from the inflexed margin of the frond, uninterrupted, ſeparating on the inner ſide.

Lonchitis. Invol. from the inflexed margin of the frond at each ſinus, in pairs, creſcent-ſhaped.

Adiantum. Invol. like ſcales, from the inflexed margin of the frond, diſtinct, ſeparating inwards.

Trichomanes. Invol. marginal, urn-ſhaped, undivided, opening outwards, ſhorter than the column bearing the capſules.

To theſe the following new genera were added.

Darea, diſtinguiſhed from *Aſplenium* by the involucrum ſeparating outwardly, or towards the margin of the leaf.

Scolopendrium, diſtinguiſhed from *Hemionitis* by its double involucrum ſeparating inwards, the valves folding over each other.

Woodwardia, differing from *Blechnum* in having ſeparate, ſhort, or interrupted, vaulted involucrums.

Lindſæa, publiſhed by Mr. Dryander in Tr. of Linn. Soc. v. 3, differing from *Pteris* in its continued nearly marginal involucrum ſeparating outwards.

Vittaria, having a double involucrum covering its long line of capſules, one valve from the margin, turned in, the other from the ſurface, ſeparating outwards; its character combining thoſe of *Pteris* and *Lindſæa*.

Davallia, having a ſmall ſcale-like involucrum to each round maſs of capſules, terminating a vein or nerve, near the margin, or ſeparating outwards.

Dickſonia of L'Heritier, having a double involucrum to each round maſs of capſules, one from the ſurface, ſeparating outwards, the other from the inflexed margin of the frond, embracing the former, and ſeparating inwards.

Cyathea, bearing its capſules in ſcattered hemiſpherical cups opening at the top without any lid.

Hymenophyllum, having an involucrum of two flattiſh ſtraight valves at the edge of the leaf, opening outwards, longer than the column to which the capſules are attached.

Schizæa, having a double uninterrupted involucrum, formed of the inflexed edges of each linear appendage to the fronds, which bears the fructification.

All theſe genera have, or at leaſt were ſuppoſed to have, a ring embracing each capſule; but it has ſince been obſerved that in ſome, as *Schizæa*, there is only an appearance of ſuch a ring, as will be mentioned hereafter. Another ſection was ſubjoined, conſiſting of three genera unknown to Linnæus, whoſe capſules are not only decidedly deſtitute of a ring, but remarkably different in appearance and ſtructure from the former, being ſeſſile, naked, opening by pores. Theſe the author termed *thecatæ*, as the former are *annulatæ*.

Gleichenia. Capſules with three cells and three valves; partitions originating from the middle of each valve.

Marattia of Swartz's Prodromus. Fl. Ind. Occ. Capſules oval, burſting longitudinally on their upper ſide, with ſeveral cells in each diviſion.

Danæa. Capſules of one cell, opening by a pore at their ſummit, and accumulated together in two parallel rows.

See in their proper places CYATHÆA, DANÆA, DAREA, DAVALLIA, and DICKSONIA.

This eſſay being reprinted in Germany, called the attention of the learned cryptogamic botaniſts of that country to the ſubject. Hence various treatiſes on the genera and ſpecies of ferns have appeared in different periodical publications, from the pens of Bernhardi, Willdenow, Mohr, and others. It was alſo publiſhed in Engliſh in 1798, in a volume of Tracts by the author.

Several new obſervations were made, and miſtakes corrected, by the writers juſt named. Mohr obſerved that the capſule of ſome ferns is only corrugated, ſo as to reſemble a ring, but not really furniſhed with one, as in *Schizæa*. The ſame diſcovery was long ago made, but never publiſhed, by Mr. R. Brown. *Onoclea*, hitherto thought deſtitute of a ring, was proved to have one, and to be a true dorſiferous fern. Several new genera were defined, but not in every caſe juſtly. Thus, the *Sphæropteris* of Bernhardi is preciſely a *Cyathea*, he having conceived a wrong idea of the latter genus, from ſome of the European leſs certain ſpecies. His *Wibelia* is a *Davallia*, and his *Ripidium* a *Schizæa*. The good genera eſtabliſhed by this and other writers will be mentioned hereafter.

At length the whole that had been done was reviſed and improved by the able Dr. Swartz, profeſſor of botany at Stockholm, who publiſhed, in Schrader's Journal at Gottingen in 1800, the Genera and Species of Ferns arranged in ſyſtematic order, which work appeared in a ſtill more perfect form, with a preface, deſcriptions of new or rare ſpecies, and ſeveral figures at Kiel in 1806, under the title of Synopſis Filicum. The family of *Lycopodium* and its allies are ſubjoined, as a diſtinct natural order; a diſtinction to which we cannot aſſent.

We ſhall enumerate the genera of ferns according to Dr. Swartz's work.

Section I. Ferns whoſe capſules are ſurrounded with an elaſtic ring; called by him *Filices Gyratæ*.

* Involucrum none.

1. *Acroſtichum*. Capſules forming an indeterminate ſpot or aſſemblage, over the back of the leaf.

2. *Meniſcium*. Schreb. Gen. 757. (Polypodium reticulatum; Linn.) Spots creſcent-ſhaped, nearly parallel, between the veins of the leaf.

3. *Hemionitis*. Spots linear, forked and reticulated. Dr. Swartz ſeparates from this genus ſuch ſpecies as have an involucrum, by the name of *Diplazium*

4. *Grammitis*. Spots linear, ſtraight, ſcattered.

5. *Tænitis*. Spots linear, longitudinal, continued, ſolitary between the rib and margin on each ſide, parallel.

6. *Polypodium*. Spots roundiſh, ſcattered.

** Spots veiled with an involucrum.

7. *Aſpidium*. Spots roundiſh, ſcattered, covered with an umbilicated, more or leſs circular, involucrum.

This conſiſts of the vaſt tribe of Linnæan ſpecies of *Polypodium*, which differ from the *vulgare* and a few others in having an involucrum, and of which we have already ſpoken. It is by far the largeſt and moſt troubleſome genus of the whole order.

8. *Aſplenium*. Spots linear, ſtraight, ſcattered. Involucrum lateral, ſeparating inwards.

9. *Darea*. (Called by Swartz *Cænopteris*, after Bergius.) Spots linear, near the margin. Involucrum lateral, ſeparating outwards.

10. *Scolopendrium*. Spots linear, in pairs, ſcattered. Involucrum of two oppoſite ſuperficial valves, folding over each other.

11. *Diplazium*. (Hemionitis; Smith.) Spots linear, ſcattered, in pairs, ſimple or branched, at each ſide of a vein. Involucrum of two valves, originating from the vein, ſeparating outwards.

12. *Lonchitis*. Spots creſcent-ſhaped, at the ſinuſes of the leaf. Involucrum from the inflexed margin of the leaf, ſeparating inwards.

13. *Pteris*. Spots linear, continued, marginal. Involucrum from the inflexed margin of the leaf, uninterrupted, ſeparating inwards.

14. *Vittaria*. Spots linear, continued, longitudinal along the diſk or near the edge of the leaf. Involucrum double, uninterrupted; one ſeparating outwards, the other inwards.

15. *Onoclea*. Spots indeterminate, entirely covering the backs of ſome leaves. Involucrum from the membranous, revolute margin of the leaf, either continued or interrupted, ſeparating inwards.

16. *Blechnum*. Spots linear, longitudinal, continued, parallel, one on each ſide of the rib. Involucrum ſuperficial, continued, ſeparating inwards.

17. *Woodwardia*. Spots oblong, diſtinct, lying near the rib. *Involucrums* ſuperficial, vaulted, ſeparating inwards.

The term ſuperficial involucrum, *involucrum ſuperficiarium*, expreſſes one that originates from the ſurface, not from the margin nor rib.

18. *Lindſæa*. Spots linear, continued, near the margin. Involucrum ſuperficial, continued, ſeparating outwards.

19. *Adiantum*. Spots roundiſh or linear, diſtinct, marginal, growing upon the inner ſide of the membranous involucrums, which are formed out of the reflexed edge of the leaf, and ſeparate inwards.

20. *Cheilanthes*. Spots roundiſh, diſtinct, marginal, each covered with a diſtinct membranous involucrum, formed of the reflexed crenate edge of the leaf, and ſeparating inwards.

This genus, eſtabliſhed by Dr. Swartz, and named from Χειλος, the *brim* or *margin*, and ανϑος, *a flower*, comprehends 12 ſpecies in his work, ſome of which had previouſly been referred to *Adiantum*, others to *Pteris*, and ſome even to *Polypodium*; which diverſity of opinion among authors affords a ſtrong preſumption of their not agreeing well with any known genus, and conſequently of the neceſſity of founding a new one to receive them. Accordingly the above character ſufficiently diſtinguiſhes them from *Adiantum*, the only genus with which they could, in the preſent ſtate of the ſcience, be confounded, by the fructification being ſeated on the leaf itſelf, and not on the ſcales which form the involucrum.—*Polypodium fragrans*, Linn. Mant. 307; and a diſtinct ſpecies ſo called by Deſfontaines, Fl. Atlant. t. 257; alſo *Adiantum capenſe* of Thunberg, are, according to Swartz, ſpecies of *Cheilanthes*.

21. *Davallia*. Spots roundiſh, ſeparate, near the margin. Involucrum ſuperficial, ſcale-like, diſtinct, terminating a vein, and ſeparating outwards.

22. *Dickſonia*. Spots roundiſh, ſeparate, marginal. Involucrum double; one ſuperficial, ſeparating outwards, the other from the inflexed margin of the frond, ſeparating inwards.

23. *Cyathea*. Spots roundiſh, ſcattered. Receptacle of the capſules central, within a cup-ſhaped involucrum, opening at the top.

The proper character of this genus conſiſts in the involucrum going under the inſertion of the capſules, either in the form of a membranous undivided cup, as in *C. arborea*; (*Polypodium arboreum*; Linn.) and ſeveral others; or of a ſimilar cup compoſed of numerous ſcales, as in *C. horrida*; (*Polypodium horridum*; Linn.). Whether ſome European ſpecies, as *C. fragilis* Fl. Brit., whoſe involucrum is a membrane enfolding the capſules while young, properly belong to the ſame, botaniſts are not agreed, nor have ſome who have decided on this ſubject been furniſhed with proper materials for the purpoſe.

24. *Trichomanes*. Spots marginal, prominent. Receptacle of the capſules briſtle-ſhaped, longer than the undivided, pitcher-ſhaped, direct involucrum.

25. *Hymenophyllum*. Spots marginal, prominent. Receptacle of the capſules briſtle-ſhaped, ſhorter than the two-valved, direct involucrum.

Section 2. Capſules of one cell, deſtitute of a diſtinct ring, opening by a longitudinal fiſſure on one ſide.—Theſe are called by Swartz *Filices ſpuriè gyratæ*, becauſe they have a wrinkled capſule, imitating the ring in the former ſection; or *rimatæ*, alluding to the fiſſure by which the ſaid capſule diſcharges its ſeeds.

26. *Schizæa*. Capſules crowded, ſeſſile, on the backs of ſeveral appendages to the leaf. Involucrum from the inflexed margin of each appendage, uninterrupted.

27. *Lygodium*. Capſules ſolitary, ſeſſile, within the imbricated two-ranked ſcales, of terminal or lateral ſpiked appendages to the leaf.

The name, derived from λυγος a *twig* or *wand*, alludes to the ſlender flexible habit. This elegant genus, which comprizes the *Ophiogloſſum ſcandens* and *flexuoſum* of Linnæus, has been indicated by ſeveral writers. Willdenow has named it *Hydrogloſſum*; Cavanilles *Ugena*; and Mirbel *Ramondia*. None can be more diſtinct.

28. *Mohria.* Capſules ſeparate, ſeſſile, at the edge of the leaf. Involucrums from the inflexed crenate margin.

A genus founded by Swartz in honour of his able cryptogamic friend *Mohr*, upon the *Polypodium caffrorum* Linn. by ſome referred improperly to *Oſmunda*.

29. *Anemia.* Capſules crowded, ſeſſile, naked, on the branches of a compound ſpike.

This genus is ſeparated by Swartz from the following, chiefly becauſe its capſules are ſeſſile on a branched receptacle, not ſtalked and ſituated on the back of a leaf, neither are they ſo much divided into two valves. The difference is rather difficult to define, but may be founded in nature. Both genera are quite deſtitute of all involucrum.—The preſent conſiſts of 17 ſpecies, amongſt which are *Oſmunda phyllitidis, hirta, hirſuta, adiantifolia, bipinnata, verticillata* and *filiculifolia* of Linnæus, all fine Weſt Indian ferns figured in Plumier.

30. *Oſmunda.* Capſules crowded, ſtalked, naked, on the metamorphoſed leaflets of the frond.

31. *Todea* of Willdenow. Capſules nearly ſeſſile, on the tranſverſe, almoſt parallel, veins of the leaf, naked.—The only ſpecies is *T. africana.* (*Acroſtichum barbarum* Linn.)

32. *Mertenſia* of Willdenow. Capſules ſeſſile, in roundiſh, ſuperficial, ſcattered, naked ſpots.

Conſiſts of ſeven ſpecies, one of which, *M. furcata*, is *Acroſtichum furcatum* Linn. figured in Plumier, t. 28. This genus is ſcarcely diſtinct from the following.

33. *Gleichenia* of Smith. Capſules three or four together, ſeſſile in a little hemiſpherical depreſſion of the leaf.

It appears from this character that Swartz conſiders as ſeparate capſules, what the author took for cells of one capſule, and analogy confirms the opinion of the former.

34. *Angiopteris* of Hoffman. Capſules ſeſſile, naked, placed in a double ſeries, in little parallel neighbouring ſpots, all together forming a longitudinal line near the margin.

The only ſpecies is *A. evecta*, a moſt elegant large fern, found in the South ſea and Philippine iſlands.

Section 3. Capſules deſtitute of all traces of a ring.

* Capſules of many cells.

35. *Marattia* of Swartz. Capſules oval, ſcattered, at firſt cloſed, then ſeparating into two parts, and diſcloſing two rows of cells, opening at the top.

36. *Danæa* of Smith. Capſules oblong-linear, tranſverſe, parallel, immerſed in the frond, with two rows of cells, opening at the top.

* Capſules of one cell, with two valves.

37. *Botrychium* of Swartz. Capſules diſtinct, ſeſſile, crowded into a cluſter, burſting tranſverſely. Separated by Swartz from *Oſmunda*, and containing our *O. lunaria*, &c.

38. *Ophiogloſſum.* Capſules united into a two-ranked, ſomewhat jointed ſpike, burſting tranſverſely.

The *Lycopodineæ* of Dr. Swartz we conſider as no leſs genuine *filices* than the foregoing. They have an herbaceous, or ſhrubby, leafy ſtem, with axillary fructifications, and may be defined as follows.

Section 4. Capſules axillary, naked, of one, two, or three cells.

39. *Lycopodium.* Capſules of one cell.

This is a large and beautiful genus, comprehended amongſt Moſſes by Dillenius and Linnæus, from which its fruit totally differs. Nothing is known reſpecting the flower or impregnation.

40. *Tmeſipteris* of Bernhardi. Capſules of two cells, with a tranſverſe ſtructure.

T. tannenſis, a New Holland plant, is the only known ſpecies.

41. *Pſilotum* of Swartz. Capſules of three lobes and three cells.

Conſiſts of *Lycopodium nudum* of Linn. and one more ſpecies. They have leaves, though ſmall ones, analogous to thoſe of *Lycopodium*, and the capſules are really axillary.

Cavanilles, in his Lectures on Botany in Spaniſh, publiſhed in 2 vols. 8vo. at Madrid in 1802, has adopted the ſame principles of arrangement, candidly acknowledging whence he has derived them, and deſcribing many new ferns from the Eaſt and Weſt Indies. Swartz refers to this work, which is the more neceſſary, as their generic names often differ.

One of the lateſt writers on the ſubject is Profeſſor Sprengel of Halle, who in his Letters on the Study of Cryptogamous Plants, already mentioned, treats copiouſly of ferns, both phyſiologically and ſyſtematically. The author does not ſeem to be aware of the perſon to whom he is obliged for his leading principles and generic characters, having apparently never ſeen the above-mentioned Eſſay, though he properly mentions "the excellent Swartz," whoſe treatiſe, as it ſtands in Schrader, he might very well take to be original; neither has the tranſlator corrected this omiſſion, which we are well aſſured is an accidental, not deſigned, injuſtice.

Sprengel eſtabliſhes the following genus upon the European *Cyatheæ*.

Athyrium. Capſules in ſmall, ſcattered, round ſpots, on the whole lower ſurface of the frond. Involucrum fixed on one, moſtly the inner, ſide, and commonly opening towards the margin.

This definition is not ſufficient to give a clear idea of the ſuppoſed genus, which, as far as concerns the ſpecies that we have all along referred to *Cyathea*, ought to be characterized as having a lacerated involucrum, enfolding the maſs of capſules, and inſerted beneath them. The reformers of *Cyathea* have not had acceſs to the whole ſeries of ſpecies which appear to us to connect theſe with the primary ones.

But however this may be, we are perſuaded ſeveral of Sprengel's *Athyria* belong rather to other genera, from whence he has removed them.

We cannot take leave of Profeſſor Sprengel's work, which is full of excellent compiled matter, without guarding our readers againſt a poſition in his 6th letter, p. 73. "The only character," ſays he, "that can be derived from the ſhape of the fruit, in the claſſification of ferns, is the preſence or want of the *annulated ring* of the ſeed-veſſels. From this therefore they may be divided," (he ought rather to have ſaid they *have been* divided), into *annulatæ*, with a ring, and *exannulatæ*, without a ring: but this is an artificial, not a natural character; for the genus *Onoclea*, whoſe ſeed-veſſels are annulated, approaches very near to *Oſmunda*, whoſe capſules are without a ring; and *Polypodium* is cloſely related to *Marattia*, *Pteris* to *Angiopteris*, *Aſplenium* to *Danæa*." This is ſo extraordinary an aſſertion, as to ſhake our confidence in the author's judgment and obſervation to the very foundations. No ferns, no plants of one natural order, are more diſtinct, unlike, and eſſentially different from each other than theſe, inſomuch that we cannot account for, nor trace, the chain of ideas which cauſed them even to be compared. We muſt repeat that nothing is more natural or abſolute than the diſtinction between annulated and exannulated ferns, nor between either of theſe, and ſuch as have a wrinkled, or ſpuriouſly annulated, capſule. The writer of the preſent article honeſtly confeſſes that the diſcovery of the latter tribe at firſt made him doubt the ſolidity of the diſtinction as far as ferns with ſingle capſules were concerned; nor had he leiſure to reſume the ſubject, before Dr. Swartz's publication removed every ſcruple, and ſet the matter at reſt. About the *thecatæ* (*Marattia* and *Danæa*) there could never be any uncertainty. Their fruit is ſo unlike the annulated ferns, that to term them *exannulatæ* ſeemed to imply a ſort of affinity or reſemblance, (independent of the ring,) for which there was no foundation; another term was therefore contrived, but it has not been adopted. The author is the more ready to reſign it, as he has ever found the neceſſity of keeping a watchful eye upon the invention of new terms, in this and other branches of natural hiſtory, which are often but a ſubſtitute for a deficiency of new ideas.

Thus the German writers are pleaſed to call, after Hedwig, the ſeed-veſſel *ſporangium*, though *pericarpium* is of preciſely the ſame meaning, and has long been eſtabliſhed. Profeſſor Swartz rightly uſes *capſula*, which moreover expreſſes what ſort of ſeed-veſſel is intended. Yet the latter prefers *gyrus*, a new botanical word, to *annulus*, becauſe, it ſeems, *annulus* is uſed in *fungi*; as if there could be any ambiguity or confuſion! Willdenow and Swartz call the involucrum *induſium*, (a cover,) which we think needleſs, becauſe the part correctly anſwers to the Linnæan idea, as well as to the true meaning of the word *involucrum*, and has long been ſo called. Cavanilles names it *tegumentum*, and Hedwig *periſporangium*. So the latter calls the ring *ſymplokium*, and Paliſot Beauvois names it *anellus*. There is no end to ſuch futile and reprehenſible changes. *Sori* of Swartz may be advantageouſly admitted for the ſpots of fructification, which cannot always be called *puncta* or dots, being ſometimes linear, and ſometimes broad and unlimited, ſo that the terms *lineæ* and *maculæ* have been reſorted to; whereas the word *ſori*, ſpots, comprehends every different ſhape.

We have in another place, Introduction to Botany, p. 388, put in a proteſt againſt a corruption of the generic nomenclature of ferns, on which ſubject we ſhall here be very brief. Several of the new names are compounded of *Pteris*, a fern, and ſome other word. Now if theſe are allowed to remain, ſome ſuch diſtinctive ſyllables might be prefixed to the old genus *Pteris* of Linnæus, to get rid of the latter; elſe a very ſound Linnæan law is needleſsly infringed, which forbids forming new generic names of already eſtabliſhed ones, combined with another word to give them a new meaning. All writers, before they publiſh, ſhould ſtudy and obſerve theſe matters, that ſcience may remain uncorrupted and unobſcured.

In the above general ſynopſis of ferns we have ſaid nothing of *Pilularia*, *Iſoetes*, *Marſilea*, *Salvinia*, and *Equiſetum*, which have generally been conſidered as belonging to this natural order, but they ought rather to compoſe a new one. It is hinted in the Flora Britannica that the two firſt might perhaps be removed to *Monoecia* in the artificial ſyſtem, and if the laſt ſhould remain among the *Filices ſpicatæ*, ſee EQUISETUM, it can only be on artificial principles. *Marſilea* and *Salvinia* we have never critically examined, but they ſeem near akin to *Pilularia*, and are likewiſe perhaps monoecious.

Of the Books containing figures of ferns, Plumier's ſplendid volume of Outlines is the moſt valuable. Petiver has copied it on a diminiſhed ſcale. There are many Eaſt Indian ſpecies in Rheede and Rumphius; ſome from all quarters in Plukenet. The younger Hedwig, now alas! no longer ſurviving his father, has publiſhed ſeveral coloured plates of this tribe; but no plants leſs require this additional illuſtration, being all ſo much alike in colour. Many European ferns are delineated in the Flora Danica, and Engliſh Botany, and a few in Bulliard's Herbier de la France. Lamarck has given ſeveral of the new genera, with the old ones, in his general plates.—Ferns are eaſily dried and preſerved in a herbarium, no other plants being ſo little attacked by inſects.

Propagation and Culture—Of the propagation of ferns by ſeed we have already ſpoken. Shade and moiſture are requiſite for the ſucceſs of the experiment; and the ſeedlings are of extremely ſlow growth. Ferns of cold countries are in our gardens hardly perennials, generally requiring a moiſt and ſhady ſituation, and ſlowly increaſing by root. Thoſe of hot climates are many of them beautiful trees, and when not too large, well worthy of culture in our ſtoves. The *Dickſonia arborea* from Madeira is ſo preſerved in a few curious collections, but does not ſucceed very well. *Polypodium aureum*, *Davallia canarienſis*, and *Woodwardia radicans*, are eaſily kept in a green-houſe, and increaſe ſlowly by means of their creeping roots. We have ſeen growing in the ſtove of Mr. Evans at Stepney in 1806, the *Todea africana*, Willd. Rare Ferns, t. 3, in full fructification. It was ſaid to have been brought from New South Wales, but poſſibly that might be a miſtake, as we have often detected ſuch in the reports of thoſe who bring plants from remote countries. It is not however impoſſible that this fern may grow in New Holland as well as Africa, in which caſe it will only afford a freſh inſtance of the impropriety of names of countries for ſpecific appellations. S.

FILICULA, a little fern, was by Tournefort applied as a generic name to ſome of the ſmaller kinds of ferns, which he ſeparated from others merely on account of their ſize. They belong to various genera, and have no good natural nor artificial characters.

FILIGRANE, FILLIGREE, or *Filagree-work*, a kind of enrichment on gold or ſilver, wrought delicately, in manner of little threads or grains, or both intermixed.

The word is compounded of *fil* or *filum*, *thread*, and *granum*, *grain*. In Latin it is called *filatim elaboratum opus*, *argentum*, *aurum*: but this is to be underſtood as alluding to the lateſt Latin writers, for *filatim* occurs only once in Lucretius, who applies it only to woollen thread. In this kind of work fine gold and ſilver wire, often curled or twiſted in a ſerpentine form, and ſometimes plaited, were wrought through each other, and ſoldered together ſo as to form feſtoons, flowers, and various ornaments; and they were alſo ſometimes melted together by the blowpipe into little balls, by which means the threads became ſo entwiſted as to have a very beautiful and agreeable effect. It was formerly much more employed than at preſent, in the manufacture of ſmall articles, which ſerved more for ſhow than for uſe; ſuch as vaſes, needle-caſes, caſkets to hold jewels, ſmall boxes, particularly ſhrines, decorations for the images of ſaints, and other church furniture. This art, however, is of great antiquity; and ſeems to have been brought into Europe from the Eaſt. Among church furniture we meet with filligree work of the middle ages. The Turks, Armenians, and Indians make at preſent ſome maſter-pieces of this ſort, and with tools that are exceedingly coarſe and imperfect. Articles of this nature, which are very pretty and elegant, are manufactured in the Deccan, and alſo in China, where the filigree work is moſtly wrought of ſilver; but this is much inferior in delicacy of workmanſhip to that of the Malays, deſcribed by Marſden, in his "Hiſtory of Sumatra," p. 140, &c. In this iſland it is univerſally uſed and worn; and the goldſmiths who are employed in it are ſettled every where along the coaſt. The ſurpriſing delicacy of the work is the more extraordinary, as the tools employed in it are very rudely and inartificially formed by the goldſmith, from any old iron which he can pick up. The gold is melted in an earthen rice pot, in a crucible of ordinary clay. In general they uſe no bellows, but blow the fire with their mouths, through a joint of bamboo; and when the quantity of metal to be melted is conſiderable, three or four perſons ſit round their furnace, which is an old broken iron pot, and blow together. At Padang alone, where the manufacture is more extenſive, they have adopted the Chineſe bellows. When they have drawn the wire to a ſufficient fineneſs, much in the European manner, they flatten it, by beating it on their anvil, and then give it a twiſt, like that in the whale bone handle of a punch ladle, by rubbing it on a block of wood with a flat ſtick. After twiſting they again beat it on the anvil; and thus form a leaf or element of a flower in their work, which is cut off. The end is again folded and cut off, till they have got a ſufficient number of leaves, which are all laid on ſingly. Patterns of the flowers or foliage, in which there is not much variety, are prepared on paper, of the ſize of the gold plate on which the filagree is to be laid. They then begin to diſpoſe on the plate the larger compartments of the foliage, for which they uſe plain wire of a larger ſize, and fill them up with the leaves before mentioned. To fix their work they uſe a glutinous ſubſtance, made of a red berry called *booa ſago*, ground to a pulp, on a rough ſtone. This pulp they place on a young cocoa-nut, about the ſize of a wall-nut: the top and bottom being cut off. The juice of the cocoa-nut ſerves probably to keep the pulp moiſt, which would otherwiſe ſpeedily dry and become unfit for the work. After the leaves have been all placed in order, and ſtuck on, bit by bit, a ſolder is prepared of gold filings and borax, moiſtened with water, which they ſtrew over the plate, and then putting it on the fire for a ſhort time, the whole becomes united. In executing the open work the foliage is laid out on a card, or ſoft kind of wood, and ſtuck on with the ſago berry: and the work, when finiſhed, being ſtrewed over with their ſolder, is put into the fire, when the card or ſoft wood burning away, the gold remains connected. If the piece be large, they ſolder it at ſeveral times. When the filagree is finiſhed, they cleanſe it by boiling it in water, with common ſalt and alum, or ſometimes lime-juice; and in order to give it a fine purple colour, they boil it in water with brimſtone. In making little balls, with which their works are ſometimes ornamented, they take a piece of charcoal, and having cut it flat and ſmooth, they make a ſmall hole in it, which they fill with gold duſt, and this, melted in the fire, becomes a little ball. They are very inexpert at finiſhing and poliſhing the plain parts, hinges, ſcrews, and the like, being in this as much excelled by the European artiſts, as theſe fall ſhort of them in the fineneſs and minuteneſs of the foliage. The price of the workmanſhip depends upon the difficulty or uncommonneſs of the pattern. In ſome articles of uſual demand, it does not exceed one third of the value of the gold; but in matters of fancy it is generally equal to it. This art is now neglected and little eſteemed in Europe. Augſburg, however, a few years ago, had a female artiſt, Maria Euphros. Reinhard, celebrated for works of this kind, who died in 1779. In 1765 ſhe ornamented with this work ſome ſilver baſons, which were ſent to Ruſſia for the uſe of the church, and which gained her great honour.

The term has been lately applied to ornamental works, formed, as fancy directs, of ſtrips of paper, differently coloured, rolled into various figures, and artfully combined.

FILING, in *Mechanics*, is the operation of uſing a file in cutting away and reducing various ſubſtances into any required form. The file is chiefly confined to the working of metal, though it is occaſionally applied to wood, ivory, bone, &c. The art of filing is an eſſential to every workman in metal, and it requires great practice and ſkill to perform it well: the principal difficulty conſiſts in filing a truly plane and even ſurface to any piece of metal. To do this, the work muſt be held firmly in a vice, ſo that the ſurface to be filed be truly horizontal; the workman then files it over with a file, adapted in its cut, or ſize of its teeth, to the magnitude of his work: in doing this, if it is large, he takes one end of the file in each hand, holding it firmly, as he moves it backwards and forwards, in a horizontal plane, taking care not to lean heavier upon one end of the file than the other. The file only cuts in going forwards; he muſt therefore preſs harder upon it, that it may take hold of the metal: in drawing it back it is unneceſſary to lean on the file, becauſe it is not then adapted to act; it is uſual, in filing a piece of flat work, to begin at one ſide, and every time the file is drawn back, to move it ſideways at the ſame time about the breadth of the file: the next ſtroke proceeds ſtraight forwards, as before, but in a freſh place, unleſs ſome ſudden eminence is to be reduced; then two or more ſtrokes ſhould be made in one place, or the preſſure on the file increaſed till all is brought to a flat or even ſurface. When the whole of the work has been done over in one direction, it is then filed in the ſame manner at right angles thereto, and afterwards diagonally, till it is finiſhed, trying it occaſionally by a ſtraight edged ruler. Some workmen, by long practice and experience, are able to make the work flat by filing in one direction only, and without any trial; ſo that if two ſurfaces of metal thus filed are placed one upon the other, they will adhere together for an inſtant if the upper one be ſuddenly lifted up. The height of the vice, in which the work is held, is a matter of ſome importance in filing; if the work is large, it ſhould be about forty inches above the floor on which the workman ſtands; for ſmall work it may be higher, becauſe the workman does not need to bear ſo heavily on the work. In filing articles which are to be fitted together, the workman makes uſe of beviles, guages, rulers, compaſſes, &c. to mark out and try the work. Round pins, &c. are held in a hand-vice, and ſupported on a piece of wood while they are filed, and the workman turns them round while he files, in order that they may be truly round and have no angles.

The file-makers in Lancaſhire, for cutting the teeth of their ſmall files, ſometimes make uſe of a knife, *fig.* 5. *Plate* XIII. *Miſcellany*, which has a beviled edge; the workman uſes it in the ſame manner as the chiſſel, except that no hammer is employed. The fineſt files uſed by watch-makers have ſometimes as many as 350 teeth *per* inch, which are frequently cut by the knife; other watch-makers' files are cut in the manner above deſcribed, by the chiſſel, *fig.* 6, which is ſtruck on the head by a ſmall hammer. The ſmalleſt chiſſels uſed are not a vaſt deal larger than the figure, and the hammer, *fig.* 7, is the full ſize, though the handle in reality is ſomewhat longer; ſome of very fine watchmakers' files are not larger than needles, and are called needle-files.

FILIPENDULA, in *Botany*, ſo called becauſe the knobs of the roots are pendulous on threads from the main ſtock. Tourn. Inſt. 293. t. 150. See SPIRÆA.

FILIPPOPOLI, PHILIPPOPEL, or *Filibe*, in *Geography*, a town of European Turkey, in Romania, on the Maritz, where it becomes navigable; founded by Philip, father of Alexander the Great. In the year 250 it was taken by the Goths, who are reported to have maſſacred 100,000 perſons in the ſack of this city; and in 1360 it was taken by Amurath I. emperor of the Turks; 90 miles W.N.W.

of Adrianople, and 124 W.N.W. of Conſtantinople. This town is meanly built, without fortifications, or one good ſtreet. Its ſituation is ſo low and moiſt, that the mud is ſometimes two feet deep, and ſtones, like poſts, are ſet up to facilitate the progreſs of foot-paſſengers. Nevertheleſs it is a place of conſiderable ſize. N. lat. 42° 22'. E. long. 24° 44'.

FILITZ, a town of Germany, in the principality of Culmbach; ſix miles S. of Kirch Lamitz.

FILIUS ANTE PATREM, *q. d.* the ſon before the father; a denomination applied by botaniſts and floriſts to plants whoſe flowers come out before their leaves. Such are the ſeveral ſpecies of colchicum, or meadow-ſaffron, the colt's foot, butterbur, &c.

FILIX, in *Botany*. See FILICES and FERN.

FILL, *To*, in the *Sea Language*, is to brace the ſails in ſuch a manner, that the wind entering their cavities from behind, dilates them, ſo as to advance the ſhip in her courſe, after the ſails had been for ſome time ſhivering or braced back.

FILLEK, in *Geography*, a town of Hungary, taken by the Turks in 1554, but ſoon after recovered. Its fortifications are deſtroyed; 40 miles S.E. of Cremnitz.

FILLER, a term often provincially uſed to ſignify the horſe which ſupports, and is placed between the ſhafts of carts or other carriages. It is commonly written thiller. See THILLER.

FILLET, in *Anatomy*. See FRÆNUM.

The word is French, *filet*, formed of *fil*, *thread*.

FILLET, or *Filet*, in *Architecture*, denotes a little ſquare member or ornament uſed in divers places and on divers occaſions, but generally as a ſort of corona over a greater moulding.

The fillet is the ſame with what the French call *reglet*, *bande*, and *bandelette*; the Italians, *liſta*, or *liſtella*.

FILLET, in *Botany*. See THREAD.

FILLET, *Teniola*, in *Heraldry*, a kind of orle or bordure, containing only a third or fourth part of the breadth of the common bordure. See BORDURE.

It is ſuppoſed to be withdrawn inwards, and is of a different colour from the field. It runs quite round near the edge, as a lace over a cloak.

FILLET is alſo uſed for an ordinary drawn like the bar from the ſiniſter point of the chief acroſs the ſhield, in manner of a ſcarf; though it is ſometimes alſo ſeen in the ſituation of a bend, feſſe, croſs, &c.

According to Guillim, the fillet is a fourth part of the chief, and is placed in the chief point of the eſcutcheon.

FILLET, in *Midwifery*, a contrivance for the purpoſe of extracting the child, in difficult births, when the head is too large to paſs readily through the pelvis. The invention is probably very ancient, as it is mentioned by Avicenna, as well known in his time; that is, towards the end of the tenth century. The ſimpleſt, and probably the firſt contrivance of the kind, was made by cutting, in a ſtrong ſlip of cloth, a ſlit, ſufficiently large to embrace, and take into it, the head of the child. This was carried up into the vagina, upon the hand of the accoucheur, and paſſed over the face of the child, and lodged under the chin, or over the hind-head, and preſſed cloſe to the nape of the neck; the hand was then withdrawn, and the child extracted by pulling down the other end of the cloth. But as it was difficult to keep the nooſe open, ſo as to make it embrace the head of the child; this defect was attempted to be remedied, by making a ſheath, with a ſlip of ſtrong cloth, two feet or more in length, through which a thin piece of whalebone was paſſed. The nooſe being carried over the head, and fixed under the chin, or cloſe to the nape of the neck, the whalebone was then withdrawn, and the child extracted by pulling down the two ends of the ſheath. Various other improvements, or alterations, in the form of the fillet, have been deviſed, all with the view of facilitating the paſſing of the nooſe over the head of the child, or of fixing it when paſſed, but with ſo little ſucceſs, that it has long been given up as uſeleſs, and the *forceps*, or the *lever*, (ſee thoſe articles) are invariably uſed in all the caſes for which the fillet was formerly recommended. This may be a proper place to mention a kind of net invented by Peter Amand, (ſee the article AMAND, *Pierre*,) an accoucheur of ſome credit, who flouriſhed the latter end of the 17th century, with which he brought away, or propoſed bringing away, the head of the child, when it happened to be left in the womb ſeparated from the body. The accident, which is far from being of frequent occurrence, can ſcarcely ever happen but when the brim of the pelvis, in the woman, is too narrow to ſuffer the head of the child to paſs entire or unmutilated; conſequently, too narrow to admit the hand of the accoucheur, encumbered with the net, to paſs into the uterus. The contrivance, therefore, ſunk as ſoon almoſt as it was invented; and the crotchet, which is much more manageable, is conſtantly uſed in theſe unpleaſant caſes. See the article CROTCHET.

FILLET is alſo uſed among *Painters*, *Gilders*, &c. for a little rule and reglet of leaf-gold, drawn over certain mouldings; or on the edges of frames, pannels, &c. eſpecially when painted white, by way of enrichment.

FILLETS, in the *Manege*, are the loins of a horſe, which begin at the place where the hinder-part of the ſaddle reſts.

FILLING *up of Chaſms*, in *Geology*. It was a favourite opinion of the late ingenious Mr. Whitehurſt, that moſt, or all of the rocky vallies in Derbyſhire, were formerly immenſe and almoſt fathomleſs chaſms, hiati, or gaping fiſſures, which were ſubſequently filled up with the fragments or ruins of the adjoining ſtrata, to the level of the preſent rivers or brooks; the vale of Matlock-Bath he particularly deſcribes as ſuch a filled-up chaſm, in the ſecond plate of his "Enquiry concerning the Earth;" but which opinion the miners of the diſtrict ſhortly afterwards proved to be unfounded, by driving acroſs, in ſolid and undiſturbed ſtrata, under the bed of the river, ſee Philoſophical Magazine, vol. xxxi, plate 2.

The inſtances are doubtleſs numerous, of the filling up of chaſms or *faults* with alluvial and extraneous matters; indeed it is a common occurrence; but it is to be obſerved, that ſuch are in general *quite filled* up, and not partially, ſo as to leave a valley between the ſides of the fault; for *faults* are but rarely viſible on the ſurface of the ground (ſee that article); and as rarely, or more ſo, do they traverſe the bottoms of vallies, with which they ſeem to have little connection, but to have happened prior to the EXCAVATION *of Vallies*; ſee that article. It is the opinion, founded on the experience of moſt miners, that the ſtrata or meaſures under vallies are as regular and undiſturbed as in any other places, and that *faults* are ſcarcely ſo much to be apprehended there, as in ſome other ſituations: if, however, a change of the dip takes place, and a real diſlocation of the meaſures on the two ſides of a valley, as Mr. Whitehurſt ſuppoſes in his ſection acroſs Matlock-Bath vale, above referred to, then a fault may confidently be looked for in the valley, the ſame as would be expected in any other ſituation, where the ſame circumſtances occur.

FILLY, in *Rural Economy*, a term ſignifying a mare, or young female of the horſe kind of animals. See HORSE.

Filly *Foal*, a term implying a mare or female foal. See Foal.

FILM, a thick ſkin or pellicle.

In plants it is often uſed for that thin woody ſkin which ſeparates the ſeeds in the pods, and keeps them apart.

Film, *White, on the eye of a horſe*, may be removed by lifting up the eye-lid, after the eye has been waſhed with wine, and ſtroking it gently with the thumb with wheat-flour: common ſalt and ſalt of lead, beaten fine, and put into the eye, are proper to conſume a film; or the horſe's eye may be waſhed with the ſpittle in the morning, faſting, having firſt put a little ſalt into your mouth; but there is nothing ſo effectual as ſal ammoniac, beaten and put into the eye, and repeated every day till the film is gone.

FILMER, Edward, gent. in *Biography*, in 1629, collected, tranſlated, and publiſhed, "French Court Ayres, with their ditties, Engliſhed, of four and five parts, dedicated to the Queen," folio. Theſe ayres were chiefly compoſed by Pierre Güedron, with two by Anthoine Boiſſet. There is very little muſical merit diſcoverable in theſe ſongs: which are, however, highly extolled in ſeveral copies of verſes prefixed to the book; and, among the reſt, in one by Ben Jonſon. The editor ſeems to have taken great pains in tranſlating the words, "totidem ſyllabis," in order to accommodate them to the original melodies.

FILOPONSKAJA, in *Geography*, a town of European Turkey, in Dobruzzic Tartary; 18 miles S.S.E. of Iſmail.

FILOQUIA, Anfiloquia, or *Jerovilia*, a town of European Turkey, in Livadia, on a river which runs into the gulf of Arta. It was anciently called Amphilochia, or Argos Amphilochium, and, although once a celebrated town, it was ruined by the war between the Venetians and Turks; 44 miles N.N.W. of Lepanto.

FILTER, or Filtre, in *Chemiſtry*, &c. a piece of woollen cloth, linen, paper, or other matter, ſome of which are in the form of hollow inverted cones, uſed to filtrate or ſtrain liquors through. The filtre has the ſame uſe and effect with regard to liquids that the ſieve or ſearce has in dry matters. Filtres are of two ſorts: the firſt are ſimple pieces of paper or cloth, through which the liquid is paſſed without farther trouble. The ſecond are twiſted up like a ſkain or wick, and firſt wetted, then ſqueezed, and one end put in the veſſel that contains the liquor to be filtrated: the other end is to be out, and hang down below the ſurface of the liquor; by means of this the pureſt part of the liquor diſtils drop by drop out of the veſſel, leaving the coarſer part behind. The filter or philter acts as a ſiphon.

Filter is alſo an apparatus uſed to ſeparate water or other fluids from any foreign moiſture it may contain; this is effected by cauſing the water to percolate through an infinite number of apertures, which are too minute to allow the paſſage of any ſubſtances mixed in the water; by this means, the moſt foul water, after paſſing through ſuch a filter becomes perfectly tranſparent and ſweet, though at the ſame time it is not deprived of any of its qualities which depend upon matter entering into combination with it; only ſuch as depend upon mechanical mixture being arreſted in its progreſs through the filter.

The great utility of filters for domeſtic uſe muſt be evident, as a fluid fit for culinary purpoſes can be obtained from any putrid and muddy water; on this account the conſtruction of apparatus, which will at the ſame time be cheap and efficacious, is a deſirable object; and a vaſt variety have been contrived, many poſſeſſing great advantages.

The filter in moſt general uſe is a baſon formed of ſome porous kind of ſtone, and ſupported over any convenient veſſel to receive the filtred fluid. The foul water being poured into the baſon, inſinuates itſelf by ſlow degrees through the minute pores of the ſtone, and is collected, drop by drop, into the receptacle placed beneath. This apparatus anſwers its purpoſe perfectly well for a time, but has its defects: the conſtant accumulation of the impurities in the baſon, in time choaks up the pores of the ſtone; this may be removed by waſhing many times, but the more minute particles of matter are, by inſenſible degrees, carried down into the ſtone, fill up the pores, and at length no water will paſs through. A trifling error is alſo committed in the form of the veſſel, which is in general a hemiſphere; in this figure the preſſure of the fluid is greateſt in the loweſt point, and gradually diminiſhes in every other part, ſo that unleſs the preſſure is greater in the centre than it ought to be, ſcarcely any water will paſs through the other parts. A more eligible form would be that of a cylinder, formed either of earthenware or metal, with a circular plate of the filtering ſtone cemented into it at the middle; by this means, the preſſure on all parts will be equal, and it would have another advantage, that when the water began to paſs ſlowly through the ſtone, by inverting the cylinder, the water would be filtred in a contrary direction, and act to remove the matter depoſited in the pores of the ſtone by the preceding proceſs. The ſtone proper for conſtructing filters, is by no means ſcarce; in London a very porous limeſtone containing innumerable fragments of broken ſhells is employed; it bears ſtrong reſemblance to the rag-ſtone found at Barnack near Stamford, Northampton; a grit-ſtone, procured at Birchover and Stanton Moor near Winſter in Derbyſhire, is found to be well adapted for filters, which are carried all over the country. The expence of ſtone filters, and their liability to be choaked up by long uſe, have given riſe to many others more ſimple; ſand finely waſhed, pulveriſed glaſs, pottery or charcoal, are frequently employed, being placed in a proper ſituation for the water to percolate through them. The latter, from its well known antiſeptic quality, is peculiarly adapted to correct putrid water, at the ſame time that it ſeparates its impurities. Mr. John Iſaac Hawkins, Titchfield ſtreet, has eſtabliſhed a manufacture of charcoal filters for the ſupply of the metropolis where the water in general requires ſuch preparation.

Figs. 8 and 9, *Plate* XIII. *Miſcellany*, repreſent two conſtructions. The latter is on a large ſcale, and conſtructed in a caſk A B C D, divided into two compartments by a vertical partition, E F, which does not reach within two inches of the bottom of the caſk; the ſpace *a* B D B C *b* is filled with charcoal, at firſt a ſtratum of coarſely powdered charcoal four inches deep, and this is covered with another ſtratum of four inches, in pieces about the ſize of walnuts; in each diviſion of the caſk the charcoal is covered with a perforated cover, the foul water is poured in on the ſide, A B E F, and is forced by its preſſure down one ſide, and up on the other, through the charcoal, in which it depoſits its extraneous mixtures, and riſes in the ſide, I E F, perfectly tranſparent and ſweet: it is drawn off for uſe by the cock *d*; at *e* is a cover to prevent the foul water being accidentally thrown in on the wrong ſide; the caſk is of wood, and charred withinſide, to ſtill farther ſweeten the water.

The filter repreſented in *fig.* 8, is on a ſmaller conſtruction; here A is the veſſel for the foul water, furniſhed with a cock *a*, delivering the water in the ſpout *b*, of a ſecond veſſel B, containing the filter; it is filled with charcoal as high as the cover *c*, which prevents the ſmall charcoal being diſturbed by the entrance of the foul water, which, after percolating through the filter, eſcapes at the tube *d* into the inferior reſervoir, where it is retained until wanted, when it is drawn off at the cock *g*. The caſk filter is two feet eight inches in height, twenty-two inches diameter at the bottom, and ſixteen inches at top; if conſtantly ſupplied with foul water it will purify one hundred gallons per day; its inventor ſtrongly recommends it for the uſe of ſhips; the other filter, which is made of earthenware, and a much ſmaller ſcale, will do a proportionate quantity; when the charcoal becomes foul it may be taken out and replaced, at an inconſiderable expence; ſand, pounded glaſs or pottery, and other ſubſtances, have at times been recommended. Profeſſor Parrot conſtructed a filter with ſand; its form is an inverted ſiphon, the curve of which is filled with ſand waſhed exceedingly clean, a conſtant ſtream of the foul water enters at one ſide of the ſiphon, and paſſing down through the ſand in one leg, riſes through the other, eſcaping on a level rather lower than it entered. Great ſtreſs is laid by the inventor upon the filtration by aſcent, as well as deſcent, as he ſuppoſes the more weighty particles will ſubſide; though from their exceedingly ſmall ſize, they might eſcape through the interſtices of the ſand. It will be eaſily ſeen that the ſhip filter by Hawkins is the ſame in effect, though on a better conſtruction.

Mr. James Peacock took out a patent in 1791 for filtration by aſcent through any of the above-mentioned ſubſtances; but he does not deſcribe any thing material which we have not mentioned above.

The filter delineated in *fig*. 10. is a contrivance of Mr. Collier, and deſcribed in the Philoſophical Magazine; A B C is an ordinary caſk divided into three parts by three horizontal partitions; the upper diviſion A B *a b* is to contain the reſervoir of foul water; the partition *a b* is perforated, and allows the water to paſs ſlowly down into the middle diviſion filled with broken crockery ware, preſenting innumerable ſurfaces upon which the water depoſits any matters which will ſubſide; the caſk is perforated all round to admit air at *a b*; the water then paſſes into the inferior compartment which contains the filters; theſe are three cylinders, one of which is ſeen at D; they are formed of argil and ſilex baked together in a potter's kiln. The water percolates through this ſubſtance, and is received into a veſſel E communicating with the filters, formed of metal, and furniſhed with a cock at *e* to draw off the fair water; F is a metal tube placed upon the top of the reſervoir E, with which it communicates, and in which the water riſes as it accumulates in the reſervoir; a cock at *f* will draw off the foul water, and the tube F, being full, or nearly, of the filtered water, the preſſure will be reverſed, and the impurities lodged in the pores of the cylinders removed by the contrary action.

To the inhabitants of a large city the filtration of the water they make uſe of is a matter of conſiderable importance, but the practice is at preſent confined to apparatus on a ſmall ſcale for the uſe of one family only; filters on a large ſcale might be ſimply conſtructed, and the expence of land for their formation would be amply repaid by the improvement of the water. The conſtruction of the ſhip filter ſeems beſt adapted for this purpoſe; a large tank lined with brick-work, and divided into two by a wall which muſt have every other brick of the lower courſe omitted, ſo as to leave apertures at the bottom of the wall; this tank being filled two feet deep with pulverized charcoal would form an excellent filter, and ſeveral of theſe being arranged round the ſteam engine for pumping the water would alternately ſupply it. The expence of charcoal might be obviated by uſing the refuſe or charm as it is termed, or ſawduſt might be charred in an iron retort at a ſmall charge. See Filtration.

Filter, or *Philter*, is alſo a charm, ſuppoſed to have a virtue of inſpiring love.

The word is derived from φιλτρον, which ſignifies the ſame thing, of φιλεω, *amo*, *I love*.

The Greeks, when their love was without ſucceſs, had ſeveral arts to procure the affections of their beloved. The Theſſalian women were famous for their ſkill in this, as well as other magical practices. The means whereby it was effected were of divers ſorts; it was ſometimes done by potions, called φιλτρα, which are frequently mentioned in authors of both languages. Juvenal ſpeaks thus:

> "Hic magicus affert cantus, hic Theſſala vendit
> Philtra, quibus valeant mentem vexare mariti."

Their operations are violent and dangerous, and commonly deprived ſuch as drank them of their reaſon. Plutarch and Cornelius Nepos report, that Lucullus, the Roman general, firſt loſt his reaſon, afterwards his life by one of them. Lucretius, the poet, ended his life by the ſame way; and Caius Caligula, as Suetonius reports, was driven into a fit of madneſs by a filtre given him by his wife Cæſonia, which ſtory is mentioned by the ſame poet. Ovid likewiſe aſſures us, that this was the uſual effect of ſuch potions.

The ingredients they were made of were of divers ſorts, ſeveral of which, applied by themſelves, were thought effectual.

FILTJA, in *Geography*, a town of Sweden, in the province of Sudermania; 10 miles S.W. of Stockholm.

FILTRATION, the act of paſſing any liquor through a filtre, called alſo *colature*, *percolation*, and *tranſcolation*. See Filtre.

The end of filtration is of two kinds; the one to free fluids from any ſolid bodies of a feculent nature with which they are mixed; and the other to ſeparate any precipitated powder or other ſolid body from ſuperfluous fluid; and the means muſt be varied accordingly. Such liquors as are incorporated with particles that adhere to them are rendered capable of filtration by coagulating and collecting the heterogeneous parts. This is effected either by boiling or by mixing whites of eggs and boiling them with the turbid liquors. See Clarification.

The moſt commodious way of filtrating is by whited-brown paper, or paper without ſize, faſtened over the mouth or aperture of a funnel; the ſmallneſs of the pores of this paper admits only the finer parts through, and keeps the reſt behind. There are alſo filtrations through ſand, pulverized glaſs, &c. Spirits of vitriol, ſalt, and nitre, are filtrated through a quantity of beaten glaſs in the bottom of a funnel.

Filtration is alſo performed by a woollen or linen bag, called Hippocrates's ſleeve: the choice of theſe muſt be directed by the liquor to be filtered.

Dr. Papin contrived a method by which filtrations through cap-paper might be made ſuddenly, and with great quantities of liquor, by the help of the air-pump. For this purpoſe he made uſe of the following contrivance: A A (*Plate* XIII. *Miſcellany*, *fig*. 11.) is a glaſs receiver; B B a cover fitted to it; C C C is a pipe forming the communication between the receiver A A and the air-pump; D D a ſhallow veſſel full of little holes; E E E a pipe that makes the communication between the veſſel D D and the receiver A A; F F a veſſel to contain the liquor to be filtrated, and G G the plate of the pump. When this inſtrument is uſed, the ſhallow veſſel D D ought to be tied about firſt with linen cloth, and then with cap-paper, ſo that no liquor may get into the holes of the ſaid veſſel but through the cap-paper, and linen cloth; this muſt be wholly placed within the liquor to be filtrated: let the air be extracted by means of the air-pump out of the veſſel A A. Then the liquor in the veſſel F F muſt be drawn through the cap-paper, and the linen cloth into the veſſel D D, and from thence through the pipe E E E into the veſſel A A; and this operation muſt be quick, on account of the great preſſure of the atmoſphere that drives the liquor; beſides, the ſediment of the liquor ſubſiding at the bottom of the veſſel F F will not be ſo apt to ſtop the pores of the cap-paper as in ordinary filtrations. Birch's Hiſt. of the Royal Society, vol. iv. p. 366, &c.

Filtering ſtones and filtering baſons, either natural or artificial, for the purpoſe of purifying water, are not unfrequently uſed in this and in other countries. Rocky mountains, beds of ſand, gravel, &c. are natural filtres. The compoſition for making filtering baſons, in order to purify water, conſiſts of equal parts of tobacco-pipe clay, and coarſe ſea, river, drift, or pit-ſand. The baſons are formed and turned on a potter's wheel; and they ſhould be about $\frac{3}{4}$ of an inch thick. When the veſſels are of the uſual degree of dryneſs, the whole outſide and inſide ſurface muſt be ſhaved or turned off on a potter's wheel; and, when perfectly dry, theſe baſons are burnt or baked in a potter's kiln after the uſual manner. Many patents have been obtained by different perſons for filtering machines of their own invention. See Filter.

The ſecretion of the divers juices in the body from the maſs of blood ſeems to be little elſe but filtration. Pitcairn, and other late authors, hold that the diverſity of filtration does not depend on the different configurations of pores, but on their different ſizes or diameters.

Springs alſo ſeem to be raiſed from the ocean by the ſame principle of filtration.

Filtration, in *Pharmacy*, is chiefly concerned in tinctures; as when ſome portion is drawn from the ingredients or ſuſpended in the tincture which is not neceſſary to it, but diſturbs and renders the reſt unpleaſant both to the palate and ſight. Beſides this, there is a filtration which has much tortured the philoſophy of ſome ages to account for; this is that performed by the aſcent of the finer parts of a liquor up a cord or ſkain of cotton, or ſuch like matter, which is contrived to drop over another veſſel and leave the groſſer behind.

After the ſame manner it is, without doubt, that the humidity of the earth is drawn up into the ſubſtance of the roots of vegetables, which we know conſiſts of long and very minute fibres, ſo diſpoſed as to form a great number of tubular interſtices; theſe act in the nature of this ſort of filtre, and attract the juices and moiſture appointed for the nutriment and increaſe of the plant.

Some ſay, that the cauſe of this aſcent is becauſe the liquor ſwells thoſe parts of the filter that touch it, by entering into the pores of the threads which compoſe it, whereby they riſe up, touch, and wet thoſe next above them; and theſe again the next threads; and ſo on to the brim of the veſſel, when the liquor runs over, and deſcends in the other part of the filter which hangs down by its own natural gravity.

But this account is liable to many objections, eſpecially as liquors riſe after the like manner in glaſs tubes much above the ſurface of the liquor they are immerſed in, where the glaſs cannot be imagined thus to ſwell.

Others account for it, by conſidering every filter as compoſed of a great number of long, ſmall, ſolid bodies, which lie very cloſe together; ſo that the air getting in between them loſes much of its preſſure, and cannot gravitate ſo ſtrongly as it doth on the fluid without them; the conſequence is, that the parts of the water between the threads of the filter muſt be preſſed upwards, and aſcend till they come ſo high, as, by their weight, to counterbalance the general preſſure on the other parts of the ſurface of the water.

Laſtly, the retainers to ſir Iſaac Newton's philoſophy deduce the phenomenon from the principle of attraction. According to them, the cauſe of this filtration is, doubtleſs, the ſame with that whereby fluids aſcend up heaps of aſhes, ſand, &c. the ſame with that whereby water is raiſed in form of vapour, the ſap riſes in vegetables, and the blood circulates through the capillary arteries, and the extremely minute glandular ſtrainers. See Ascent *of fluids*.

FILTRUM, in *Natural Hiſtory*, the name of a ſtone much in uſe in the eaſtern parts of the world, and ſometimes with us for the filtrating of water intended for drinking. The Japaneſe are extremely fond of this ſtone, and impute their uninterrupted health, and particularly their being always free from the ſtone and gravel, to their drinking the water thus cleared of all its heterogeneous and miſchievous particles. The people of this, and many other places thereabouts, have a ſettled opinion, that moſt diſeaſes ariſe from impurities of water, and are well aſſured, that theſe impurities are all lodged in the ſtone-filtre, and left behind by the water in its paſſage.

The manner of uſing the ſtone is this; they form a ſort of mortars with very thick bottoms out of the largeſt pieces of it, and the water is poured into theſe, and the ſtone being of a very lax and ſpungy texture, it ſoon makes its way through, and is received into a veſſel placed underneath for that purpoſe. It being found, therefore, an eaſy thing for us to have our water filtered in the ſame manner that the Japaneſs have, it remains to try whether it will have all thoſe ſalutary effects which the people of that part of the world give it; and this ſeems not to be imagined from reaſon and analogy. We very well know that water is frequently impregnated with ſaline particles, and that it alſo frequently diſſolves by this means earthy and other matters which it otherwiſe could not do. But we alſo know, that ſalts diſſolved in water are not to be ſeparated by filtration; and it is equally certain, that earthy, ſparry, or other matter, that is ſuſpended in water when clear, will in like manner paſs through the filter with it.

Upon the whole, we are happy enough to have no occaſion for filtering ſtones, ſince our ſprings and rivers afford us water already pure enough to our hands; and in places where this is not the caſe, it is always poſſible to ſave rain-water, which will keep a long time with proper management, and is much purer than all the art in the world can make ſuch as has once been foul. Valentini Muſæum Muſæorum, lib. i. cap. 22.

The only inſtance in which a filtering-ſtone can be of real uſe, is, when there is no water to be had but that of ſome muddy river; in this caſe, the mud being a foreign body not diſſolved in, but only floating among the water, it will be left behind in its paſſing the cloſe ſtructure in the filtre; but this is always to be as well obtained by letting it ſtand a while to ſubſide. Ephem. Germ. Cent. iii. p. 76.

Filtres, however, have been found uſeful to thoſe who live near the metropolis, and who are ſupplied with water from the Thames, the New River, and the ponds from Hampſtead; and many filtering machines have been contrived for this purpoſe. See Filter and Filtration.

FILTZ, Anton. in *Biography*, a performer on the violoncello in the Elector Palatine's band at Manheim, in

1763, and an elegant compoſer. His pleaſing productions for various inſtruments were ſoon noticed and admired; but alas! death ſtopped his career in the prime of life, before his genius and talents were well developed. In 1768 the muſical world was robbed of this young artiſt, of whom, from the ſpecimens he had already given of his abilities, the higheſt expectations were formed. In Paris and Amſterdam the following compoſitions appeared before his deceaſe, ſix ſymphonies, ſix violin trios for the harpſichord, violin, and baſe. Theſe were printed from the Paris copy, by Bremner, as were moſt of his ſymphonies. Nothing was ever ſo elegant, and at the ſame time ſo eaſy, as his harpſichord trios. He left behind him in MS. various concertos for the violoncello, the German flute, the hautbois, and the clarinet, which were ſold ſingly in MS. at the muſic ſhops in Leipſic and Hambro', all much admired when executed by great performers. Beſides theſe, ſome MS. duets and ſolos for the violoncello were long purchaſed and performed with great applauſe.

FILUM Aquæ, the thread or middle of the ſtream where a river parts two lordſhips. "Et habebunt iſtas buttas, uſque ad filum aquæ prædictæ. File du mer, the high tide of the ſea." Rot. Parl. 11 Hen. IV.

FILURINA, in *Geography*, a town of European Turkey, in Macedonia; 28 miles N. of Edeſſa.

FIMARELLA, a river of Naples, which runs into the gulf of Tarento. N. lat. 39° 36'. E. long. 17° 12'.

FIMBLE Hemp, in *Rural Economy*, a term ſometimes applied to early ripe hemp, or female hemp. See Femble *Hemp*.

FIMBRIA, in *Anatomy*, the fringed border of the opening, by which the Fallopian tube communicates with the abdominal cavity. This part is named the fimbriated extremity of the tube. (See Generation.) There is alſo a part in the brain called corpus fimbriatum. See Brain.

Fimbria, in *Surgery*, was a term anciently employed to ſignify the outer tape, or fillet, which was put on to ſecure the reſt of ſome bandage, or apparatus.

FIMBRIATED, a term in *Heraldry*, ſignifying that an ordinary is edged round with another of a different colour.

Thus, he beareth, or, a croſs-pattee gules fimbriated ſable.

FIMBRISTYLIS, in *Botany*, from *fimbria*, a fringe, and *ſtylus*, the ſtyle of the flower. Vahl. Enum. v. 2. 285. Claſs and order, *Triandria Monogynia*. Nat. Ord. *Calamariæ*, Linn. *Cyperoideæ*, Juſſ.

Gen. Ch. *Cal.* a ſingle ſcale to each flower, concave, keeled, gradually deciduous, making part of a ſpike imbricated every way. *Cor.* none. *Stam.* Filaments uſually three, rarely only one or two; anthers linear. *Piſt.* Germen very ſmall, ſuperior; ſtyle with a half-globular bulb at the baſe, which falls off along with it; compreſſed and gradually dilated upward, fringed or ciliated at each edge; ſtigmas two, capillary, ſpreading, downy. *Peric.* none. *Seed* one, lenticular, convex at each ſide, pointed at the baſe, without any ſurrounding briſtles. *Receptacle* gradually elongated and becoming naked from the baſe upward, very cloſely pitted, the pits or cells having each a membranous border.

Eſſ. Ch. Glumes chaffy, imbricated every way. Corolla none. Style cloven, bulbous at the bottom, compreſſed, fringed at each edge. Seed ſolitary, without any briſtles at its baſe.

This genus is ſeparated from *Scirpus* by Vahl, in conſideration of the great extent of the latter, which has long rendered ſome ſuch diviſion deſirable. He defines its habit as follows.

Stems ſeveral, erect, without joints, leafy in the lower part. Leaves channelled, rough-edged upwards. Involucrum like the leaves. Rays of the umbel bearing each one ſpike, and having a central ſeſſile ſpike at their baſe; ſometimes each ray bears two ſpikes, one of which is ſeſſile, the other ſtalked: all the ſpikes are gradually elongated as the ſeeds ripen. Keel of the ſcales green.

The author juſt named ſtill ſeems to conſider this as an artificial genus, which may perhaps be tenable as a ſection only of *Scirpus*. Yet he aſſerts it to be as diſtinct from the latter as *Pelargonium* and *Erodium* are from *Geranium*; three genera as diſtinct, if we be not greatly miſtaken, as any that agree in natural order throughout the whole vegetable kingdom. See Erodium.

Vahl has 24 ſpecies of *Fimbriſtylis*. Among them are,

F. *miliaceum*. "Spikes globoſe. Involucrums of about two leaves, ſhorter than the twice-compound umbels. Stem leafy at the baſe." (Scirpus miliaceus; Linn. Sp. Pl. 75. Willd. Sp. Pl. v. 1. 305. Rottb. Gram. 57. n. 77. t. 5. f. 2. Burm. Ind. 22. t. 9. f. 2.)—Native of the Eaſt Indies. Perennial. *Stems* a foot high. *Leaves* flaccid, ſmooth. *Umbels* more compound than the above account of the habit of the genus implies. *Spikes* ſcarcely bigger than muſtard-ſeed, ruſty-brown.

F. *dichotomum*. "Spikes ovate-oblong. Involucrum of about three leaves, longer than the repeatedly compound umbel." (Scirpus dichotomus; Linn. Sp. Pl. 74. Willd. Sp. Pl. v. 1. 303. Sm. Fl. Græc. Sibth. v. 1. t. 50. Rottb. Gram. 57. t. 13. f. 1.)—Native of the Eaſt Indies and ſouth of Europe, in moiſt ſandy ground. *Root* annual, fibrous. *Herbage* glaucous-green. *Stems* from ſix to twelve inches high. *Spikes* more ovate and acute, as well as larger, than in the former. *Stamens* from one to three. Rottboll deſcribes the ſtyle as rough, but does not repreſent it ſo, neither is that character, which makes the plant a *Fimbriſtylis*, exhibited by Mr. Bauer in the *Flora Græca*.

F. *ferrugineum*. "Spikes ovate-oblong. Scales ſomewhat downy or hoary in the middle. Involucrum of about two leaves, as long as the ſimple umbel." (Scirpus ferrugineus; Linn. Sp. Pl. 74. Gramen cyperoides majus, ſpicis ex oblongo rotundis compactis ferrugineis; Sloane Jam. v. 1. 118. t. 77. f. 2.)—Native of ſalt marſhes in Jamaica. *Stems* a foot and half high, glaucous, ribbed, compreſſed. *Umbel* ſimple or compound, of from three to ſix rays. *Spikes* half an inch long, brown and hoary.—Vahl is much confuſed in his quotation of Sloane, as in many other ſimilar caſes, his book being careleſsly executed in that reſpect. In this inſtance he errs by copying Linnæus without turning to the book quoted.

F. *ſpadiceum*. "Spikes oblong, cylindrical, acute. Involucrum rigid, of two leaves, as long as the doubly compound umbel." (Scirpus ſpadiceus; Linn. Sp. Pl. 74. Gramen cyperoides majus aquaticum, paniculis plurimis junceis ſparſis, ſpicis ex oblongo rotundis ſpadiceis; Sloane Jam. 118. t. 76. f. 2.)—Native of watery places in the Weſt Indies. *Stems* two or three feet high, rigid and ruſhy. *Spikes* numerous, acute, an inch long, dark ſhining brown.

F. *argenteum*. "Spikes cylindrical, obtuſe, ſeſſile, cluſtered, in round heads."—(Scirpus argenteus; Rottb. Gram. 51. t. 17. f. 6. Mulen-pullu; Rheede H. Mal. v. 12. 101. t. 54.)—Native of moiſt places in the Eaſt Indies. *Root* apparently annual. *Stems* numerous, from three to ſix inches high, glaucous as well as the leaves. *Spikes* of a ſilvery grey, numerous, in denſe heads. Vahl thinks

Scirpus monander of Rottboll, 50. t. 14. f. 3, is not different from this.

We believe this genus will receive augmentation from ſeveral ſpecies hitherto conſidered as *Scirpi,* but not yet deſcribed. As far as we have obſerved, the progreſſively denudated rachis of the ſpikes, from the deciduous glumes, is very characteriſtic of a *Fimbriſtylis*.

FIN, in *Geography*, a ſmall river of the county of Monaghan, Ireland, which riſes in the weſt of the county, and runs into Lough Erne.

Fin, *Pinna*, in *Natural Hiſtory*, the name of that part of a fiſh which diſtinguiſhes it from other aquatic creatures, no animal but a fiſh having fins and wanting legs.

The fin is properly a part ſtanding out or hanging from the body of the fiſh, and conſiſting of a membrane ſupported by ſeveral rays or oblong bones, which are in ſome hard and firm, and in others cartilaginous.

This definition of a fin properly excludes all thoſe other parts of a fiſh which may be prominent from the body, and may be of a membranaceous ſtructure, and even bear the appearance of a fin, though they have none of the rays or little bony ſubſtances within them, and therefore cannot ſerve the creature in the office of fins in ſwimming; for the cartilages or bones which ſupport the membranes of the fins are what give them their due and neceſſary ſtrength and firmneſs to bear againſt the water for the motion of the body of the fiſh; thoſe other membranaceous appendages to the bodies of fiſhes cannot do this; for wanting the ſupport of theſe rays, the ſimple and ſoft membrane has no more power of moving the water than the water has of moving it. Hence appears the uſe of the bones or rays ſupporting the fins, and the truth of the definition, that nothing is properly a fin which wants them.

The fins, by their differences, make very obvious diſtinctions among the ſeveral ſpecies of fiſh; and theſe differences are in regard to number, ſituation, figure, and proportion.

The number of the fins, including the tail, is very different in different fiſh. 1. In ſome there is only one fin to the whole fiſh: this is the caſe in the ophidium lumbriciforme, and in the muræna. 2. The fins are two in number in others, as in the petromyzæ, and the like. 3. There are many which have three fins, as the conger, the eel, the common ophidium, the Greenland whale, the ſea-cow, and the like. 4. Many have four fins; of the number of which are the dolphin, the phocœna, and the ſecond kind of the acus Ariſtotelis. 5. Several have five fins, as the ammodytes or ſand-eel, the ſword-fiſh, the lupus marinus, the mola or ſun-fiſh, and many others. 6. The lump-fiſh gives us an inſtance of ſix fins; for the ſeeming firſt fin on the back of that fiſh is not a real fin, but only a cutaneous prominence. 7. Many fiſh have ſeven fins, as the gudgeon, the pleuronectes, the cyprinus, the clupea, the coregones, the oſmeri, the ſalmons, the cobites, the eſoces, the cernua fluviatilis, the gaſteroſtei, the ſpari, the labri, the ſilurus, the mugil alatus, the remora, the capriſcus, the hippurus, the pompilus, and the accipenſer. 8. Many fiſh alſo have eight fins each; of this number are ſome of the pearches, the clarea, the cottus, the mugil, the labrax, the ſudis, the mulli, the ling, the trachurus, the ſcyæne, the trachinus, the uranoſcope, and that little fiſh called the anguella by the Venetians. 9. The ſcorpæna of Rondeletius gives us an inſtance of the fins being nine in number; and finally, the ſcombri and thynni give us inſtances of eleven fins in the ſame fiſh.

The differences in ſituation are leſs numerous than theſe as to number, but they are not leſs obvious and eſſential. 1. They are generally placed both on the back and belly, as we ſee in moſt of the ſpecies of fiſhes. 2. They are ſometimes placed only on the back; this is the caſe in the petromyzæ, the acus lumbriciformis, and ſome others. 3. Some have them, on the contrary, only on the belly; of this kind are the Greenland whale, the ſea-cow, and the like: and to this it is to be added, that the back and belly fins differ greatly in the ſeveral fiſh, in their being placed more or leſs backward or forward.

The differences of ſhape or figure in the fins of fiſhes are alſo very obvious. 1. They are in ſome nearly triangular, as in the cyprini and ſalmons, &c. 2. Some few fiſh have them round. And, 3. Some have them of an oblong ſquare or parallelogram ſquare.

Finally, the difference in proportion is not to be omitted, for they are in ſome much ſhorter and ſmaller than the body, as is the caſe in the generality of fiſh; but in others they are of an equal length with the body. Of this kind are the pectoral fins in ſome of the legyræ, and the ventral fins in the mugil alatus of Rondeletius and other authors. Artedi, Ichthyol. p. 4. See *Anatomy of* Fishes.

Fin, Fr. *Fine*, Ital. *Finis*, Latin, the end of a work, or, in *Muſic*, of a compoſition.

Fins *of Fiſh*, in *Natural Hiſtory*, is the name by which ſome foſſil relics have been denominated, owing to their reſemblance to that member of the finny tribe, in the preſent race: Mr. W. Martin recommends the claſſing of all theſe detached parts of reliquia under temporary ſpecies; there to remain, until the whole, or a ſufficient number of the parts of the ſame animal, ſhall be found united, to determine its place among the permanent ſpecies.

Fin, in *Rural Economy*, is a term frequently uſed to ſignify a ſharp cutting plate of iron, fixed upon the coulter or ſock of a plough, in order to render its operation or work more complete. It is moſtly had recourſe to in coarſe, tough, peaty ſorts of land.

Fin, a common name frequently applied to the troubleſome weed termed *reſt-karrow*.

Fin-*fiſh*, the *balena phyſalus* of Linnæus. See Physalus.

Fins, *Whale*, are commonly taken for that part of the whale which the populace call *whale-bone;* but whence the miſtake ſhould ariſe is not eaſy to determine.

Theſe whale-fins, as ſome have erroneouſly called them, are the moſt valuable part of the animal. See *Whale* Fishery, and Whale-*bone*.

FINAL, that which terminates or comes laſt in any thing, as a final judgment, final ſentence, &c.

Final *Cauſe*, is the end for which the thing is done. The final cauſe is the firſt thing in the intention of a perſon who does a thing; and the laſt, in the execution. See Cause.

Final *Decree*. See Decree.

Final *Judgment*. See Judgment.

Final *Letters* are thoſe which cloſe words.

The Hebrews have five final letters, which, when at the end of a word, have a different figure from what they have at the beginning or in the middle thereof. Theſe are the ך, ם, ן, ף, ץ, *caph*, *mem*, *nun*, *pe*, *tſade*, which every where but at the end of words, are wrote כ, מ, נ, פ, צ.

FINALE, in *Geography*, a town of Italy, in the department of the Panaro, on an iſland in the river Panaro; 18 miles N.N.E. of Modena.

Finale, a ſmall marquiſate, ſurrounded by the Ligurian republic, agreeable, fertile, and populous; which, after having frequently changed its poſſeſſors, at length became ſubject to the Ligurian republic. Its capital is a ſea-port town of the ſame name, having a good harbour on the coaſt of the Mediterranean; 31 miles S.W. of Genoa. N. lat. 44° 10′. E. long. 8° 24′.

Finale, Ital. in *Muſic*, the laſt chorus, or movement at the end of an act of an opera; and in ſymphonies, concertos, quartettos, or ſonatas, the laſt movement is called the *finale*. The finales of the Italian comic operas are the moſt ingenious, varied, pleaſing, and maſterly compoſitions which dramatic muſic can boaſt; particularly thoſe of Piccini, Paeſiello, Cimaroſa, and Mozart. Such a variety of meaſure, ſuch fire, grace, paſſion and pathos, by turns, that the hearer, at the end, is unable to ſay what movement or paſſage he likes beſt. They are extremely difficult to perform, yet the Italians, by dint of ſtudy and rehearſal, are no more embarraſſed than if, inſtead of ſinging, they were only talking and ſquabbling the whole time.

FINALIS Pausa, in old muſic, two Latin words. See Corona.

FINANCES, in *Political Economy*, denote the revenues of the king and ſtate; much the ſame with the fiſcus of the Romans. The word is derived from the German, *finantz*, *ſcraping*, *uſury*; though Du-Cange chooſes rather to deduce it from the barbarous Latin, *financia*, *præſtatio pecuniaria*.

The French have a peculiar kind of figures or numeral characters, which they call *chiffre de finance*. See Character.

Finances, *Britiſh*. See Fund and Revenue.

FINBO, in *Geography*, a mountain of the Lower Engadine; 8 miles N. of Traſp.

FINBY, a town of Sweden, on an iſland in the government of Abo; 28 miles S.S.E. of Abo. N. lat. 60° 7′. E. long. 23° 43′.

FINCASTLE, a poſt-town of America, in Virginia, and capital of Botetourt county, ſituated on the E. ſide of Catabaw creek, a ſmall ſtream which falls into James river, on the W. ſide of the North mountain. It has about 56 houſes, a court-houſe and gaol, and contains 426 free inhabitants, and 276 blacks. It lies on the poſt road from Richmond to Kentucky; 36 miles E. of Lexington.

FINCH, a townſhip in the county of Stormont, in Upper Canada, W. of Oſnabruck.

Finch, in *Ornithology*. See Fringilla.

Finch-*backed*, ſtreaked on the back with white. It is moſtly uſed in reſpect to cattle.

FINCHED, in *Rural Economy*, a term which is often uſed to ſignify cattle ſtreaked on the back or other parts with white ſpots or ſtripes.

FINCK, Herman, publiſhed at Wittemberg, in 1556, "Practica Muſica," in Latin, with examples of various characters, proportions, and canons, with opinions of the eccleſiaſtical modes or tones, and a more pleaſing and artificial method of ſinging. This may have been a uſeful tract when publiſhed, but it is dry, and little is to be learnt in it now, of material uſe.

FINDER, in *Optics*, a ſhort teleſcope, generally affixed to the tube of a large one, for the purpoſe of expeditiouſly finding out any object. This finder does not magnify the object more than four, ſix, or eight times; but it has a large field of view, ſo that a great part of the heavens may be ſeen through it at once. In the inſide of its tube, and exactly at the focus of the eye-glaſs, there are two ſlender wires, which croſs each other in the axis of the teleſcope. The finder is adjuſted by means of ſcrews upon the tube of the large teleſcope, in ſuch a manner, that, when an object, ſeen through the finder, appears to be near the croſſing of the above-mentioned wires, it is at the ſame time viſible through the large teleſcope; hence, when the obſerver wiſhes to view a ſmall diſtant object, as a ſtar, a planet, &c. he moves the inſtrument to one ſide or the other, until, by looking through the finder, he brings the object nearly to coincide with the croſſing of the wires. And when that takes place, he immediately looks through the large teleſcope.

Finders, in our *Old Statutes*, are ſuppoſed to be the ſame with thoſe we now call ſearchers, who are employed for the diſcovery of goods imported or exported without paying cuſtom. Stat. 18 Edw. III. 14 Ric. II. 17 Ric. II. &c.

Finder, among *Sportſmen*. See *Water*-Dog.

FINDHORN, in *Geography*, a fiſhing-town of Scotland, on the N. coaſt of the county of Murray, at the mouth of the river Findhorn, near the firth of Murray, with a tolerable harbour, and a large convenient bay; 9 miles W. of Elgin. N. lat. 57° 139′. W. long. 3° 29′.

FINDING *of a Bill of Indictment*, in *Law*. See Indictment.

FINE′, Oronce, in *Biography*, one of the moſt celebrated mathematicians of his time, was ſon of a phyſician at Briançon, where he was born in the year 1494. His father dying while he was very young, he was ſent to Paris, and, through the intereſt of Anthony Silveſter, obtained a place in the college of Navarre, where he went through a courſe of claſſical learning and philoſophy. His attention to polite literature did not prevent him from applying much of his attention to mathematics, which he found moſt congenial to his taſte and inclination. In theſe ſciences he had no inſtructor, and the ſtudy of them had fallen into diſrepute. Regardleſs of the prevailing faſhion of the age, he determined to proceed, and by the force of his own genius, and a ſedulous application, he made conſiderable progreſs in them. In 1519, he publiſhed an edition of "John Martin Siliceus's Arithmetic;" and afterwards, in 1523, he gave to the public a reviſed and improved edition of the "Margareta Philoſophica," containing the principles of rational and moral philoſophy. After this, for he was ſtill a ſtudent at the college of Navarre, he gave private lectures in the mathematics, and then became a public teacher of them in the college of Gervais. In this capacity he obtained ſo high a reputation, that Francis I. who had founded a new college at Paris, and who was deſirous of filling the profeſſorſhips with men of the firſt rate abilities, recommended Finè as the moſt proper perſon to teach the mathematics. This excellent mathematician, like many others who flouriſhed at the ſame period, was devoted to the art of judicial aſtrology, and, on one occaſion, he ſuffered a long and ſevere impriſonment, for preſuming to announce predictions that ſeemed to affect the court of France. Finè was likewiſe a good mechanician, and invented and conſtructed different inſtruments and pieces of mechaniſm, which added very much to his celebrity as a man of ſcience. Notwithſtanding his genius, aſſiduity, and extraordinary talents; and the eſteem in which he was held by an almoſt indefinite number of perſons, it was his hard lot never to receive an adequate reward for his great ſervices. Through the whole of life he had to ſtruggle with the evils of poverty, to the diſgrace of many who affected to value him very highly, and who could not but be well acquainted with his wants, but who nevertheleſs had not the ſpirit nor the virtue to afford him any aſſiſtance. He died in the utmoſt diſtreſs in 1555, leaving behind him a wife and ſix children, involved with debt, and deſtitute of all means of ſupport. Proviſion was, however, made for their decent maintenance, by thoſe who had pretended to patronize him while living. The works of Finè were publiſhed together in three volumes folio, which bear the dates of 1532, 1542, and 1546. Bayle. Moreri.

Fine, that which is pure, and without mixture. The term is particularly uſed in ſpeaking of gold or ſilver. See Gold and Silver.

Fine, *finis*, or *finalis concordia*, in *Law*, denotes a ſolemn amicable agreement or compoſition of a ſuit (whether that ſuit be real or fictitious) made between the demandant and tenant, with the conſent of the judges; and enrolled among the records of the court where the ſuit was commenced; by which agreement freehold property may be transferred, ſettled, and limited. (Cruiſe on Fines.) Sometimes, ſays Shepherd (Touchſt. c. 3.) it is taken for "a final agreement or conveyance upon record for the ſettling and ſecuring of lands and tenements;" and accordingly it is deſignated by ſome to be "an acknowledgment, in the king's court, of the land or other things to be his right that doth complain;" and by others "a covenant made between parties, and recorded by the juſtices;" and by others "a friendly, real, and final agreement amongſt parties, concerning any land, rent, or other thing, whereof any ſuit or writ is hanging between them in any court;" and by others more fully "an inſtrument of record of an agreement concerning lands, tenements, or hereditaments; duly made by the king's licence, and acknowledged by the parties to the ſame, upon a writ of covenant, writ of right, or ſuch like, before the juſtices of the Common Pleas, or others thereunto authorized, and engroſſed of record in the ſame court; to end all controverſies thereof, both between themſelves, which be parties and privies to the ſame, and all ſtrangers not ſuing or claiming in due time."

A fine is ſometimes ſaid to be a feoffment of record (Co. Litt. 50.); though it might be more accurately called an acknowledgment of a feoffment on record; by which is to be underſtood, that it has at leaſt the ſame force and effect with a feoffment, in the conveying and aſſuring of lands; though it is one of thoſe methods of transferring eſtates of freehold by the common law, in which livery of ſeiſin is not neceſſary to be actually given; the ſuppoſition and acknowledgment thereof in a court of record, however fictitious, inducing an equal notoriety. But, more particularly, a fine may be deſcribed to be an amicable compoſition or agreement of a ſuit, either actual or fictitious, by leave of the king or his juſtices; whereby the lands in queſtion become, or are acknowledged to be, the right of one of the parties. (Co. Litt. 120.) In its original it was founded on an actual ſuit, commenced at law for recovery of the poſſeſſion of land or other hereditaments; and the poſſeſſion thus gained by ſuch compoſition was found to be ſo ſure and ſo effectual, that fictitious actions were, and continue to be, every day commenced, for the ſake of obtaining the ſame ſecurity. A fine is ſo called becauſe it puts an *end*, *finis*, not only to the ſuit thus commenced, but alſo to all other ſuits and controverſies concerning the ſame matter. Accordingly it is ſo expreſſed in an ancient record of parliament, 18 Edw. I. Fines, indeed, are of equal antiquity with the firſt rudiments of the law itſelf: they are ſpoken of by Glanvil and Bracton in the reigns of Henry II. and Henry III. as things then well known and long eſtabliſhed; and inſtances of them have been produced even prior to the Norman invaſion. (Plowd. 369.) So that the ſtatute of 18 Edw. I. called "Modus levandi fines," did not give them original, but only declared and regulated the manner in which they ſhould be levied, or carried on. This is as follows:

1. The party, to whom the land is to be conveyed or aſſured, commences an action or ſuit at law, againſt the other, generally an action of covenant, by ſuing out a writ or "præcipe," called a writ of covenant; the foundation of which is a ſuppoſed agreement or covenant, that the one ſhall convey the lands to the other; on the breach of which agreement the action is brought. On this writ there is due to the king, by ancient prerogative, a "primer fine," or a noble for every five marks of land ſued for; that is, one-tenth of the annual value. (2 Inſt. 511.) The ſuit being thus commenced, there follows

2. The "licentia concordandi," or leave to agree the ſuit. For, as ſoon as the action is brought, the defendant, knowing himſelf to be in the wrong, is ſuppoſed to make overtures of peace and accommodation to the plaintiff; who accepting them, but having, upon ſuing out the writ, given pledges to proſecute his ſuit, which he endangers if he now deſerts it without licence, he applies to the court for leave to make up the matter. This leave is readily granted; but for it there is alſo another fine due to the king, by his prerogative, which is an ancient revenue of the crown, and is called the "king's ſilver," or ſometimes the "poſt-fine," with reſpect to the "primer-fine," before-mentioned. And this is as much as the "primer-fine," and half as much more, or 10 ſhillings for every mark of land; that is, three twentieths of the ſuppoſed annual value. (5 Rep. 39. 2 Inſt. 511. Stat. 32 Geo. II. c. 14.)

3. Next comes the "concord," or agreement itſelf, after leave obtained from the court; which is uſually an acknowledgment from the deforciants (or thoſe who keep the other out of poſſeſſion,) that the lands in queſtion are the right of the complainant. And from this acknowledgment, or recognition of right, the party levying the fine is called the "cognizor," and he to whom it is levied the "cognizee." This acknowledgment muſt be made either openly in the court of Common Pleas, or before the lord chief juſtice of that court; as alſo before one of the judges of that court, or two or more commiſſioners in the county, empowered by a ſpecial authority called a writ of "dedimus poteſtatem;" which judges and commiſſioners are bound by ſtatute 18 Edw. I. ſt. 4. to take care that the cognizors be of full age, ſound memory, and out of priſon. If there be any feme-covert among the cognizors, ſhe is privately examined whether ſhe does it willingly and freely, or by compulſion of her huſband.

By theſe acts all the eſſential parts of a fine are completed; and if the cognizor dies the next moment after the fine is acknowledged, provided it be ſubſequent to the day on which the writ is made returnable (Comb. 71.), ſtill the fine ſhall be carried on in all its remaining parts; of which the next is

4. The "note" of the fine; which is only an abſtract of the writ of covenant and the concord; naming the parties, the parcels of land, and the agreement. This muſt be enrolled of record in the proper office, by direction of the ſtatute 5 Hen. IV. c. 14.

5. The fifth part is the "foot" of the fine, or concluſion of it; which includes the whole matter, reciting the parties, day, year, and place, and before whom it was acknowledged or levied. Of this there are indentures made, or engroſſed, at the chirographer's office, and delivered to the cognizor and the cognizee; uſually beginning thus, "hæc eſt finalis concordia," or "this is the final agreement," and then reciting the whole proceeding at length. Thus the fine is completely levied at common law. By ſeveral ſtatutes ſome additional ſolemnities are introduced, in order to render the fine more univerſally public, and leſs liable to be levied by fraud or covin. And firſt, by 27 Edw. I. c. 1. the note of the fine ſhall be openly read in the court of Common

Pleas, at two ſeveral days in one week, and during ſuch reading all pleas ſhall ceaſe. By 5 Hen. IV. c. 14. and 23 Eliz. c. 3. all the proceedings on fines, either at the time of acknowledgment, or previous, or ſubſequent thereto, ſhall be enrolled of record in the court of Common Pleas. By 1 Ric. III. c. 7. confirmed and enforced by 4 Hen. VII. c. 24. the fine, after engroſſment, ſhall be openly read and proclaimed in court (during which all pleas ſhall ceaſe) ſixteen times, *viz.* four times in the term in which it is made, and four times in each of the three ſucceeding terms; which is reduced to once in each term by 31 Eliz. c. 2; and theſe proclamations are endorſed on the back of the record. It is alſo enacted by 23 Eliz. c. 3. that the chirographer of fines ſhall every term write out a table of the fines levied in each county in that term, and ſhall affix them in ſome open part of the court of Common Pleas all the next term; and ſhall alſo deliver the contents of ſuch table to the ſheriff of every county, who ſhall at the next aſſizes fix the ſame in ſome open place in the court, for the more public notoriety of the fine.

Fines, thus levied, are of four kinds: 1. What is in our law French called a fine "ſur cognizance de droit, come ceo que il ad de ſon done," or a fine upon acknowledgment of the right of the cognizee, as that which he hath of the gift of the cognizor. This is the beſt and ſureſt kind of fine; for thereby the deforciant, in order to keep his covenant with the plaintiff, of conveying to him the lands in queſtion, and at the ſame time to avoid the formality of an actual feoffment and livery, acknowledges in court a former feoffment, or gift in poſſeſſion, to have been made by him to the plaintiff. This fine is therefore ſaid to be a feoffment of record; the livery thus acknowledged in court being equivalent to an actual livery; ſo that this aſſurance is rather a confeſſion of a former conveyance than a conveyance now originally made; for the deforciant, or cognizor, acknowledges, "cognoſcit," the right to be in the plaintiff, or cognizee, as that which he hath "de ſon done," of the proper gift of himſelf, the cognizor. 2. A fine "ſur cognizance de droit tantum," or upon acknowledgment of the right merely; not with the circumſtance of a preceding gift from the cognizor. This is commonly uſed to paſs a *reverſionary* intereſt, which is in the cognizor. For of ſuch reverſions there can be no feoffment, or donation with livery, ſuppoſed; as the poſſeſſion during the particular eſtate belongs to a third perſon. (Moor. 629.) It is thus worded: "that the cognizor acknowledges the right to be in the cognizee; and grants for himſelf and his heirs, that the reverſion, after the particular eſtate determines, ſhall go to the cognizee. (Weſt. Symb. p. 2. § 95.) 3. A fine "ſur conceſſit" is, where the cognizor, in order to make an end of diſputes, though he acknowledges no precedent right, yet grants to the cognizee an eſtate "de novo," uſually for life or years, by way of ſuppoſed compoſition. And this may be done reſerving a rent, or the like; for it operates as a new grant. (Weſt. p. 2. § 66.) 4. A fine "ſur done, grant, et render" is a double fine, comprehending the fine "ſur cognizance de droit come ceo, &c." and the fine "ſur conceſſit:" and may be uſed to create particular limitations of eſtate; whereas the fine "ſur cognizance de droit come ceo, &c" conveys nothing but an abſolute eſtate, either by inheritance, or at leaſt of freehold. (Salk. 340.) In this laſt ſpecies of fine, the cognizee, after the right is acknowledged to be in him, grants back again, or renders to the cognizor, or perhaps to a ſtranger, ſome other eſtate in the premiſes. But, in general, the firſt ſpecies of fine, "ſur cognizance de droit come, &c." is the moſt uſed, as it conveys a clear and abſolute freehold, and gives the cognizee a ſeiſin in law, without any actual livery; and is therefore called a "fine executed," whereas the others are but "executory."

The force and effect of a fine principally depend, at this day, on the common law; and the two ſtatutes, 4 Hen. VII. c. 24. and 32 Hen. VIII. c. 36. The ancient common law, with reſpect to this point, is very forcibly declared by the ſtatute 18 Edw. I.; which ſtates that the fine is ſo high a bar, and of ſuch force, that it precludes not only thoſe which are parties and privies to the fine, and their heirs, but all other perſons in the world, who are of full age, out of priſon, of ſound memory, and within the four ſeas, the day of the fine levied; unleſs they put in their claim on the foot of the fine within a year and a day. But this doctrine of barring the right by "non-claim" was aboliſhed for a time by a ſtatute made in 34 Edw. III. c. 16. which admitted perſons to claim, and falſify a fine, at any indefinite diſtance (Litt. § 441.); whereby, as ſir Edward Coke obſerves, (2 Inſt. 518.) great contention aroſe, and few men were ſure of their poſſeſſions, till the parliament, held 4 Hen. VII. reformed that miſchief, and excellently moderated between the latitude given by the ſtatute and the rigour of the common law. By that ſtatute the right of all ſtrangers whatſoever is bound, unleſs they make claim, by way of action or lawful entry, not within *one* year and a day, as by the common law, but within *five* years after proclamations made: except feme-coverts, infants, priſoners, perſons beyond the ſea, and ſuch as are not of able mind; who have five years allowed to them and their heirs, after the death of their huſbands, their attaining full age, recovering their liberty, returning into England, or being reſtored to their right mind. Henry VII. ſeems by this ſtatute to have covertly extended fines ſo as to have been a bar of eſtates-tail, in order to render them more open to alienations; but doubts having ariſen whether they could, by mere implication, be adjudged a ſufficient bar (which are expreſsly declared *not* to be by the ſtatute "de donis"), the ſtatute 32 Hen. VIII. c. 36. was thereupon made, which declares that a fine levied by any perſon of full age, to whom or to whoſe anceſtors lands have been entailed, ſhall be a perpetual bar to them and their heirs, claiming by force of ſuch entail; unleſs the fine be levied by a woman after the death of her huſband, of lands which were, by the gift of him or his anceſtor, aſſigned in tail to her for her jointure (ſtat. 11 Hen. VII. c. 20.); or unleſs it be of lands entailed by act of parliament or letters patent, and whereof the reverſion belongs to the crown.

From the view now given of the common law, regulated by theſe ſtatutes, it appears that a fine is a ſolemn conveyance on record from the cognizor to the cognizee; and that the perſons bound by a fine are *parties*, *privies*, and *ſtrangers*. The *parties* are either the cognizors or cognizees; and theſe are immediately concluded by the fine, and barred of any latent right they might have, though under the legal impediment of coverture. And, indeed, as this is almoſt the only act that a feme-covert or married woman is permitted by law to do, (and that becauſe ſhe is privately examined as to her voluntary conſent, which removes the general ſuſpicion of compulſion by her huſband), it is therefore the uſual and almoſt the only ſafe method whereby ſhe can join in the ſale, ſettlement, or incumbrance of any eſtate. *Privies* to a fine are ſuch as are any way related to the parties who levy the fine, and claim under them by any right of blood, or other right of repreſentation. Such as are the heirs-general of the cognizor, the iſſue in tail ſince the ſtatute of Henry VIII., the vendee, the deviſee, and all others who muſt make title by the perſons who levied the fine. For the act of the anceſtor ſhall bind the heir, and the act of the principal his ſubſtitute, or ſuch as claim under any conveyance made by him ſubſequent to the fine ſo levied. (3 Rep. 87.) *Strangers* to a fine are all other perſons, except parties and privies. Theſe are alſo bound by a fine, unleſs, within five years after proclamation made, they interpoſe their claim, provided they are under no legal impediment, and have then a preſent intereſt in the eſtate. The impediments, as we have already mentioned, are coverture, infancy, impriſonment, inſanity, and abſence beyond ſea: and perſons, who are thus incapacitated to proſecute their rights, have five years allowed them to put in their claims after ſuch impediments are removed. Perſons alſo that have not a preſent, but a future intereſt only, as thoſe in remainder or reverſion, have five years allowed them to claim in, from the time that ſuch right accrues. (Co. Litt. 372.) And if within that time they neglect to claim, or (by the ſtatute 4 Ann. c. 16.) if they do not bring an action to try the right within one year after making ſuch claim, and proſecute the ſame with effect, all perſons whatſoever are barred of whatever right they may have, by force of the ſtatute of non-claim. But, in order to make a fine of any avail at all, it is neceſſary that the parties ſhould have ſome intereſt or eſtate in the lands to be affected by it. Elſe it were poſſible that two ſtrangers, by a mere confederacy, might without any riſk defraud the owners by levying fines of their lands; for if the attempt be diſcovered, they can be no ſufferers, but muſt only remain in *ſtatu quo;* whereas, if a tenant for life levies a fine, it is an abſolute forfeiture of his eſtate to the remainder-man or reverſioner (Co. Litt. 251.) if claimed in proper time. It is not therefore to be ſuppoſed that ſuch tenants will frequently run ſo great a hazard; but if they do, and the claim is not duly made within five years after their reſpective terms expire (2 Lev. 52.), the eſtate is for ever barred by it. Yet where a ſtranger, whoſe preſumption cannot be thus puniſhed, officiouſly interferes in an eſtate which in no wiſe belongs to him, his fine is of no effect; and may at any time be ſet aſide (unleſs by ſuch as are parties or privies thereunto (Hob. 334.) by pleading that "partes finis nihil habuerunt." And even if a tenant for years, who hath only a chattel intereſt, and no freehold in the land, levies a fine, it operates nothing, but is liable to be defeated by the ſame plea. (5 Rep. 123 Hardr. 401.) Wherefore, when a leſſee for years is diſpoſed to levy a fine, it is uſual for him to make a feoffment firſt, to diſplace the eſtate of the reverſioner (Hardr. 402. 2 Lev. 52.), and create a new freehold by diſſeiſin. Blackſt. Com. Book ii. See RECOVERY.

In order to puniſh criminally ſuch as thus put the eſtate of another to the hazard as far as in them lies, the ſtat. 21 Jac. I. c. 26. makes it felony without benefit of clergy to acknowledge, or procure to be acknowledged, any fine, recovery, or judgment, &c. in the name of any perſon not privy or conſenting to the ſame.

Fines may be reverſed for error, ſo as the writ of error be brought in 20 years, &c. and not afterwards by ſtat. 10 & 11 W. III. c. 14. which 20 years are to be computed from the time of the fine levied, and not from the time the title accrued (2 Stra. 1257.) No perſon can bring a writ of error to reverſe a fine, or any judgment, that is not intitled to the land, of which the fine was levied. In order to avoid a fine there muſt be an actual entry, except where the fine is levied without proclamations; for the ſtatute 4 H. VII. c. 24. does not extend to ſuch a fine, and it may be avoided at any time within 20 years. (2 Wilſ. 45.) The entry, when neceſſary, muſt be made by the perſon who has a right to the lands, or by ſome one appointed by him. (1 Inſt. 258 *a.*) Nothing can be aſſigned for error that contradicts the record. (1 Rol. Abr. 757.) Fines are not reverſible for raſure, interlineation, miſentry, or any want of form, but it is otherwiſe if of ſubſtance. (Stat. 23 Eliz. c. 3.) Fines may be avoided, where they are obtained by fraud, covin, or deceit, though there be no error in the proceſs. (Cro. Eliz. 471.)

Fines are generally divided into thoſe with, and thoſe without proclamations; the former is termed a fine according to the ſtatutes 1 R. III. c. 7. 4 H. VII. c. 24; and the latter is called a fine of the common law, being levied in ſuch manner as was uſed before the ſtatute 4 H. VII. c. 24; and is ſtill of the like force by the common law, to diſcontinue the eſtate of the cognizor, if the fine be executed.

Fines are either *ſingle* or *double. Single* fine is that by which nothing is granted or rendered back again by the cognizees to the cognizors, or any of them. *Double* fine contains a grant and render-back, either of ſome rent, common, or other thing out of the land, or of the land itſelf, to all or ſome of the recognizors for ſome eſtate, limiting thereby remainders to ſtrangers not named in the writ of convenant.

In this kind of fine, called "ſur done, grant and render," both the fines "ſur cognizance, &c." and "ſur conceſſit," are formed into one; and it is partly executed and partly executory. See FINE above.

Sometimes alſo a *double* fine is when the lands lie in ſeveral counties.

Fines, with regard to their effect, are divided into *executed* and *executory.* Fine *executed,* is ſuch as of its own force gives a preſent poſſeſſion (at leaſt in law) to a cognizee; ſo that he needs no writ of "habere facias ſeiſinam" for execution of the ſame: of which ſort is a fine "ſur cognizance de droit come ceo, &c." that is, upon acknowledgment, that the thing mentioned in the concord is "jus ipſius cogniſati, ut illa quæ idem habet de dono cognitoris." Weſt. § 51. K.

The reaſon is, becauſe the fine paſſeth by way of releaſe of a thing which the cognizee hath already (at leaſt by ſuppoſition) by virtue of a former gift to the cognizor, which is, in truth, the ſureſt fine of all. See FINE, ſupra.

Fines *executory,* are ſuch as of their own force do not execute or give the poſſeſſion to the cognizee without entry or action, but require a writ of "habere facias ſeiſinam;" as a fine "ſur cognizance de droit tantum," unleſs the party be in poſſeſſion of the lands. This kind of fine is commonly made uſe of to paſs a reverſion There is alſo another executory fine called "ſur conceſſit." See FINE, ſupra.

Fines in England are now levied in the court of Common Pleas at Weſtminſter, in regard to the ſolemnity thereof, ordained by the ſtatute of 18 Ed. I. ſtat. 4. before which time they were ſometimes levied in the county-court, court-barons, and in the exchequer, as may be ſeen in Origines Juridiciales, &c.

Fines are alſo taken by commiſſioners in the country, empowered by *dedimus poteſtatem.* 15 Ed. II. ſtat. *de fin.* Though by the common law all fines were levied in the court. Fines levied befor the juſtices in Wales, or in the counties palatine of Cheſter, Durham, &c. have the ſame effect as thoſe that are levied before the juſtices of C. B.

FINE *adnullando levato de tenemento quod fuit de antiquo dominico,* a writ directed to the juſtices of C. B. for diſannulling a fine levied of lands in ancient demeſne to the prejudice of the lord. Reg. Orig. 15.

Fines *for alienation*, are fines formerly paid to the king by his tenants in chief, for licence to alienate their lands; according to the ſtatute 1 Edw. III. c. 12. but taken away by ſtatute 12 Car. II. cap. 24.

Fine *capiendo pro terris*, &c. a writ lying where a perſon upon conviction of any offence by jury hath his lands and goods taken into the king's hands, and his body is committed to priſon; to be remitted his impriſonment, and have his lands and goods re-delivered him on obtaining favour for a ſum of money. Reg. Orig. 142.

Fine *force*, is an expreſſion in ſtat. 35 Hen. VIII. cap. 12. denoting that a perſon is forced to do that which he can in no way avoid.

Fine *levando de tenementis de rege in capite*, &c. a writ directed to the juſtices of the Common Pleas to admit of a fine for the ſale of land holden of the king *in capite*. Reg. Orig. 167.

Fine *non capiendo pro pulchre placitando*, a writ to inhibit officers of courts to take fines for fair pleading. Reg. Orig. 179.

Fine *pro rediſſeiſina capienda*, &c. a writ lying for the releaſe of one impriſoned for a rediſſeiſin, on payment of a reaſonable fine. Reg. Orig. 222.

Fines *le roy*, are all fines to the king. Under this head are included fines for original writs. Thus, for every writ of plea of land, if it be not of right patent, which is for the yearly value of five marks, and for all original writs in debt and treſpaſs, where the debt or damage is 40*l.* a fine is due to the king of 6*s.* 8*d.* and more proportionably when the writ is for greater value.

Fine alſo, according to Cowel, ſignifies a ſum of money paid as an income for lands or tenements let by leaſe, anciently called *gerſuma*.

Fine is alſo uſed to denote an amends, pecuniary puniſhment, or recompence, for an offence committed againſt the king and his laws, or againſt the lord of a manor. In which caſe a man is ſaid, *facere finem de tranſgreſſione cum rege*, &c.

In all the diverſities of the uſe of the word fine, it hath but one ſignification; and that is, a final concluſion, or end of differences between parties. In the laſt ſenſe, where it denotes the ending and remiſſion of an offence, it is uſed by Bracton, who ſpeaks of a *common fine* that the country pays to the king for falſe judgments or other treſpaſſes, which is to be aſſeſſed by the juſtices in eyre before their departure, by the oaths of knights and other good men, upon ſuch as ought to pay it. There is alſo a common fine in courts leet.

The diſcretionary fines (and diſcretionary length of impriſonment) which our courts are enabled to impoſe, may ſeem an exception to the general rule, that the puniſhment of every offence is aſcertained by the law. But the general nature of the puniſhment, *viz.* by fine or impriſonment, is fixed and determinate; though the duration and quantity of each muſt frequently vary, from the aggravations, or alleviations, of the offence, the quality and condition of the parties, and innumerable other circumſtances. The *quantum*, in particular, of pecuniary fines neither can, nor ought to be, aſcertained by any invariable law. The value of money is fluctuating; and what would be ruin to one man's fortune may be matter of indifference to another's. Thus the law of the twelve tables at Rome fined every perſon, that ſtruck another, twenty-five denarii; and this, in the more opulent days of the empire, became a puniſhment of ſo little conſideration, that Aulus Gellius tells a ſtory of one Lucius Neratius, who diverted himſelf by giving a blow to any perſon at pleaſure, and then tendering the legal forfeiture. Our ſtatute law has not therefore often aſcertained the quantity of fines, nor the common law ever; merely directing ſuch an offence to be puniſhed by fine in general, without ſpecifying the certain ſum: and this will appear to be fully ſufficient, when we conſider that, however unlimited the power of the court may ſeem, it is far from being wholly arbitrary; but its diſcretion is regulated by law. For the bill of rights (ſtat. 1 W. and M. ſt. 2. c. 2.) has particularly declared, that exceſſive fines ought not to be impoſed, nor cruel and unuſual puniſhments inflicted (which had a retroſpect to ſome unprecedented proceedings in the court of king's bench, in the reign of king James II.); and the ſame ſtatute farther declares, that all grants and promiſes of fines and forfeitures of particular perſons, before conviction, are illegal and void. Now the bill of rights was only declaratory of the old conſtitutional law; and accordingly we find it expreſsly holden, long before (2 Inſt. 48.) that all ſuch previous grants are void; ſince thereby many times undue means, and more violent proſecution, would be uſed for private lucre, than the quiet and juſt proceeding of the law would permit.

The reaſonableneſs of fines in criminal caſes has alſo been uſually regulated by the determination of "Magna Charta" (c. 14.) concerning amercements for miſbehaviour by the ſuitors in matters of civil right. See Amercement.

Courts of record may fine for an offence committed in court in their view, or by confeſſion of the party recorded in court. (1 Lill. Abr. 621.) A man ſhall be fined and impriſoned for all contempts done to any court of record, againſt the commandment of the king's writ, &c. (9 Rep. 60.) See Contempt. Some courts may impriſon, and not fine, as the conſtables at the petit ſeſſions; ſome courts cannot fine, or impriſon, but amerce, as the county, hundred, &c.; but ſome courts can neither fine, impriſon, nor amerce, as eccleſiaſtical courts held before the ordinary, archdeacon, &c. or their commiſſaries, and ſuch who proceed according to the canon, or civil law. (11 Co. 43, 44.)

A fine may be mitigated the ſame term it was ſet, being under the power of the court during that time, but not afterwards. (T. Raym. 376.) And fines aſſeſſed in court by judgment upon an information, cannot be afterwards mitigated. (Cro. Car. 201.) If a fine certain is impoſed by ſtatute upon any conviction, the court cannot mitigate it; but if the party comes in before conviction, and ſubmits to the court, they may aſſeſs a leſs fine; for he is not convicted, and perhaps never might. The court of exchequer may mitigate a fine certain, becauſe it is a court of equity, and they have a privy-ſeal for it. (3 Salk. 33.) If an exceſſive fine is impoſed at the ſeſſions, it may be mitigated at the king's bench. (1 Vent. 336.)

All fines belong to the king, becauſe the courts of juſtice are ſupported at his charge; and wherever the law puts the king to any charge for the ſupport and protection of his people, it provides money for that purpoſe. (Bract. 129.)

Fine-*drawing*, or *rentering*, a very nice way of ſewing up or rejoining the parts of any cloth, ſtuff, or the like, torn or rent in the dreſſing, wearing, &c.

It is prohibited to fine-draw pieces of foreign manufacture upon thoſe of our own, as has formerly been practiſed. See Rentering.

Fine *Loch*, in *Geography*, is one of the extenſive inland waters of Argyleſhire, in Scotland, connecting with the ſea by means of the eſtuary of the Clyde rivers, and by Kylbrannin ſound on the weſt of the iſle of Arran: it has alſo another communication with Clyde river by means of the Kyles of Bute on the weſt of Bute iſland. The principal branch of Fine Loch extends a few miles to the N.E. of the town of Inverary; from the top of Gilp Loch, which is a branch of this loch, the Crinan canal proceeds, for the paſſage of ſhips to the weſt into Crinan Loch, and the ſound of Jura. From Eaſt Tarbeth Loch, another ſhort branch of Fine Loch, the Tarbeth canal was, in 1773, propoſed by Mr. Watt to form another communication with the ſound of Jura, by means of Weſt Tarbeth Loch. See Canal.

Fine-*ſtiller*, in the *Diſtillery*; that branch of the art which is employed on the diſtilling the ſpirit from treacle or other preparations or recrements of ſugar, is called *fine-ſtilling*, by way of diſtinction from malt-ſtilling; and the perſon who exerciſes this part of the trade is called a fine-ſtiller.

The operation in procuring the ſpirit from ſugar is the ſame with that uſed in making the malt ſpirit; a waſh of the ſaccharine matter being made with water from treacle, &c. and fermented with yeaſt. It is uſual to add in this caſe, however, a conſiderable portion of malt, and ſometimes powdered jalap, to the fermenting backs. The malt accelerates the fermentation, and makes the ſpirit come out the cheaper, and the jalap prevents the riſe of any muſty head on the ſurface of the fermenting liquor, ſo as to leave a greater opportunity for the free acceſs of the air, and thus to ſhorten the work, by turning the foamy into a hiſſing fermentation. Shaw's Lect. p. 220.

FINECHIOLARO, in *Geography*, a ſmall iſland in the Mediterranean, near the N.E. coaſt of the iſland of Corſica; 7 miles N. of Baſtia. N. lat. 42° 58′. E. long. 9° 39′.

FINEERING. See Veneering.

FINERS *of Gold and Silver*, are thoſe who purify and part thoſe metals from other coarſer ones by fire and acids.

They are alſo called *parters*, in our old law-books, and ſometimes *departers*.

FINERY, in the *Iron-works*, is one of the two forges at which they hammer the ſow or pig iron. See Forge.

Into the finery they firſt put the pigs of iron, placing three or four of them together behind the fire, with a little of one end thruſt into it; where ſoftening by degrees, they ſtir and work them with long bars of iron, and expoſe at different times different parts to the blaſt of the bellows, in order to refine it as equally as poſſible, till the metal runs together with a round maſs or lump, which they call a *half-bloom*. They then take this out, and give it a few ſtrokes with their ſledges; afterwards they carry it to a great heavy hammer, raiſed by the motion of a water-wheel; where, applying it dexterouſly to the blows, they preſently beat it out into a thick ſhort ſquare. This they put into the finery again, and, heating it red-hot, they work it out under the ſame hammer till it comes to be in the ſhape of a bar in the middle, but with two ſquare nobs at the ends, which they call an *ancony*. It is then carried into the other forge, called the *chafery*. Phil. Tranſ. No. 137, or Abr. vol. ii. p. 559. See Iron.

FINESSE, a French term, of late current in Engliſh. Literally, it is of no farther import than our Engliſh *fineneſs*; but among us it is chiefly uſed to denote that peculiar delicacy or ſubtlety perceived in works of the mind, and the niceſt and moſt ſecret and ſublime parts of any ſcience or art.

It is ſometimes uſed to expreſs that kind of ſubtlety made uſe of for the purpoſes of deception.

FINGAH, in *Ornithology*. See Lanius *Cæruleſcens*.

FINGAL, in *Biography*, the diſtinguiſhed hero whoſe exploits and character are ſo charmingly pourtrayed in the faſcinating poems of Oſſian, who, notwithſtanding what has been advanced againſt their exiſtence in the Gaelic language, from which they were profeſſedly tranſlated; was a real perſonage, a famous warrior, and renowned prince. The controverſy reſpecting the genuineneſs of the originals was at one time as long and as ably defended by the partizans on each ſide the queſtion, as that on the ſubject reſpecting the authenticity of the Epiſtles of Phalaris by the critics of the day, under thoſe able leaders in controverſy, Boyle and Bentley. What was the family name of this ſuppoſed fictitious hero of romance, but really the gallant defender of his country from Roman ſubjugation, does not appear on the face of hiſtory; in that early period it not unfrequently happened, the real name was ſunk in the official deſignation, or honorial title. He was the ſon of Comhal, the grandſon of Truthal, and the great grandſon of Trenmôr, all Caledonian princes of great military reputation, during the ſevere ſtruggles the Celtic tribes held with the invaders of Britain. He was king of Morven, a country to the north of the river Tay, ſuppoſed by ſome to have had for its ſouthern boundary the Caledonian foreſt; and by others to have extended farther ſouthward, into part of the Roman province of Valentia: it doubtleſs, from the beſt authorities, compriſed the whole of the northern and weſtern Highlands, incluſive of the Hebrides or Weſtern iſles. His principal reſidence was at Selma, in the vicinity of Glenco, county of Moray, ſuppoſed to be the Cona celebrated by Oſſian. According to the Iriſh annals, he was born A.D. 282; but the poems of Oſſian fix the date of his birth a few years later. The time of his death is uncertain.

After the Romans had overrun the country of the Picts, and given to that part of the iſland to the north of their province, Valentia, the name of Caledonia, as the country next to be ſubdued, and penetrated part of the Highlands with an army under Lollius; they were repulſed and beaten back behind the frontier wall, erected at the command of Severus, by the ſuperior proweſs and valour of the troops under Comhal. On this occaſion, the exploits performed by the ſon of that prince evinced he was equally qualified by talents, as deſcent, to be the antagoniſt of a Roman emperor, and the hero of Oſſian; when Severus determined to conduct the war in perſon through North Britain, to wipe off the diſgrace of his defeated legions under Lollius, and revenge the ſeverities inflicted on his troops by the outraged natives; he paſſed the two walls for theſe purpoſes, with the collected force of the empire in Britain; and entered with a ſpirit of vengeance, and reiterated menaces of extirpation, the diſtrict of Caledonia. At that period, the prince denominated Fingal was the head of the united Britiſh forces in the north, the Vind-galt of the combined army, a ſtation or office ſimilar to that of the Pendragon among the weſtern Britons; which has likewiſe been confounded with the family names, and conſidered a perſonal appellation. The haughty and enraged emperor was met by the undaunted Fingal, whoſe troops, well acquainted with the defiles and paſſes of the country, hung upon the invader's rear, haraſſed the imperial army in its march, ſelected advantageous ground, and made at every turn vigorous attacks, and frequently drew the enemy into inſidious and fatal ambuſcades. Thus wearied and reduced by the ſuperior manœuvering of their bold and vigilant opponents, the Romans experienced the greateſt diſtreſs, ſo as to be obliged to deſtroy their ſick and wounded, leſt they ſhould fall alive into the hands of what they conſidered a barbarous enemy. In this expedition alone, according to Ammianus Marcellinus, they loſt 50,000 men, and were conſtrained to cede to the victors that part of the country conquered by Lollius. And when the Romans, after being reinforced, again entered the country under the command of Caracalla, who was commiſſioned to exterminate the natives, Fingal met the Roman general in that part, now the county of Stirling, the latter was defeated on the banks of the Carron, the conteſted dominions given up, and the Romans again obliged to retire to the ſouth of the wall. Excluſive of theſe conteſts, in which, through a protracted warfare, he diſplayed a ſuperior proweſs, and undaunted intrepidity, he appears to have conducted alſo naval wars. He is ſtated to have made frequent voyages to Scandinavia, the Orknies, and Ireland, deſignated by Oſſian, as Locklin, Inniſtore, and Ullin.

“The character of Fingal,” Dr. Blair obſerves, “is perhaps the moſt perfect that was ever drawn by a poet, for we boldly defy all the writers of antiquity to ſhew us any hero equal to Fingal. Throughout the whole of Oſſian's works, he is preſented to us in all that variety of lights which give the full diſplay of a character. In him concur almoſt all the qualities that can ennoble human nature, that can make us admire the hero, or love the man. He is not only unconquerable in war, but he maketh his people happy by his wiſdom in the days of peace. He is truly the father of his people.” Whitaker's Hiſtory of Mancheſter. Oſſian's Poems, with notes, &c.

FINGAMO, in *Geography*, a town of Japan, on the iſland of Niphon; 45 miles N. of Meaco.

FINGERS, in *Anatomy*, the laſt diviſions of the upper extremity. For their names, ſee DIGITUS. The bones and joints of the fingers are deſcribed in the article EXTREMITIES. The ſtructure of theſe organs, conſiſting of three bones moveable on each other, renders them particularly well ſuited for graſping, ſeizing, and holding external objects; for all thoſe offices which come under the common name of prehenſion. By this arrangement any object of moderate ſize can be encircled by the fingers. The ſize of the bones, the firmneſs of the joints, and the ſtrength of the muſcles, beſtow on them great powers in addition to their flexibility. The integuments at their extremities are highly organized, and receive a large ſupply of veſſels and nerves, ſo as to conſtitute them the organs of touch, and the facility with which they can be applied to any body, of which we are deſirous to learn the properties, makes them a very convenient ſituation for that organ.

Fingers, *Amputation of*. See AMPUTATION.

Fingers, *Carious*. In theſe caſes the ſurgeon is to endeavour to extract the exfoliating portions of bone, immediately when they become looſe. For this purpoſe, he is juſtified in making ſuch inciſions as may enable him to fulfil the object in view. Until the proceſs of exfoliation is ſufficiently advanced, he can do little more than apply ſimple dreſſings, and keep the part in a clean, quiet ſtate.

When the ſeparation of the dead pieces of bone will certainly deſtroy the utility of the finger, and convert the part into an inconvenient, ſtiff appendage to the hand; or, when the patient's health is ſeverely impaired by the irritation of the diſeaſe, the termination of which cannot be expected within a moderate ſpace of time; amputation is proper. It is a truth, however, that many fingers are amputated which might be preſerved, and ſurgeons ought to conſider well, before preſuming to remove parts which, when cureable, may become of the greateſt conſequence, in regard to the perfection of the hand. The bread of many perſons, it is well known, depends on the unmutilated ſtate of certain fingers. Theſe remarks are offered, becauſe we have ſeen ſeveral ſurgeons, who are fond of ſeizing every opportunity of cutting their fellow-creatures, remove fingers, which might have been uſefully ſaved, either by allotting a little more time to the exfoliation, or by making inciſions, and cutting out the dead piece of bone.

Fingers, *Diſlocations of*. See LUXATION.

Fingers, *Fractures of*. See FRACTURE.

Fingers, *Supernumerary*. Children are ſometimes born with more fingers than are natural, and ſince allowing the redundant number to remain would keep up deformity and create future inconvenience, the ſurgeon is called upon to amputate them. The redundant fingers are ſometimes with, ſometimes without, a nail; are ſeldom more numerous than one on each hand, are generally ſituated juſt on the outſide of the little fingers, and, as far as our obſervation extends, are incapable of motion, in conſequence of not being furniſhed, like the reſt of the fingers, with muſcles. The beſt plan is to cut off ſupernumerary fingers with a ſcalpel, at the place where they are united to the other part of the hand. The operation ſhould be performed while the patient is in the infant ſtate, that is to ſay, before the ſuperfluous parts have acquired much ſize, and while the object can be accompliſhed with little pain. The inciſions ought to be made ſo as to form a wound with edges, which can be brought into contact with ſtrips of adheſive plaſter. The hemorrhage will almoſt always ceaſe, as ſoon as the dreſſings are applied, without any ligature.

Finger, Godfrey, in *Biography*, who reſided many years in England during the latter end of the 17th century, and the beginning of the laſt, was a good performer on the violin, and a voluminous compoſer for that inſtrument, and when he quitted England and returned to Germany, was, according to Teleman in Mattheſon's Ehrenpforte, chamber muſician to Sophia Charlotte, queen of Pruſſia, in 1702, and in 1717 chapel maſter to the court of Gotha. Finger was not a man of genius; but in ſcience he was infinitely ſuperior to the muſicians with whom he had to contend.

Finger's *Breadth*, a meaſure of two barley-corns in length, or four laid ſide to ſide.

Finger-*keys*, in *Muſic*, or clavier of the Germans, ſignify the arrangement of ſhort levers of different colours, on which the fingers act in performing on organs, piano-fortes, and ſome other inſtruments with fixed tones; the arrangement of theſe within one octave, from C to C, is ſhewn in *Muſic*, *Plate* I.; the learning and recollection of which will be much facilitated, by conſidering the ſame divided (between E and F) into two parts, which Dr. Callcott, in his “Plain Statement of Earl Stanhope's Temperament,” calls a *ditone* and a *tritone*, ſee thoſe articles. It may be proper here juſt to add, that D is always the middle of the ditone or firſt diviſion, and that G and A are the middle notes of the tritone or ſecond diviſion of the *ſeptave*, or whole octave. In Mr. Hawke's patent piano-fortes and organs, with 17 ſtrings or pipes in each octave (ſold by Mr. Bill, Rathbone Place, and Mr. Elliot, Tottenham Court), the whole clavier or range of finger-keys is ſhifted, by pedals, for occaſioning either the five flat or the five ſharp notes of each octave to be brought into play, as may be deſired; without altering the pitch of the long keys or natural notes. See TEMPERAMENT for an account of this, and various other ſyſtems of muſical intervals.

Finger-*key Intervals*, is a term ſometimes uſed for the *half-notes*, or *ſemi-tones*, between the 13 finger-keys of inſtruments; theſe, according to the common theory and notation uſed by all compoſers and copyiſts of muſic, are equal among themſelves, and conform to the *equal temperament* of the ſcale, ſee that article, and Philoſophical Magazine, vol. xxvii. p. 195; but, in ſtrictneſs, theſe finger-key intervals, both the ſimple ones between the next adjoining as well as between the more diſtant finger-keys, differ very ſenſibly from each other, in moſt of the other different ſyſtems of temperament, and even in different parts of the ſcale of each of ſuch ſyſtems themſelves. The number of theſe finger-key intervals, which any interval, larger than the enharmonic dieſis contains, appears on inſpection, when it is expreſſed in the new notation of Mr. Farey, by the number of *f*'s, or leſſer fractions which it contains; thus, his expreſſion for the fifth $358\,\Sigma + 7f + 31\,m$, (Phil. Mag. p. 35. vol. xxx.) ſhews that interval to contain ſeven half-notes or finger-key intervals, and by which the ſituation of its treble above any note on the clavier or range of keys on an inſtrument, or of its baſs below any note, conſidered as the treble of a fifth, can with certainty be found. See Fifth.

Finger-*keyed Viol*, a muſical inſtrument, noticed under our article Claviole, which is another name for the ſame invention: at that time we had not had an opportunity of ſeeing this inſtrument, but have now the ſatisfaction of being able to preſent our readers with a drawing and deſcription of it, having, for that purpoſe, obtained the permiſſion of its inventor, Mr John Iſaac Hawkins, proprietor of the uſeful and mechanical muſeum, No. 79, Great Titchfield ſtreet, London, where are many curious mechanical contrivances, the moſt ſtriking of which we ſhall occaſionally notice. *Plate* XIV. *Miſcellany*, is devoted to the elucidation of this curious piece of mechaniſm: a general idea will be given by inſpecting the firſt figure, which is a perſpective view of the whole inſtrument, laid open, while the remaining figures explain the conſtruction of the more minute parts. The inſtrument contains 68 gut ſtrings, ſtretched in a vertical poſition, and arranged in four ſeries: the firſt, A, correſponding to the double baſs, with 17 large ſtrings, 13 of which are covered with wire; the longeſt ſtring is 38 inches, and the ſhorteſt 28 inches: the ſecond ſeries of 17 ſtrings, B, producing the tones of the violoncello, from 28 to 15 inches in length: the third, C, is the viola, from 15 inches to ſeven long, and the fourth, the violin, are from ſeven to three inches long. The frame containing the ſtrings is of equal height in all parts, though the effective lengths of the ſtrings are only to be reckoned from their reſpective bridges, *a*, *b*, *c*, and *d*, to the keys; each ſtring is provided with a finger-key, which keys are arranged in the ſame order as in the organ, &c. and each ſtring is adjuſted to ſound the proper note for the key to which it belongs; the adjuſtment is made at the upper end of the ſtring by a ſcrew. To keep the inſtrument in tune, through all variations of the atmoſphere, each ſtring is ſtretched by a helical ſpring, attached to the lower part of the frame at one end, and to the ſtring at the other; by this means the tenſion of the ſtring is always equal, notwithſtanding its variations of length from the ſtate of moiſture in the air, as the force of the ſpring will not be ſenſibly changed, by ſuch minute alteration of length: theſe ſprings are ſeen beneath the keys of the inſtrument at *h i g k*, and ſeveral of the tuning ſcrews are ſhewn ſeparately in *fig.* 2. The end of the ſtring, *e*, or of a wire to which it is tied, is hooked upon a pin projecting from the nut, *a*, of the ſcrew, *b*, which is turned round by a ſmall handle to produce the motion of the nut, and adjuſt the ſtring.

The next parts to be ſpoken of are the roſined horſe-hair bows, which are the moſt ingenious parts of this invention; they are four in number, being ſituated at E F G and H in *fig.* 1. one to each ſeries of ſtrings. The horſe-hairs are arranged within a circular ring of braſs, *f f*, in *figs.* 3 and 6, where the method is ſhewn by which an approximation to a circle can be formed from a great number of ſimilar and equal chords within a larger circle; it is in fact a polygon, but with ſo many ſides as to render its difference from a circle inſenſible in its effects: the braſs ring containing the hairs is ſuſtained by three wheels *g*, *h*, and *i*, within it, which admit of its rotative motion, and at the ſame time allow the ſtrings to paſs down through the ring at *m*; and to be as near to the hairs as poſſible, without touching them: for this purpoſe each ſeries of the ſtrings is arranged in a circular form to correſpond with the curvature of the bows at E F G and H in the principal figure. The circular bows are put in motion by a pulley on the axes of the wheel *i*, and a ſtrap or band paſſing round this, communicates motion from a vertical axis, *k*, in *fig.* 7, which is common to the whole, and is put in motion by a wheel, on the axis of a crank, which is turned by the treadle I, and provided with a fly-wheel, K, *fig.* 1, to regulate the motion, and continue it, while the treadle is aſcending: the communication between the horizontal axis *l*, *fig.* 7. of the crank and fly-wheel, and the vertical axis *k*, giving motion to the bows, is made by two conical wheels, *m* and *n*, covered with ſoft leather, touching each other in their circumferences: this is an excellent ſubſtitute for toothed wheels, both with reſpect to the freedom and ſilence of the motion, as the toothed wheels, being neceſſarily conſtructed of metal, could not be diveſted of an unpleaſant ſound, not to be endured in a muſical inſtrument.

The keys are conſtructed, as ſhewn in *figs.* 3 and 4, moving on a fulcrum at *o*, and by that means, when preſſed down by the fingers, the oppoſite end elevates one arm of the bent lever *p*; at the ſame time the other arm is drawn back, and the wire, *q*, moves one arm of a ſecond angular lever *r*; the other arm ends in a hook, which is engaged with the ſtring correſponding to the key: from this arrangement, when the key is forced down, the ſtring is drawn in contact with the hairs of the bow ſituated at *f*, juſt above the lever *r r*, and the friction cauſes the ſtring to vibrate in the ſame manner as the violin.

It is ſcarcely neceſſary, after this, to ſay any thing reſpecting the action of the inſtrument: the performer keeps the bows in continual motion by the treadle I, which moves with ſuch eaſe as to be no impediment to the freedom of motion requiſite for a performer on a keyed inſtrument: an increaſe of preſſure on the keys cauſes that fulneſs of tone which is ſo much admired in the violin, and the delicate ſoftneſs, produced by lightly touching the keys, is a principal advantage in this inſtrument; and it is a great recommendation, that by its aſſiſtance theſe excellencies of the violin are ſecured to every good performer on keyed inſtruments. The velocity of the bows is another circumſtance to be attended to at the ſame time with the preſſure: when moved ſlowly the tones will be ſoft and delicate; but when the velocity is increaſed the tones are full, and adapted for grandeur of effect; the alteration in velocity is eaſily made, Mr. Hawkins having adapted an ingenious balance weight to the treadle, which acts to turn the wheel while the treadle is aſcending, ſo that by this aſſiſtance the wheel can be made to revolve exceedingly ſlow, without danger of *pitching*, or ſtopping at the higheſt or loweſt points of the cranks: this ingenious contrivance is equally adapted to lathes, or other machines receiving motion from the foot, and will be explained under the article Foot Wheel.

In this manner the velocity of the bows is completely manageable by the greater or leſs preſſure upon the treadle, and the performer may eaſily make a ſudden tranſition from quick to ſlow, by reſiſting the aſcent of the treadle when he wiſhes to retard it, or preſſing the treadle while it is deſcending to accelerate the motion of the wheel: it is worthy of notice that each bow moves with a different velocity, as is beſt adapted to produce the vibration of the ſtrings it is applied to; this is effected by the different diameters of the four pullies on the vertical axis *k*, *fig.* 5, which tunes the bows; theſe are in ſuch proportion, that when the double baſs bow revolves at the rate of 25 times *per* minute, the others make 35, 50, and 75 revolutions in the ſame period.

The inſtrument is provided with pedals, one of which, when preſſed down, brings a piece of roſin in contact with the hairs of each bow, ſo as to cauſe no interruption for this neceſſary operation. Another pedal elevates the bows all together, and cauſes them to act nearer the bridge than when it is not in uſe, producing the effect well known to performers on the violin when they bow near the bridge; for this purpoſe the frame containing the three wheels *g*, *h*, *i*, *fig.* 6. of the bow, terminates in a ſtem *t*, which ſlides in a ſocket, and can be elevated or depreſſed by the pedal juſt mentioned. A third pedal brings a piece of leather lightly in contact with the middle of each ſtring, which cauſes it to vibrate in two portions, and ſound the octave in a beautiful tone, ſimilar to the muſical glaſſes.

FINGERIN, in *Ichthyology*, a name given to the Samlet or Salmulus, called alſo Branlin and Salmoneta, which is the leaſt of the trout kind, and ſuppoſed by ſeveral, without ſufficient reaſon, as Pennant conceives, to be the fry of the ſalmon. It is frequent in the Wye, in the upper part of the Severn, and the rivers that run into it, in the north of England and in Wales. Theſe fiſhes are alſo common in the rivers of Scotland, where they are called Pars. Thoſe of the Wye are there known by the name of Skirlings, or Laſprings. This fiſh reſembles the trout, but the head is narrower, and the mouth leſs than that of the trout; the body deeper; length ſeldom exceeding ſix or ſeven inches; the pectoral fins have generally one large black ſpot, ſometimes attended by a ſingle ſmall one; the ſpurious or fat fin on the back is never tipped with red, nor is the edge of the anal fin white; the ſpots on the body are fewer than thoſe of the trout, and not ſo bright, and it is marked from the back to the ſides with ſix or ſeven large blueiſh bars, whence it has been called fingerin or fingery; the tail is much more forked than that of the trout. Some have erroneouſly ſuppoſed that there are no other but males of this ſpecies.

FINGERING *on Keyed Inſtruments.* This is a ſubject which, to treat amply, requires great knowledge, meditation, and experience; and ſo many examples and illuſtrations of the rules, as an entire volume could hardly contain, much leſs an article of a dictionary. We ſhall, however, give the principal elementary rules for the carriage of the hand, and economy of the fingers, in a few keys, which, by analogy, may be extended to the reſt. Conperin (ſee DOIGHTER) was the firſt who treated the ſubject with intelligence, in the minority of Louis XV. 1717; and though his compoſitions, for which the rules were given, have long ſince been thrown aſide and forgotten, moſt of his rules are ſtill good for muſic of a very different kind. He adviſes parents to place their children under an intelligent maſter, at ſix or ſeven years old, and preſcribes not only the manner of placing the hands on the keys, but the carriage of the perſon. The height of the ſeat, if allowed to ſit at ſo early an age, ſhould be ſuch as would place the wriſts on a level with the keys; the fingers ſhould be curved ſo as to be all of the ſame length, ſo as that each ſhould cover a key. Something ſhould be placed under the feet of very young ſtudents, to prevent them from hanging looſe in the air, and to ſupport their frames in a juſt equilibrium; and this ſupport ſhould be diminiſhed in proportion to their growth. The diſtance at which a perſon of mature age ſhould ſit from the inſtrument ſhould be about nine inches and leſs in proportion to the ſhort arms of children. They ſhould place themſelves in the middle of the keys, in as natural and eaſy a poſture as poſſible; the knees not too cloſe, and the feet even. Great attention muſt be paid to the countenance of children, that no grimace or appearance of difficulty ſhould be viſible, and become habitual, which would be attended to by ſtanders-by more than the muſic that is performing, however good and well executed. M. Couperin even adviſes a glaſs to be placed on the deſk of the young performers in danger of becoming ridiculous, that they may correct themſelves. Particular care ſhould be taken to place the hands even, and not let very young ſubjects attempt reaching octaves too ſoon, as it flattens the left hand, and makes it ſeem to belong to a different perſon from the other. The time or meaſure ſhould never be marked by the head, feet, or the whole perſon, which is unbecoming and conſtrued into affectation. Even in counting the time it ſhould be done in a whiſper, or elſe it tends to prevent the ear from having any ſhare in the performance. The fingers ſhould be ſuſpended as near the keys as poſſible, and all their force ſhould come from the upper joints, not from the weight of the hand, which would be heavy and thumping. Children in their early leſſons ſhould not be ſuffered to practiſe alone; they are too giddy and playful to remember the rules, till duly impreſſed by care and habit. Couperin uſed to take away the key of the inſtrument during the firſt leſſons, that they might not undo in his abſence all that he had tried with great pains to inculcate. Shakes, beats, and trills, in all keys, muſt be early practiſed with both hands extremely ſlow, and quickened by degrees; as muſt be the exerciſes for each hand, called evolutions of fingering; for which ſee muſic plate. The weak fingers of both hands, that is, the ring finger and the little finger, muſt be very much exerciſed, to make them, if poſſible, equally brilliant with the others. Chords, if the hands are well placed on the inſtrument, are perhaps the beſt rules for fingering; for if the notes can be well and eaſily ſtruck together, there will be no difficulty in breaking them into paſſages. The rapidly running up and down the keys, whatever number of flats and ſharps there may be at the clef, depends on the thumb, which, in keys with flats, ſhould be placed, in general, on C or F, and in moſt keys with many ſharps upon B and E, that is, on a long key, which, if there are more than five ſharps, will be E and B ×. The thumb of each hand, as far as five flats, muſt be appropriated to F and C for the ſame reaſon; but neither the thumb nor the little finger, in the rapid aſcent or deſcent of the ſcale, ſhould be uſed for a ſhort key, unleſs in playing octaves or chords compoſed entirely of flats and ſharps. In practiſing quick paſſages, the fingers ſhould be lifted up with a ſpring, and not allowed to hang on the keys, till wanted again, unleſs in arpeggioing chords, or in paſſages of expreſſion. In the firſt practice of a ſhake, in order to keep the wriſt quiet, place the thumb on the 5th, 4th, or 3d below, and keep the fingers that are unoccupied as tranquil as poſſible. Couperin was the firſt, we believe, who made it a rule for his ſcholars never to play two notes together with the ſame finger, unleſs in repeating chords. See examples of iteration, *Plate* N° V.

N° VIII. Shakes ſhould be practiſed with all the fingers. Tranſient ſhakes, double ſhakes, a chain of running ſhakes turned, a ſeries of double notes in 3ds, 6ths, and octaves; in the two latter, the thumb and the little finger only can be uſed, and nothing but downright drudgery and perſeverance can acquire theſe modern tricks, ſo unnatural to the genius of keyed inſtruments. Double ſhakes can only be gained, if at all, by long and patient practice. The experiment, however, ſhould be made.

N° IX. In order to transfer the fingers to different parts of the inſtrument, upwards or downwards, without quitting a note which ought to be ſuſtained, the young ſtudent ſhould change the fingers upon the ſame note with both hands without letting the key riſe. There is no harm in letting children play their firſt leſſons by heart: it fortifies the memory; occupies the ear more than the eye; and, indeed, it is impoſſible for them to find the keys without looking at them, till the fingers fall mechanically upon certain paſſages and chords, as the feet, in walking, move without the owner paying the leaſt attention to them.

With reſpect to reading muſic readily, it muſt be acquired by playing firſt with one hand, and then with the other, ſeveral new pages of notes every day, without repeating any thing; and when that can be done readily, at ſight, with each hand ſeparately, then let the pupil begin playing ſimple ſtrains with both hands. This will be practice for the eye alone. But in learning to execute difficulties, it muſt be done by beginning ſlow, and repeating quicker and quicker a thouſand and a thouſand times; this is practice for the *finger*. *Expreſſion* depends greatly on the ſuſtaining and ceſſation of ſound; or, in technical language, on what the Italians term *legato* or *ſoſtenato*, and *ſtaccato* or *ſciolto*, as well as on *accents*, and the different ſhades of *piano* and *forte*.

In the evolutions of fingering, or ſhort exerciſes to form the hands, it ſeems a paradox, but it may be truly ſaid of Nos. III. and IV. that, by throwing a finger away, the fingers, in ſuch paſſages, become inexhauſtible.

In the courſe of theſe exerciſes, where the fingers are marked, the ſemicircle, or ſtar, includes ſuch notes as lie under the hand, without any contrivance or change: and in other places, where no fingers are marked, ſuch are uſed as lie over the keys.

The detached paſſages, N° VII. are meant to be ſeverally repeated quicker and quicker, till the hand is tired.

FINGRIGO, in *Botany*. See Pisonia.

FINIA, in *Geography*, a town of Sweden, in the province of Schonen; 20 miles N.W. of Chriſtianſtadt.

FINIAL, in *Ancient Architecture*, the flower, fruit, or foliage terminating a pediment or pinnacle in the pointed ſtyle. This repreſented a lily, a trefoil, an acorn, a pomegranate, endive, &c. according to the taſte of the architect or artiſt.

FINIANA, or Finana, in *Geography*, a town of Spain, in the province of Grenada; ſeven miles S. of Baça.

FINICA, a town of Aſiatic Turkey, in Natolia, near the coaſt; 50 miles S. of Satalia.—Alſo, a river of Natolia, which runs into the Mediterranean, 14 miles W. N. W. of Cape Chelidoni.

FINIMARBOO, a town of Africa, in Bambarra; 96 miles W. N. W. of Sego.

FINING. See Refining.

Fining *of Wines*. The uſual method of fining down wines, ſo as to render them expeditiouſly bright, clear, and fit for uſe, is this: take an ounce of iſinglaſs, beat it into thin ſhreds with a hammer, and diſſolve it by boiling in a pint of water; this when cold becomes a ſtiff jelly. Whiſk up ſome of this jelly into a froth with a little of the wine intended to be fined, then ſtir it well among the reſt in the caſk, and bung it down tight; by this means the wine will become bright in eight or ten days. This method, however, is found to be beſt ſuited to the white wines: for the red ones, the wine coopers commonly uſe the whites of eggs beat up to a froth, and mixed in the ſame manner with their wines. The method by which theſe viſcous bodies act in the operation is this; they entangle themſelves among the flying lee or light fæculencies that float in the wine, and thus forming a maſs ſpecifically heavier than the wine, they ſink through the body thereof like a net, carrying down all the foulneſs they meet in the way to the bottom; but when the wine is extremely rich, ſo that its ſpecific gravity is greater than that of the maſs formed by the ingredients uſed in fining and the dregs or lee; this maſs then riſes upwards, and floats at the ſurface of the wine, which will in this caſe alſo draw off fine. See Clarification and Forcing.

FINIRE, in *Law*, was uſed to fine, or pay a fine upon compoſition and making ſatisfaction. It is the ſame with *finem facere*, mentioned in Leg. Hen. I. cap. 53.

FINISHING, in *Architecture*, &c. is frequently applied to the crowning or acroteria over a piece of building, placed there to terminate and finiſh it.

FINISTERRA, in *Geography*, a town of Spain, in the province of Galicia, near Cape Finiſterre.

FINISTERRE, formerly a portion of Bretagne, in 48° 25′ N. latitude, now the moſt weſterly department of France, bounded on the N., W., and S., by the ſea, and on the E. by the departments of the North coaſts and Morbihan, eſtimated at about 50 miles from N. to S. and 40 to 45 from E. to W., and containing 343 ſquare leagues, and 474,349 inhabitants. It is divided into five diſtricts, *viz.* Breſt, having 149,610 inhabitants; Morlaix, 109,914; Chateaulin, 82,131; Quimper, 84,074; and Quimperlé, 48,620. Its capital is Quimper; and its other chief towns are Breſt, Morlaix, Chateaulin, Leſneven, Landerneau, Crozon, Briec, Quimperlé, and Bannalec. Its chief rivers are the Aulne and Odet. The number of its cantons is 43, and that of its communes, 287; its contributions amount to 2,458,757 francs, and the expences charged upon it are 315,198 f. 66 c. This department is tolerably fertile, producing grain, flax, hemp, fruits, and good paſtures, with mines of iron and lead.

Finisterre, *Cape*, *Calticum Promontorium*, called *Artabrum* by the ancients, and by ſome *Norium*, a cape on the N. W. coaſt of Spain, in the province of Galicia. It is nearly S. or a little weſterly, about five leagues from cape Toriano, and ſhips may anchor on the E. of a large rock, in ſix or ſeven fathoms, where is a great bay that runs far inland. Forty-two leagues from Cape Finiſterre, there is a large rock above water, dangerous to navigators. N. lat. 42° 53′ 52″. W. long. 9° 16′ 15″.

FINITE, ſomething bounded or limited, in contradiſtinction to infinite.

The ſchoolmen make two kinds of finite; *viz.* the one as to *extenſion*, which is applied to things that have not all poſſible or conceivable extenſion.

The other as to *perfection*, applied to things which have not the laſt perfection.

To get an idea of a thing finite in point of perfection, we firſt conceive the thing as having certain perfections; and then conceive ſome other perfection which it has not, or ſome perfection in a farther degree. After the ſame manner I conceive a room to be finite, by having an idea of extenſion beyond what is contained therein.

FINITO, *Ital.* in *Muſic*, a canon or fugue is ſaid to be finito, finiſhed, when it is not perpetual, but when at ſome certain place all the ſeveral parts ſtop together on the chord of the key note; after having followed each other for ſeveral rounds, on ſignal being given by the leading part holding up his finger. See Canon.

FINITOR, in *Aſtronomy*, the horizon ; thus called, becauſe it finiſhes or bounds the ſight or proſpect.

FINLAND, in *Geography*, a country of Europe, bounded on the north by Lapland, on the eaſt by Ruſſia, on the ſouth by a gulf to which it gives name, and on the weſt by the gulf of Bothnia. This country was formerly divided into Ruſſian and Swediſh Finland. The former, or Ruſſian Finland, anciently belonged to the Swedes ; but it was partly ceded to the Ruſſians by the peace of Nyſtadt in 1721, and partly at the treaty of Abo in 1743 : its capital is Wiburgh, and it now conſtitutes the government of Wiburgh. (See WIBURGH.) The limits of Ruſſia and Sweden, ſettled by the peace of Abo, are formed by the river Kyman ; which flows into the centre of the gulf of Finland ; on the ſouth bank of which are a wooden houſe, a rampart of earth, and a ſmall battery. The frontiers are defended by *Frederickſham*, which ſee. This province retains moſt of its ancient privileges, with ſome modifications under the new government. The country produces, beſides paſture, wheat, rye, oats, and barley, but not ſufficient for the inhabitants. Wiburgh retains its own civil and criminal courts of juſtice ; in penal caſes, not capital, the puniſhments preſcribed by the provincial judicature are inflicted ; but whenever a criminal is condemned to death, the Ruſſian laws interpoſe, reprieve him from the ſentence of beheading or hanging, &c. enjoined by the Swediſh order, and conſign him to the knout and tranſportation to Siberia. In the governor's court buſineſs is tranſacted in the Swediſh, German, and Ruſſian tongues ; the peaſants uſe only the Finniſh dialect, but the inhabitants of the towns underſtand alſo Swediſh, and many of them German. The Lutheran is the eſtabliſhed religion of the province, but the Greek worſhip has been lately introduced by the Ruſſians. This part of Finland is not ſo extenſive as Swediſh Finland. It is remarkable, that in both countries the productions of nature are ſooner ripe in the parts covered with foreſts, than on the ſea-coaſt and iſlands. The interval between ſeed-time and harveſt is from 10 to 12 weeks. The Finns apply principally to the culture of hemp, flax, and tobacco, which thrives well in their country. As to trees, thoſe which bear fruit, ſuch as cherry and plum-trees, are almoſt always deſtroyed by the rigour of winter ; the mulberry is planted and thrives only on the iſlands ; the oak is ſaid not to grow beyond 61°, and the aſh beyond 62°. The foreſts of firs furniſh in Finland the principal articles of commerce in wood, charcoal, timber, and planks, which are ſent to Wiburgh, Stockholm, &c. for exportation. The country abounds with game, and in the lakes and rivers various kinds of fiſh are plentiful. At the bottom of the moraſſes they dig earth, from which iron is extracted, and they have ſome mines of lead. The peaſants of Finland differ very much from the Ruſſians in their aſpect and dreſs ; moſt of them have fair complexions, and many of them red hair, which they part at the top and allow to flow at conſiderable length over their ſhoulders ; they alſo ſhave their beards ; whereas the Ruſſians have generally dark complexions and hair, which they cut ſhort, and they alſo ſuffer their beards to grow. The Finns, by their commerce with foreigners, are in general more civilized than thoſe Ruſſians who do not reſide in the capital or in their vicinity. The ſmalleſt villages of Finland afford much better accommodations than are uſually met with in the largeſt towns of Ruſſia. In the 12th century great pains were taken to convert the Finns to Chriſtianity ; and Henry, who was biſhop of Upſal, in 1157, fell a martyr to his zeal in the accompliſhment of this benevolent deſign. That prelate founded the firſt cathedral in Finland at Randamoki ; but the ſee was afterwards transferred to Abo, not far from the former place. Martin Skytte, and Peter Serkilar, were the firſt promoters of Lutheraniſm in this country. The provinces of Swediſh Finland are Finland Proper, the iſle of Oeland or Aland, Oſtrobothnia, Tavaſtaland, Nyland, Savolax, and that part of the fief of Kymene and Carelia, which Sweden reſerved to itſelf; but the whole of Finland has lately (1809) been ceded to Ruſſia ; in conſequence of the unſucceſsful ſtruggles of the Swedes to maintain their independence ; and by the treaty of peace concluded between Ruſſia and Sweden, and ſigned at Frederickſham, the incorporation of the grand duchy of Finland with the Ruſſian empire was confirmed. The town of Torneo, and the river of the ſame name, form the frontiers.

FINLAND *Proper*, a province, lately belonging to Sweden, ſituated on the ſouthern part of Finland, conſidered in its utmoſt extent, bounded on the S. by the gulf of Finland, and on the weſt by that of Bothnia ; about 160 miles in length and 100 in breadth. The ſoil is fertile, and the land, eſpecially in the ſouthern parts, produces good corn, hay, and hops. It has ſeveral fine lakes and rivers, which yield abundance of fiſh, and on part of the coaſt is a pearl fiſhery. The inhabitants ſubſiſt by agriculture, grazing, fiſhing, and the manufacture of woollen ware. The principal articles of their commerce are grain, meal, cattle, butter, talc, linen, yarn ſtockings, &c. Finland is divided into north and ſouth ; the capital of the former is Biorneborg, and that of the latter Abo.

FINLAND, *Gulf of*, that part of the Baltic ſea which waſhes the coaſts of the governments of St. Peterſburg, Reval and Wiburgh ; it is above 400 verſts in length, and from 100 to 120 in breadth. The gulf of Finland is of difficult navigation, both on account of the heavy gales of wind that are ſo frequent here, and the multitude of rocks and ſhelves with which it abounds.

FINMARK, called alſo *Lapmark*, a province of Norway, bounded on the N. by the northern ocean, on the E. by the northern ocean and the territories of Ruſſia, on the S. by Swediſh Lapland, and on the W. by the northern ocean. The coaſt of this country is well inhabited, but it has neither towns nor villages. The inhabitants ſubſiſt chiefly by fiſhing, and their country yields the beſt ſalmon in Norway. The ſun, ſuch is their latitude, continues above their horizon in ſummer for ſome weeks. Finmark has a particular governor, regiſter, and judge. It is divided into Weſt Finmark, which includes twelve churches and chapels, ſerved by five preachers ; and Eaſt Finmark, in which are nine churches and chapels, ſerved by three preachers. See FINNS.

FINN, a river of the county of Donegal, Ireland, which flows from a lake of the ſame name, and, after a courſe of ſeveral miles in an eaſtern direction, joins the river Foyle, near Strabane.

FINNERYDIA, a town of Sweden, in Weſt Gothland, 34 miles S.W. of Orebro.

FINNHAR, a ſmall iſland on the weſt ſide of the gulf of Bothnia. N. lat. 60° 58′. E. long. 17°.

FINNIKIN, in *Ornithology*, the name of a particular ſpecies of pigeon, called by More the *Columba in gyrum flectens*. It is of the ſhape and ſize of the common pigeon. The crown of its head has ſomething of the reſemblance of a ſnake's head ; and it is gravel-eyed, and has a tuft of feathers on the hinder part of its crown, which runs down its neck not unlike a horſe's main. It is not feather-legged, and is in colour always either a black or blue pied.

They have their name from their ſingular manner of courting the female, which is always by riſing over her and making three or four turns, flapping the wings, and then turning as many times round the other way.

FINNIS Bay, in *Geography*, a bay of Scotland, on the eaſt coaſt of the iſland of Harris. N. lat. 57° 53′. W. long. 6° 55′.

FINNS, a race of perſons, who are ſaid to be the aborigines of Ruſſia, and who inhabited the regions of the Volga and the Duna. Theſe people, though they form one main ſtem of the inhabitants of Ruſſia (the Slavonians being the other), have never, in any of their branches, riſen into a ruling nation; yet as they are the common ſtock of moſt of the northern nations of Europe, they are diſtinguiſhed by their antiquity, and by their wide extent from Scandinavia to a great diſtance among the Aſiatic nations of the north, and thence again to the ſhores of the Volga and the Caſpian. Although the Finns have been thus widely diſperſed, yet they have preſerved a general reſemblance in bodily frame, in national character, in language, and in manners. It is alſo remarkable, that the greater number of thoſe who belong to the Finniſh race, ſtill dwell only in the north, which has ever been their favourite abode, and on which account they are called inhabitants of moraſſes or fens; and the fiſhery and chaſe have been their chief occupation and trade. Which of theſe widely diſperſed people has the beſt claim to be conſidered as the parent ſtock, it is not eaſy to decide. The aboriginal name of Finns, known to the Roman hiſtorian Tacitus, is not in uſe with any of theſe nations; but they call themſelves by a different appellation. None of theſe people have ever exhibited a conſpicuous figure on the theatre of the world, nor acquired a permanent independence; but they have all, as far back as hiſtory can trace them, been a prey to their more enterpriſing and powerful neighbours. Accordingly, they have no chronicles of their own; and their hiſtory is only to be found in the annals of their conquerors. Of their ancient hiſtory nothing certain is known, except that they poſſeſſed the greater part of Scandinavia and Ruſſia in the north, and ſeparated into ſeveral tribes, which either lived entirely without any government, or, like the Permians and proper Finns, under their own kings. All theſe were gradually ſubjugated by three nations, under the dominion of which they ſtill remain; *viz.* the Norwegians, the Ruſſians, and the Swedes. The Norwegians were the firſt who ſubjected a part of the Finniſh north. Finmark, which is a large province extending even to the eaſt of Cape Nord towards Ruſſian Lapland, has ever been tributary to them. Yet it appears that, long before the commencement of the 10th century, the whole tract, from Wardhuys to the White ſea, was independent of them; and that only the remoter Finns, about the gulf of Bothnia and Finland, and on the Dwina, obtained their national freedom.

The inhabitants of Finmark have been amply deſcribed by Leems (De Laponibus Finmarchiæ, Copenhagen, 1767, 4to.) cited in Pinkerton's Geography. This race of men, he ſays, is of ſmall ſize, generally about four feet, with ſhort black hair, narrow dark eyes, large heads, and high cheek-bones, a wide mouth, and thick lips, and of a ſwarthy complexion. In the ſouthern part of Finmark they are mingled with Norwegians; but the northern wilderneſs is wholly their own. They call themſelves "Same," their ſpeech "Same-giel," and their country "Same-edna," being probably of the ſame race as the Samoieds. The language has only an affinity with the Finniſh, but not nearly ſo much as the Daniſh has with the German; and, it ſhould ſeem, that they had anciently a different ſpeech, which they enriched with large additions from that of their more poliſhed neighbours the Finns. Towards the ſhore they build huts; and on the mountains uſe tents of a flatly conic form, and divided into two parts by a kind of paſſage; each part having three rude ſubdiviſions; the two fartheſt for the maſter, miſtreſs, and gueſts; the middle on each ſide of the fire for the children; and thoſe neareſt the door for the ſervants: behind theſe the cattle find a refuge, but the cattle are few, the rein deer conſtituting their chief wealth. The ſun abſents himſelf for ſeven weeks, and yet from ten in the forenoon to one in the afternoon, the twilight will enable a perſon to read without a candle; nevertheleſs the ſtars are viſible, and the moon, when apparent, ſhines all the day. The ſun never ſets for ſeven weeks in ſummer; but in the night his beams are dull, and he aſſumes a ruddy hue. Several rivers, particularly the Tana, in eaſtern Finmark, ſometimes much ſwelled by the melted ſnow, ſupply ſalmon and other fiſh, the chief food of the Laplanders; though at a feſtival they have mutton or rein-deer, and mead. The men wear conic red caps, lined with fur, and a kind of robe of cloth or ſkin; the poor ſometimes uſe that of ſalmon, which appears like a white ſhagreen; the head and neck are protected with a ſort of cowl, and the veſt is of undreſt ſheep-ſkin, with the wool inwards. The head-dreſs of the women is narrowed in the middle, widening like a baſon at the top: the veſt and robe reſemble thoſe of the men. Their amuſements are ſhooting with the bow at a mark, a kind of tennis, and a game reſembling draughts. They are alſo fond of wreſtling, and other exerciſes. They were formerly addicted to magic, and were fabled by ancient times to invoke a dæmon in the ſhape of a fly, which was called the "gan-fly," and commiſſioned to ſting their enemies. Till recent times they were immerſed in paganiſm, regarding particular mountains and rocks as gods. Their chief god was "Radien," who dwelled in the ſtarry heavens; in the lower aerial regions were "Beivi," or the ſun, a god, as Grotius has obſerved, very unjuſt to them; with "Horangalis," or the thunderer, and other divinities. On earth were the gods of hunting and fiſhing; and the goddeſs "Maderakko," with her daughter "Sarakka," a kind of Venus, who prepared the body after Radien had ſent the ſoul. The "Saivo Olmak," or gods of the mountains, were ſuppoſed to be oracular. The places of ſacrifice were chiefly holy mountains, near the firth of Waranger, and along the Tana, and ſome on the bay of Porſanger. Their magical ſongs and drums are very trivial. For the converſion of the Laplanders to Chriſtianity, Eric Bredal, biſhop of Drontheim, made ſome vain attempts about the year 1660; but the royal miſſion was not founded till 1714; and extended to the Laplanders of Finmark, with thoſe of Norland to the ſouth, being a conſiderable portion of the dioceſs of Drontheim. Since that period, the miſſionaries have been reſolute, and induſtrious, and ſucceſsful: there being commonly two for Finmark, one for the eaſt, who preſides over Waranger, Tana, and Laxefiord; the other for the weſt, over Porſanger, Hvalſund, and Alten.

The Ruſſians were the people who, next to the Norwegians, diſperſed themſelves among the Northern Finns; and though at firſt, on their ſettling about the Volkhof, they lived on good terms with their neighbours the Tſchudes or Finns, and even elected a government conjointly with them, yet afterwards they, later than the Norwegians, and earlier than the Swedes, conquered and ſubdued them. At firſt the Ruſſians had merely the region about the gulf of Finland, or on the Kyrialabotn, and about the Ladoga lake, quite up to the White ſea. They afterwards ſpread farther round in theſe deſart countries, and ſubjected to themſelves a part of Finland. In the ſequel they took not only the whole of Lapmark round Kola, but proceeded to levy a tribute on the Finns in the preſent Finmark, and on thoſe who dwelt in Trumſen as far as Malanger. The other Finniſh nations in the Eaſt, on the Volga, and in Siberia, became ſubject to them with their gradual extenſion into theſe regions, by the conqueſt of the Tartar kingdoms and the diſcovery of Siberia. The Swedes were the laſt who founded a ſovereignty in the Finniſh parts of the North. It was not till the middle of the 12th century, about the year 1157, that king Erik, the ſaint, undertook the ſubjugation and converſion of the proper Finns: 100 years afterwards the Swedes entered Tavaſtland; towards the end of the 13th century they eſtabliſhed themſelves in Karelia; and about the ſame time the Laplanders were alſo reduced under their authority. Thus the whole of the Finniſh North was partitioned among three ſovereigns, and the nation itſelf was removed from the rank of an independent people. Of the 13 tribes into which the Finniſh ſtock was divided, 12 belong either wholly or in part to the inhabitants of the Ruſſian empire; *viz.* the Laplanders, the Finns, the Eſthonians, the Livonians, Tſcheremiſſes, Tſchuvaſches, Mordvines, Votiaks, Permiaks, Siryanes, Vogules, and Kondiſh Oſtiaks. The Madſhares alone, the great maſs of the mixed multitudes whom we at preſent call Hungarians, are the only Finniſh nation which belongs not to Ruſſia, and alſo the only one that has preſerved its national independence.

The country which is inhabited by the Finniſh nation compriſes the north-eaſtern corner of the Bothnic and Finniſh gulfs, interſperſed throughout with mountains, rocks, moraſſes, and lakes, between the 60th and 65th degrees of N. latitude; its circumference being computed at 30,000 verſts. The greater part of it *did* belong to the kingdom of Sweden; the ſmaller ſouth-eaſtern portion, till of late poſſeſſed by Ruſſia, contained Ingermanland, Kexholm, and Karelia, forming the government of Vyborg or Wiburgh, and part of that of St. Peterſburg. In the government of Vyborg, the Finns compoſe by far the greater part of the inhabitants, or more properly they are the people of the country. In moſt of the circles of the Peterſburg government, they, with the Ingrians, are likewiſe the main body of the population: and in the government of Tver and Novgorod, they form conſiderable colonies, which have long been ſettled in theſe regions. The number of all the Finns living in Ruſſia cannot be correctly aſcertained; but they probably exceed 400,000 perſons. Tooke's Ruſſ. Emp. vol. i.

FINO, a ſmall iſland in the Baltic, near the E. coaſt of Sweden. N. lat. 58° 9′. E. long. 16° 42′.

Fino, *Cape*, a cape on the coaſt of Genoa. N. lat. 44° 19′. E. long. 8° 6′.

FINOCHIO, in *Gardening*, the name of a plant ſometimes cultivated as a ſallad herb. See Anethum.

It is raiſed by ſowing the well ripened ſeeds procured from Italy, about the end of March in a warm ſituation, on a bed of light rich earth in the drill manner, very thin, covering them in lightly with the fine mould. The drills ſhould not be nearer together than about eighteen inches. The plants will be up in about a month, when they muſt be thinned out to ſix or ſeven inches diſtance, and be kept perfectly clean from weeds. When the ſtalks begin to ſwell out above the ſurface of the ground, they ſhould be earthed up in the manner of cellery, when in the courſe of a fortnight they will be ready for uſe, and eat criſp and tender. Succeſſive crops ſhould be ſown every three weeks until July. The late put in crops being occaſionlly watered and ſhaded from the heat of the ſun.

This plant is not now much cultivated in our kitchen gardens.

FINOW, in *Geography*, a town of Germany, in the Upper Mark of Brandenburg; 32 miles N. E. of Berlin.

FINSCALE, in *Ichthyology*, an Engliſh name for the river fiſh, more uſually called the *rudd*, the *rutilus latior*, or *rubellio fluviatilis* of authors. See Cyprinus *erythrophthalmus*.

FINSPANG, in *Geography*, a town of Sweden, in Eaſt Gothland; 15 miles N. W. of Nordkioping.

FINSTER-AAR-HORN, a high mountain of Switzerland, in the canton of Bern; the elevation of which has been found by actual meaſurement to be 14,116 Engliſh feet.

Finster *Munſter*, a town of the Tyroleſe; 12 miles N. E. of Tiaſp.

FINSTERBACH, a river of Franconia, which runs into the Rednitz, 2 miles N. of Roth.

FINSTERWALDA, a town of Saxony, in the margraviate of Meiſſen; 36 miles N. of Dreſden. N. lat. 51° 37′. E. long. 13° 56′.

FINTO, *Ital.* in *Muſic*, implies a feint in preparing for ſomething that is not performed, as *cadenza-a-finita* implies the making a full cloſe expected, when, inſtead of the baſe falling a 5th or raiſing a 4th, another unexpected baſe and its harmony are given, which at preſent is called a *diſappointed cadence*, and may be brought about various ways.

FINTONA, in *Geography*, a ſmall poſt town of Ireland, in the county of Tyrone, on the road from Omagh to Enniſkillen; 7 miles S. from Omagh, and 94 miles N. W. from Dublin.

FINTRAY, a town of Scotland, in the county of Stirling, containing about 1000 inhabitants; 8 miles S. W. of Stirling.

FINVARRA Point, a cape of Ireland, in the county of Clare, on the ſouthern coaſt of Galway bay. W. long. 9° 4′. N. lat. 53° 7′.

FIONDA, a town of Aſiatic Turkey, in Natolia, in the gulf of Satalia; anciently called *Phaſelis*, near a famous paſs into Pamphilia; now the ſee of a Greek biſhop, though much decayed; 28 miles S. of Satalia. N. lat. 36° 36′. E. long. 30° 26′.

FIORA, a river which riſes in the Sienneſe, and runs into the ſea below Montalto, in the duchy of Caſtro.

FIORAVANTI, Leonard, in *Biography*, a phyſician of Bologna, in the ſixteenth century, who poſſeſſed a conſiderable degree of reputation among his contemporaries, not only on account of his knowledge in medicine, but alſo of his chirurgical dexterity. Neverthleſs he was an arrant empiric, in the modern ſenſe of the word, and in the writings which he left behind him, he dwells at great length on the excellence of the ſecret remedies which he poſſeſſed, and is violent in his condemnation of blood-letting. He died on the 4th of September 1588. The titles of his works, which are in Italian, are as follows; "Del Specchio di Scientia Univerſale," Venice, 1564. "Regimento della peſte," ibid. 1565. "Capricci Medicinali," ibid, 1568. "Il Teſoro della vita humana," ibid, 1570. "Compendio dei Secreti Naturali," Turin, 1580, Venice, 1581, &c. "Della Fiſica, diviſa in Libri Quattro," Venice, 1582, "Cirurgia," ibid. 1588. All theſe works have undergone ſeveral editions.—Eloy.

FIORENTINO, in *Geography*, a town of Italy, in the Campagna di Roma; 25 miles N. of Terracina. N. lat. 41° 42.′ E. long. 13° 6′.—Alſo, a town of Naples, in Capitanata; 7 miles S. of Lucera.

FIORENZUOLA, a town of Etruria, in a valley of the Apennines, on the ſcite of the ancient Fidentia; 22 miles N. of Florence.—Alſo, a town of the duchy of Parma.

—Alſo, a town of Naples, in Capitanata, anciently called *Florentinum;* now decayed; 10 miles S. of St. Savaro.

FIORI, Mario da, in *Biography*, a painter of flowers, whoſe real name was Mario Nuzzi. He was born at Perona in the kingdom of Naples in 1603, and ſtudied with his uncle Tomaſo Salini. He imitated the lighter productions of nature, as flowers, ſhells, &c. with great beauty. A fulneſs and richneſs of touch and colour are given by him with great elegance and lightneſs. It was ſo much the taſte of the time to admire his productions, that he could not complete them faſt enough for the demand; and what was more to his credit, Domenichini and other artiſts of renown were not aſhamed to paint in conjunction with him. One of his moſt capital works is in the church of St. Andrea della Valle at Rome. It is a wreath of flowers encircling the portrait of St. Gaetano, which was painted by Andrea Camaſſei. At Wilton is a very beautiful painting of his; a wreath of flowers round a head of the virgin, by Carlo Dolci. He died in 1673, at 70 years of age.

FIORITO, *Ital.* is a *muſical* term, implying flowery, ornamented; as *canto fiorito*, florid ſong, *contrappunto fiorito;* to diſtinguiſh them from *canto fermo*, and *contrappunto ſemplice*.

FIORLITA, in *Geography*, a ſmall iſland of the Mediterranean, at the entrance of the gulf of Tarento. N. lat. 40° 14′. E. long. 18°.

FIORONI, Gian. Andrea, in *Biography*, maeſtro di cappella at the great church or Duomo in Milan, about the middle of the laſt century. He was an excellent contrappuntiſt alla Paleſtrina, that is to ſay, in the ſtyle of our beſt old maſters in their ſervices and full anthems, which conſiſt of good harmony, ingenious points and contrivances, but no melody. Sig. Fioroni is a voluminous compoſer and publiſher of maſſes and motets in eight parts, *à due lori.* So that though this ſtyle, and that of the church, are abandoned in Italy, on days of feſtival, when inſtruments and ſecular ſingers are employed, the ancient grave ſtyle of the 16th century is not wholly loſt.

FIR-Tree, in *Botany*. See Abies and Pinus.

Fir-*Tree*, the common name of a tree of the evergreen timber kind, frequently met with in the more elevated and mountainous ſituations of the colder climates of the north. It has, for the moſt part, ſingle leaves, which are produced on every ſide of the branches. This is a tree which is capable of being raiſed upon almoſt any ſort of ſoil which is not very retentive of moiſture; and it is both rapid in its growth, and hardy in its nature, but not perhaps ſo ornamental as ſome others of the evergreen kind.

The uſual method of raiſing theſe trees is by ſowing the ſeeds taken from the well ripened cones which they produce. The mode of extricating the ſeeds from the cones is, either by expoſing them to the gentle heat of a fire, or by ſoaking them for a ſhort time in warm water, by which they readily open and emit the ſeeds. The former method is the beſt, when due attention is paid not to expoſe them to too great a degree of heat. This ſhould not however be done until the period of ſowing or putting them into the ground. The beſt way is to ſow them in a nurſery where the land has been well prepared, in order that they may be well protected from the ravages of birds at the time of their coming up; as they are very apt to deſtroy them at that period, by picking off the huſks of the ſeeds which come up along with the plants.

The proper time of putting the ſeeds into the ground is about the end of March, or beginning of the following month. They ſhould be ſown on a bed of light earth, and covered to the depth of about half an inch by means of a garden rake. The plants ſhould be continued in this bed until the following ſpring, being kept perfectly clean from weeds. At that time other beds ſhould be put in a proper ſtate of preparation for receiving the young plants; into which they ſhould be carefully tranſplanted in rows, at the diſtance of ſix or eight inches from each other, and three or four inches apart in the rows. When the ſeaſon happens to be very dry afterwards, it may be proper to water the plants once or twice a week according to the heat of the weather: and in ſome caſes it may be requiſite to cover the beds with mats in order to ſcreen them from the ſun and drying winds, until they have taken good root; after which no further care is neceſſary, except that of keeping them free from weeds. The plants may continue in theſe beds two years; at the end of which time they may be removed into other ſpaces of open ground properly prepared for them, being placed out at ſuch diſtances as may be moſt ſuitable for them. The moſt uſual diſtances in theſe caſes are four or five feet from row to row, and two or three feet apart in the rows.

After they have been planted out, when the weather happens to be dry, they ſhould have a good watering to ſettle the mould to their roots; and which may be repeated three or four times, in caſe the ſeaſon continues droughty, with great benefit in promoting their taking root, and ſecuring them from the effects of drying winds.

The plants may remain in theſe ſituations for two or three years longer, or until they may be wanted; during which time the ground ſhould be dug between the rows in every ſpring, and be afterwards kept perfectly clean from weeds by frequent hoeing, care being taken in the diggings not to cut or injure their roots. This is all that is requiſite in their cultivation while they remain in ſuch places.

When they are to be removed into the ſituations where they are to remain, great care is neceſſary in taking up the plants, not to cut off or hurt the roots, nor to ſuffer them to continue any length of time expoſed out of the ground, before they are replanted. The moſt ſafe time for performing the buſineſs of removing this ſort of trees for finally planting out in moiſt ſoils is the beginning of April; though in dry lands they may often be planted about Michaelmas, with ſucceſs.

Fir trees are frequently removed at the height of ſix or ſeven feet and ſometimes more, but the height of two or three feet is much better, and plants of this height generally, in the courſe of a few years, ſurpaſs thoſe that have greater heights when firſt ſet out.

The firſt, or large ſort of plant, muſt, at firſt planting out, be always well ſecured by ſtakes or other means, in order to prevent their being moved and made looſe by winds, which, whenever they occur, are ſure of deſtroying the trees. The ſmall plants only ſtand in need of having the mould firmly trodden in about their roots during the time they are planting out.

The vaſt improvements that have been made by planting large maſſes of trees of the fir kind on the poor, bare, bleak, expoſed, moory, and heathy ſituations in the northern parts of Scotland, ſufficiently ſhew their importance, and plainly demonſtrate the advantage of ſuch undertakings in ſuch places, where properly managed. And though it may be admitted that the Scotch fir is amongſt the moſt periſhable and leaſt valuable ſorts of timber wood that can be raiſed, and conſequently ſells in general, at the leaſt price; yet as the expence of raiſing it is very trifling, the returns are in all caſes ſo abundant as to fully ſatisfy thoſe who have engaged in the forming of ſuch plantations. This has even been the caſe when no other circumſtance but the direct income which has ariſen from ſuch plantations themſelves has been taken into the account. But when the collateral advantages are conſidered likewiſe, the benefit occaſioned by them is evidently extremely great. It has been ſtated by the author of the "Eſſays on Rural Affairs" that in the vicinity of plantations of the fir kind, houſes can be raiſed at ſo little expence, and the roofs are ſo much ſtraighter, and better than the ordinary ones, that ſettlers in ſuch ſituations are induced to make their houſes much neater and more commodious than in other places; and beſides rails, and other kinds of materials for dead fences, can be ſo eaſily procured, that the poor people are firſt enabled to have good well-fenced gardens, and then commodious incloſures of larger extent; the branches likewiſe afford fuel to them, which adds greatly to the comforts of their ſituation. The cutting and manufacturing of the wood into various kinds of utenſils furniſh employment for a great many perſons; population is thereby increaſed, and with an augmentation of population, its neceſſary conſequence, the deſire for land to produce the neceſſaries of life, and of courſe an increaſe of rent to the proprietor. Theſe new ſettlers in the deſert waſtes of Scotland, like thoſe in America, cultivate and improve the ſoil in proportion as the trees are removed from it. At this moment, it is added, Mr. G Dempſter, who will be long reſpected by his countrymen, ſees fields on his eſtate rapidly converting, in this way, into cultivated ground, and yielding him ten or twelve ſhillings per acre in rent, not only without any expence to himſelf, but after having derived a conſiderable profit from the ſale of woods of his own planting, which grew upon land that twenty-five years ago was not worth to him above two pence the acre, and which might have remained in that ſtate, perhaps for ages to come, had it not been planted at all. It is contended by the ſame writer, that it is by a judicious management of this ſort that men of large landed eſtates, by a little fore-ſight, find themſelves enabled to provide both employment and ſubſiſtence, with much profit, to a numerous people, who muſt otherwiſe have either remained in a deſtitute condition, or have abandoned a country, which did not properly provide for their accommodation.

It may be remarked likewiſe that a plantation of Scotch firs may be made at much leſs expence than of any other ſort of trees in thoſe northern parts of the kingdom, as the young plants can be afforded at a lower price than any others. In Aberdeenſhire, where planting is ſo general as to have become a ſort of occupation, fir plants of two years growth, above which age no experienced planter will ever buy them, ſometimes will be ſold at the very low rate of fourpence the thouſand, which conſiſts of twelve hundred plants; and they formerly ſeldom exceeded eightpence; on the average about ſixpence, or one halfpenny the hundred: but they have lately been conſiderably higher. There are men who make a buſineſs of forming plantations, who will undertake to complete the whole, encloſing and planting, at the diſtance of one yard each way, and uphold them for five years, that is, ſupply any deficiencies that may take place, at the rate of from ten to fifteen or thirty ſhillings the Scotch acre, which is nearly equal to one and a quarter Engliſh, according to the ſize of the incloſure, and the nature of the fence. In all caſes of this kind, it is ſuppoſed that the plantations are of the extent of thirty or forty acres or upwards; for where the incloſures are ſmaller, the expence of incloſing is proportionally augmented. The charge is thus not only rendered moderate, but the whole of the expence that is to be incurred, aſcertained before the plantation is begun, by which the being involved in unforeſeen difficulties is fully obviated.

Experience has fully ſhewn that there is ſcarcely any ſoil ſo bad, or any expoſure ſo bleak, that the fir-tree will not live in, if the plantation be of ſufficient extent, and not upon the very ſummits of high peaked hills. They do not indeed bear the ſea air very well, where they are much expoſed to the ſeverity of its blaſts; nor is the wood ever of ſo good a quality, or the tree long lived, upon ſoils of the clayey kind. It has been found that in the ſouthern parts of the kingdom, the pineaſter bears the ſea blaſt much better than any other of the fir tribe. This is a diſcovery of great importance, and which deſerves the attention of improvers in the way of planting. The ſpruce fir will however bear a ſtill more expoſed ſituation than the Scotch fir; and after a few years from the time of planting, it ſhoots up with ſtill greater luxuriance. This is the caſe probably only in particular ſituations. But the cones are not to be had in equal abundance; and the plants being more difficult in the rearing, they are ſold at a much higher price, uſually about ſix ſhillings the thouſand, fit for being planted out. In a good ſoil the ſilver fir alſo proſpers well, and is a beautiful tree, on account of the depth of its ſhade; but the price of the plants is too great to admit of large plantations of it being made with advantage. But wherever the ſituation is bleak, and much expoſed to ſtrong blaſts of wind, the plantation muſt not only be of conſiderable extent, if the trees be expected to thrive, but they muſt be planted very cloſe together, ſo that each plant may ſtand at the diſtance of from two to three feet at moſt from each other. The more expoſed the ſituation is, the cloſer they ſhould be planted; as it may be obſerved that until the branches begin to intermix, and give a mutual ſupport to each other, the trees never begin to advance with vigour. Where the plantations are thus thick, there is a neceſſity for beginning to thin them out at a pretty early period, ſo that after the tenth to the fifteenth year from the time of planting, perſons muſt be conſtantly employed in thinning them: and there are very few ſituations, indeed, in which the thinnings cannot be diſpoſed of to advantage, or in which ſuch ſorts of plantations cannot be made.

It has been remarked by an able writer, in the Tranſactions of the Bath Agricultural Society, that though he does not think that the Scotch fir can, in this country, ever equal the yellow deal from the Baltic, yet it may be worth propagating, as being uſeful in ordinary buildings. The drier the ſoil is on which this ſort of timber grows, the ſlower is its progreſs; but the cloſer its pores, the more ſuperior its quality. When planted in rich land theſe trees will ſhoot three or four feet in a ſeaſon, and equal, if not ſurpaſs, the abele in growth. In his plantations, though chiefly confined to chalky banks, in a north-weſt expoſure, the trees evince, that when once rooted, few obſtacles will prevent their profitable progreſs. From obſerving the miſtakes of others in endeavouring to ornament their naked downs too ſuddenly, he has learnt the neceſſity of planting firs when only a foot in height, and by opening the ground ſome time before, inverting the turf at the bottoms of the holes, and throwing the mould upon it in hillocks to meliorate, his plantations ſucceeded well: for though the ſoil is ſcarcely ſix inches in depth, the firs ſet in 1766 are now 30 feet in height, and from two feet ſix inches, to two feet, in circumference, at four feet from the ground; ſome few planted at the ſame time in a deeper ſoil, and warmer ſituation, are now about three feet round. And ſpruce firs, planted in 1766. likewiſe in a tolerably good ſoil, are now 40 feet in height, and from two feet ten inches and a half, to three feet, round. But he has ſeen plantations that far ſurpaſſed either of theſe in growth; they however occupied ground which was infinitely more valuable. See PINUS. In hard, ſcarce ſeaſons the tops or ſhoots of the fir tree have been uſeful as a food for cattle, ſheep, &c.

Fir, *Moſs upright*. See Lycopodium.

Fir, *Scotch*, in *Botany*. See Pinus.

Fir-*cones*, *foſſil*, in *Natural Hiſtory*, are extraneous foſſils, reſembling the cones of the fir-tree. Numbers of theſe have been deſcribed by different authors, who appear evidently to have confounded recent and peat foſſils with thoſe belonging to, or found lodged in the undiſturbed ſtrata, or to have had but ſlight evidence of the identity of the foſſils with recent cones. We have been told that a very perfect fir-cone was, a few years ago, found at Aſpley in Bedfordſhire, not many inches beneath the ſoil, in a completely ſilicious ſtate. The many fables that have been publiſhed reſpecting the petrifying ſprings of this place, would have induced the writer to have taken no notice of this, had it not been related to him by a gentleman of veracity, and a competent judge of theſe matters; but ſince he has had himſelf the opportunity of making enquiries on the ſpot concerning this foſſil.

Fir-*wood*, *foſſil*, has generally been that obtained from out of peat moſſes, in which recent fir-trees have been preſerved during the growth of the peat; and, as Mr. Parkinſon thinks, have undergone a degree of the *bituminous* Fermentation (which ſee), by which their inflammability has not only been preſerved, but in ſome inſtances heightened. The ſame gentleman (Organic Remains, i. 400.) figures a ſilicious remain, (Plate II. fig. 4 and 5.) which he deſcribes as a piece of fir, but we think without offering ſufficient proof of its identity to any of the recent fir tribe.

FIRABUS, in *Geography*, a town of Perſia, in the province of Mecran; 45 miles W. S. W. of Kidge.

FIRAN, a ſmall iſland in the Red ſea, about 18 miles from the coaſt of Arabia, celebrated for its fiſheries of pearl. N. lat. 17° 13′. E. long. 41° 30′.

FIRANDO, an iſland and kingdom of Japan, with a good harbour, in the ſea of Corea. N. lat. 33° 35′. E. long. 130° 40′.

FIRE. This word has been uſed to expreſs things ſomewhat differing from each other; yet bearing analogy to its moſt uſual and moſt common ſignification, which is that of an active natural proceſs, attended with the emiſſion of heat and light, and likewiſe with the decompoſition of certain ſubſtances, which are ſaid to be *burning*, or in a *ſtate of combuſtion*, during the proceſs, and are ſaid to be *burnt* after the termination of the proceſs.

The general uſe of fire, which comes continually under our obſervation, ſuggeſts to our minds the meaning of the word perhaps much more readily than the recollection of the above ſtated definition; the latter, however, is attended with this advantage, namely, that it defines the limits of the meaning, whence it prevents its equivocal application.

The various ſpectacles which fire exhibits to our ſenſes; its aſtoniſhing effects, and the innumerable uſes to which it may be applied, have, at all times, rendered it an object of the utmoſt conſequence to the human ſpecies. The new-born infant generally fixes his eyes to the flame of a candle, or to a common culinary fire, in preference to any other object; at a more advanced age the various means of exciting and of employing fires occupy the thoughts of a very great portion of the human ſpecies; and the induſtry of philoſophers has at all times endeavoured to inveſtigate the nature, and to account for the effects of fire.

It is not every kind of bodies that are capable of combuſtion. Thoſe which are capable of ſupplying a fire, or of being burnt, are called *combuſtibles*, and ſuch are either ſimple, as hydrogen, ſulphur, and phoſphorus; or compound, *viz.* thoſe which conſiſt of various ſubſtances together with a notable proportion of one or more of the above-mentioned ſimple combuſtibles; ſuch as wood, coal, oils, &c. Several other bodies are not combuſtibles; theſe, however, may, by the action of a fire, be rendered red-hot, ſo as to emit heat and light, but they do not undergo any decompoſition; or if they do undergo any, it is not of that kind which a fire produces amongſt bodies that are really combuſtibles. The incombuſtible bodies that are rendered red-hot, are ſaid to be in a ſtate of ignition, or of incandeſcence, and this incandeſcence, which emits heat and light, exiſts no longer than the cauſe which produces it; for after that it begins to diminiſh, and gradually vaniſhes; whereas the real combuſtibles, when once ſet on fire, continue of themſelves to burn, until the materials are loſt. Thus a pebble or a brick, by being placed in the middle of a common fire, may be eaſily rendered red-hot, but as ſoon as it is removed from the fire, its heat and light will gradually diminiſh, and will laſtly vaniſh; the pebble or the brick remaining in the ſame ſtate as it was before the operation. On the other hand, a piece or two of wood ſet on fire will of themſelves continue to burn until their whole ſubſtance is changed into ſomething quite different from what it was before the combuſtion.

Sometimes a ſubſtance which is actually a combuſtible, may, when placed in a common fire, be only ignited, and act like an incombuſtible body; that is, without undergoing any perceptible decompoſition. The reaſon of this is, that the given combuſtible requires to be expoſed to a very high temperature before it will ſuffer decompoſition; therefore when placed in a lower temperature, yet ſufficient to render it red-hot, it will then only acquire a ſtate of incandeſcence. Thus a diamond, which is perfectly combuſtible in a very high temperature, may be made repeatedly red-hot and cooled, without the leaſt alteration of its nature.

It may alſo happen that a combuſtible body may be placed in a degree of temperature much higher than that which is neceſſary for its combuſtion; yet the combuſtion will not take place for want of ſome of the circumſtances upon which that proceſs neceſſarily depends. Thus a piece of charcoal placed in a cloſe veſſel may be rendered red-hot, and may be kept in that ſtate for any length of time, without undergoing the leaſt decompoſition. The reaſon of which is, that in a cloſe veſſel no oxygen gas can come in contact with the ignited charcoal; and without the preſence of oxygen, or of ſubſtances which can yield oxygen, no combuſtion can take place. See the articles Combustion and Excitation, wherein whatever belongs to the theory of combuſtion will be found.

From the former of theſe articles it appears, that no fire can continue long without a conſtant ſupply of a combuſtible ſubſtance, and of oxygen; for the whole proceſs conſiſts in a decompoſition of both theſe ſubſtances, and the formation of new compounds, at the ſame time that the latent heat, or caloric, and the light, are ſeparated and are ſet at liberty. As fire is of great and conſtant uſe for economical purpoſes, no pains have been ſpared to determine how the greateſt effect may be produced in the ſafeſt and moſt economical manner poſſible, relative to all ſpecies of fire, from the burning of the leaſt lamp, to that of the moſt powerful furnace. The combuſtibles, which are uſed for all theſe kinds of fire, are collectively called *fuel*, and in all caſes the difficulty is to determine which kind of fuel is (according to other concurring circumſtances of place, expence, &c.) the fitteſt for any given purpoſe. The full conſideration of theſe particulars will be found under a variety of articles, ſuch as Fuel, Lamp, Light, Furnace, &c.; we ſhall nevertheleſs barely mention in this place ſome of the leading facts, which have been determined in conſequence of repeated experiments, and which may, for the preſent, furniſh the reader with a ſufficient idea of the limits within which our powers of employing fires have as yet been confined.

Half an ounce of ſpermaceti oil, of the beſt kind, in a proper lamp, which is furniſhed with a wick of a ſingle thread of cotton, may be made to burn for about twenty hours, and it ſeems that no ſmaller or cheaper quantity of any other combuſtible ſubſtance is known, which will maintain a fire for nearly ſo long a time. The Chineſe uſe a very peculiar mode of continuing a ſmall fire. A very light ſtick, about a twentieth of an inch in diameter, and about fourteen inches in length, is cruſted over with a fine ſort of ſaw-duſt, wherein perhaps a very ſmall quantity of nitre may be contained. The ſaw-duſt is probably made to adhere to the ſtick by means of weak ſize. If one of theſe ſticks ſo cruſted be lighted at one extremity, it will continue to burn, not with a flame, but like tinder, and will laſt about a quarter of an hour or twenty minutes. The Chineſe keep ſuch ſticks burning before their idols, or for the purpoſe of lighting their pipes, even in their boats upon water; and when one of them is nearly out, another is put in its place. The flame of a lamp, furniſhed with ſpirit of wine, is much more active than when furniſhed with oil, and it is to be remarked that the flame of ſpirit of wine gives much more heat, and at the ſame time much leſs light, than the like flame of oil. The flame of burning hydrogen gas in common air is not very active, at leaſt not nearly ſo active as a ſimilar ſized flame from oil; yet it is ſaid that the flame of hydrogen gas, urged by pure oxygen gas, produces the moſt active fire known. For this experiment the two gaſes muſt not be mixed in a common veſſel, and then let out of a ſmall aperture in order to be lighted, and to produce a ſtream of fire; for in that caſe the whole quantity of mixed gaſes would at once explode, and burſt the veſſel; but the two gaſes ſhould be kept in ſeparate veſſels, as, for inſtance, in two bladders furniſhed with ſtop-cocks, and when the ſtream of hydrogen is burning, then the ſtream of oxygen ought to be directed towards it. The gas, which is extricated from coal by means of heat, has been found uſeful for lighting apartments in certain circumſtances, but the particulars will be found detailed under the article Flame. For a culinary, or common fire place, ſeveral ſpecies of coal furniſh, *cæteris paribus*, the moſt laſting, and, upon the whole, the moſt uſeful fire. The ſame will do for large furnaces; but for ſmall furnaces, wherein a clear fire may be wanted, or for drying malt, &c. coke or charred coal is preferred; for the action of charring expels from the coal a good deal of groſs vapour, which otherwiſe renders the fire ſmoky, eſpecially at firſt. The greateſt heat of an air furnace, eight inches in diameter, according to Wedgwood's eſtimation, amounts to about 21,877° of Fahrenheit's thermometer, or to 160° of Wedgwood's.

From the above-mentioned ſtatements one may be eaſily led to conceive what degree of credit muſt be given to thoſe idle ſtories of perpetual fires, and of lamps having been found actually burning in old tombs, and ſtone coffins. The improbability, or rather the abſurdity of the accounts, is ſo very glaring as to render them only fit for novels and low poems.

Whatever belongs to fire, ſuch as its excitation, its theory, its economical uſes, its natural devaſtations, &c.; obtrudes itſelf on our notice under ſo many other obvious articles, as to ſuperſede the neceſſity of rendering the preſent very prolix; there are, however, two particulars, which may with more propriety be expected in the preſent; and therefore we ſhall briefly ſubjoin them. Theſe are a ſhort hiſtory of the principal opinions that have been entertained reſpecting the nature of fire, and ſome remarks on the various ſenſes in which the word fire has been uſed.

The opinions of the ancient philoſophers reſpecting fire were various and fanciful. Ignorant of the leading facts which a theory is required to account for, and unaſſiſted by experiments or tools, they generally made uſe of words which convey no definite ideas. They called it an active fermentation, an inteſtine motion, a repulſive agent, and ſo forth; but no real attempt towards a rational inveſtigation is to be found in their works. And though ſome of their aſſertions ſeem to coincide with the more rational modern theories; yet that apparent coincidence muſt be conſidered as being accidental; for it is not grounded upon any regular reaſoning. It muſt be acknowledged, however, that almoſt all the opinions, either ancient or modern, reſpecting fire, may be divided into two claſſes; for ſome of them aſſerted that fire was nothing more than a violent agitation, in ſome unknown manner, of the parts of burning bodies; whilſt others attributed it to ſomething peculiar, and *ſui generis* which either exiſted in all combuſtible bodies, or was communicated to them. The former, which is called the mechanical hypotheſis, was believed and maintained by the moſt able philoſophers of much earlier, and much more enlightened times. Bacon, Boyle, and Newton, were of that opinion; and there ſeems to have exiſted a conſiderable ſtruggle between thoſe diſtinguiſhed perſons, and ſome celebrated chemiſts of thoſe times, who maintained that fire was a fluid of a peculiar nature. The former aſſerted that the phenomena of fire could be accounted for on the ſuppoſition that fire conſiſted in nothing more than the violent agitation of the parts of the bodies concerned; but as no ſuch motion could be produced without an adequate cauſe, they were conſiderably perplexed by it; and, in fact, their attempts towards an explanation are very confuſed. Boyle ſays that when a piece of iron becomes hot by hammering, "there is nothing to make it ſo, except the forcible motion of the hammer impreſſing a vehement and variouſly determined agitation on the ſmall parts of the iron."—It is to be remarked, that the ſame Mr. Boyle, on obſerving the phenomena of the metallic bodies acquiring additional weight by their calcination, was induced to publiſh a treatiſe on the poſſibility of rendering fire and flame ponderable. Bacon defines heat, (which he conſiders as meaning the ſame thing as fire) to be "an expanſive undulatory motion in the minute particles of a body, whereby they tend with ſome rapidity from a centre towards a circumference, and at the ſame time a little upwards." Newton did not attempt to aſſert any thing poſitive concerning it; but he conjectured that groſs bodies and light might be convertible into one another; and that great bodies of the ſize of our earth, when violently heated, might continue and increaſe their heat by the mutual action and re-action of their parts.

The firſt of the chemiſts who attempted to form chemiſtry into a regular ſyſtem, was John Joachim Beccher, but the famous George Erneſt Stahal, (who was born in the year 1660, and died in the year 1734,) by following Beccher's plan, continued to raiſe the edifice, endeavouring to collect the principal facts then known into a coherent ſyſtem, by connecting them by means of general principles. This intelligent man, amongſt other improvements, formed the famous phlogiſtic theory of fire (ſee the article Com-

BUSTION), which was almoſt univerſally adopted, notwithſtanding its inſufficiency to account for ſome of the moſt eſſential phenomena of combuſtion. This theory continued in vogue until towards the cloſe of the laſt century, when a new ſyſtem of chemiſtry, and a new theory of fire was announced to the world by the immortal Lavoiſier, who unfortunately died in the year 1794. His hypotheſis, beſides the conviction with which its bare enunciation was attended, has continually derived additional confirmation from a variety of new facts and ſubſequent experiments. This Lavoiſier's hypotheſis will be found particularly deſcribed under the article COMBUSTION.

Since the publication of Lavoiſier's hypotheſis, or rather eſtabliſhed theory, an objection, apparently of importance, has been made to it by Count Rumford, in conſequence of ſome experiments which he made upon friction. This gentleman found, that in boring a cannon during half an hour, the temperature was raiſed 70°; and that it ſuffered a loſs of 837 grains by the duſt and ſcales torn off, which amounted to $\frac{1}{948}$th part of the cylinder. He then, calculating upon the ſuppoſition that all the heat ſo raiſed was given out by thoſe ſcales and duſt, concludes that they muſt have loſt 66,360° of temperature; when at the ſame time he found that their ſpecific heat was not thereby ſenſibly diminiſhed. This obſervation made him doubt the exiſtence of the *caloric* propoſed by Lavoiſier, as a principle *ſui generis*, &c. and prompted him to make certain unwarrantable queries reſpecting the nature of fire; but he omitted to notice a very material circumſtance; namely, the compreſſion which the whole piece of metal ſuffered in conſequence of the boring; hence Mr. Dalton juſtly ſays, "the heat excited does not ariſe from the ſcales merely, elſe how ſhould hammering make a body red-hot without any loſs of ſcales? The fact is, the whole maſs of metal is more or leſs condenſed by the violence uſed in boring, and a riſe of temperature of 70°, or 100°, is too ſmall to produce a ſenſible diminution in its capacity for heat. Does Count Rumford ſuppoſe, that if in this caſe the quantity of metal operated upon had been one pound, and the duſt produced the ſame as above, that the whole quantity of heat evolved would have been the ſame?"

The word fire has alſo been uſed both figuratively and incorrectly. The allegorical expreſſions of *the fire of the imagination*, *the fire of youth*, *the fire of contention*, and ſo forth, do not fall under the cognizance of natural philoſophy; but the ſcientific uſe of that word for expreſſing heat without light, or light without heat, or laſtly, things which have neither heat nor light, is in want of correction. Thus phoſphoreſcent ſubſtances, like certain pieces of decayed wood, fiſh, &c. are frequently ſaid to be on fire; whereas they are not attended with any degree of heat. Alſo the heat of fermenting ſubſtances, and of other kinds of chemical combinations, has often been called their fire. But the moſt ſingular uſe of that word is its being often employed for expreſſing the electric fluid, which in its quieſcent ſtate ſhews neither heat nor light. It is true that in a vaſt number of electrical experiments fire is actually produced, and every electric ſpark is capable of ſetting fire to certain inflammable bodies. A very ſmall ſpark of electricity, ſuch indeed as may appear not bigger than a pin's head, is ſufficient to inflame hydrogen gas. But it muſt be conſidered that the effects of fire take place only when the electric fluid is obliged to paſs through certain ſubſtances which in ſome meaſure obſtruct its free motion. A Leyden phial fully charged with electricity, and left inſulated, does not ſhew the leaſt perceptible mark of light or of heat, more than a ſimilar phial not charged with electricity. Let the charged phial be diſcharged through a ſubſtance which reſiſts its paſſage, (and all ſubſtances obſtruct the paſſage of the electric fluid more or leſs,) and the moſt aſtoniſhing effects of fire are produced; metallic bodies are fuſed, and even diſperſed into ſmoke, combuſtible bodies are inflamed, hard bodies are broken, &c. If the diſcharge be made through the beſt vacuum which can be effected by means of an air-pump, the light and the heat will hardly be perceptible, becauſe that vacuum offers a very trifling reſiſtance to the paſſage of the electric fluid. In ſhort it is univerſally true that the production of fire, that is the evolution of light and heat, is, if not exactly, at leaſt nearly proportionate, to the obſtruction which a given quantity of electric fluid meets with in its paſſage from one place to another. Therefore, upon theſe and other obvious conſiderations, which would be uſeleſs to mention in this place, inſtead of looking upon the electric fluid as fire, would it not be more rational to attribute the effects of fire, which are obſerved in electrical experiments, to the ſcore of friction? In the boring of holes with hard tools, in the driving of nails through wood, in the quick paſſage of a bullet through the air or through harder ſubſtances, and in a great many other ſuch like caſes, no one heſitates to attribute the production of heat to friction or preſſure; and if the very rapid movement of the electric fluid through bodies, and its immenſe elaſticity be conſidered, it ſhould ſeem that the effects of fire which are obſerved in electrical experiments, ought likewiſe to be attributed to the above-mentioned cauſe of friction or preſſure.

FIRE, in *Medicine* and *Surgery*, is uſed in the ſame ſenſe with cautery. See CAUTERY and CAUSTIC.

Fire alſo gives the denomination to divers diſeaſes, as,

FIRE, *St. Anthony's*. It ſeems clear that the eryſipelas was firſt ſo called in the ſouth of France, and in the 12th century, where and when this diſorder was exceedingly prevalent, from the ſucceſs of the monks of St. Anthony (whoſe profeſſion it was to attend the ſick, and who therefore carried the figure of a crutch upon the left ſhoulder) in curing it. They made great uſe of lard in theſe cures; hence their pigs were allowed to range free through the neighbouring grounds; and that they might be diſtinguiſhed from other pigs, bells were hung round their necks. Theſe circumſtances account for the figure of St. Anthony, the Egyptian hermit of the 4th century, being repreſented with the pig, the bell, and the letter Tau upon his ſhoulder. Paquot in Molanum, de imaginibus.

FIRE, *walking*, called alſo *Will-with-a-wiſp*, *Jack-in-a-lantern*, *ignis fatuus*, &c. See IGNIS *fatuus*.

FIRE, in *Theology*, is frequently underſtood of the puniſhment of the wicked after death. See HELL.

It is ſuppoſed the world will periſh at laſt by fire. See CONFLAGRATION.

God has made ſeveral revelations of himſelf under the appearance of fire; he appeared to Moſes under the form of a fire burning in a buſh; the Holy Ghoſt deſcended on the apoſtles in tongues of fire; and the camp of the Iſraelites was guided and conducted in the night time by a pillar of fire.

The Chaldeans had an high veneration for fire, which they accounted a divinity; and in the province of Babylon there was a city conſecrated to this uſage, which was called the city of Ur, or of Fire.

The Perſians alſo adored God under the image or repreſentation of fire, becauſe it is fire that gives motion to every thing in nature. They had temples, which they called "Pyræa," fire temples ſet apart ſolely for the preſervation of the ſacred fire. They are ſaid to have in that empire fires ſtill ſubſiſting, which have burnt many thouſand years. See FIRE *everlaſting*, GABRES, and MAGI. The worſhip of the goddeſs Veſta (ſee Vesta) and of fire was brought into Italy by Æneas and the other Trojans, who landed there; but the Phrygians themſelves had received it from the eaſtern nations. Fire was held in religious veneration among the Gauls; and ſimilar ſentiments and practice have prevailed in ſeveral countries of America.

The Hebrews kept up the holy fire in the temple. This holy fire deſcended from heaven, firſt upon the altar in the tabernacle at the conſecration of Aaron and his ſons to the prieſthood, Lev. ix. 24. and afterwards it deſcended anew on the altar in the temple of Solomon, at the conſecration of that temple, 2 Chron. vii. 1. And there it was conſtantly maintained by the prieſt day and night, without ſuffering it ever to go out; and with this all the ſacrifices were offered that required fire. This fire, according to ſome of the Jewiſh writers, was extinguiſhed in the days of Manaſſeh; but the more general opinion among them, is, that it continued till the deſtruction of the temple by the Chaldeans; after that it was never more reſtored; but inſtead of it they had only common fire in the ſecond temple.

The Veſtals were appointed expreſsly to keep up the ſacred fire of the Romans. See Vestals.

Vulcan was worſhipped among the ancients, and particularly the Egyptians, as the inventor of fire; and Boerhaave has made it highly probable, that the Vulcan of the heathens was the Tubal-Cain of the Hebrews, the firſt who appears to have known the uſe of fire, and to have applied it in the fuſion of metals and other preparations of chemiſtry. See Prometheus.

Fire, *Divination by*. See Pyromancy.

Fire, in the *Manege*. To give the fire to a horſe is to apply the firing-iron red-hot to ſome preternatural ſwelling in order to diſcuſs it, which is oftentimes done by clapping the firing-iron upon the ſkin without piercing through. We give the fire to farcy knots, by running a pointed burning iron into the ulcers. We likewiſe give the fire for wrenches of the paſterns. See Firing-*iron*.

Fire, in the *Military Language*, is ſometimes applied to the fires lighted in an army in the night-time.

But the term fire or firing is more frequently uſed for the diſcharge of the fire-arms, or the ſhot made on the enemy from the artillery, &c. And accordingly it is uſed as a word of command to ſoldiers of all denominations to diſcharge their fire-arms, grenades, cannon, &c. The fire of the infantry is by a regular diſcharge of their fire-locks, by platoons, diviſions, &c. that of the cavalry with their fuſees and piſtols; and that of the place beſieged from their artillery. See Exercise and Firing.

In fortification, the *fire of the place* denotes the flank, or that part of the curtain where the line of defence terminates from whence they fire to defend the oppoſite face of the baſtion.

Fire-*Arms*, a term attaching to all weapons, principally of an offenſive nature, from which bullets, &c. may be impelled by the force of gun-powder. Theſe are generally divided into two ſpecies, the one requiring much labour to tranſport, and known by the names of artillery, ordnance, cannon, great-gun, &c. and again ſubdivided into claſſes, ſuch as the mortar, the howitzer, the culverin, the demi-culverin, the royal, &c. &c; the other ſpecies are made on a portable principle, and compriſe thoſe implements commonly called muſkets, carabines, match-locks, arquebuſſes, blunderbuſſes, fuſils, together with piſtols of various ſizes and deſcriptions; forming in the whole an ample catalogue of inventions ſuited to enabling the human race not only to defend itſelf againſt beaſts of prey, and to attain proviſions from among the ſeveral inhabitants of the earth, the air, or the waters, but to deſtroy each other wholeſale; as though we were afraid that our increaſing population ſhould ultimately condemn us either to ſtarvation, or to reſort to the moſt horrid means of ſupporting exiſtence, *viz.* Cannibaliſm.

In treating of Artillery, we have already explained the nature of ordnance in general, and ſhewn the proportions ſeverally of the different *natures*, as the various ſizes are technically called; therefore, in this place our attention will be chiefly directed towards thoſe matters relating to fire arms in general; by which we mean to be underſtood as applying that term to thoſe leſſer weapons popularly called "ſmall-arms."

The ſeveral nations of Europe, among which the arts have made ſuch rapid progreſs, have long ſince baniſhed the more rude and uncertain mode of igniting the powder in the priming pan by means of a match, which being formed of ſome ſubſtance that retains fire, but burns very ſlowly, could merely, by the motion of a ſmall lever, acted upon by a finger, be applied thereto. This method is, however, very generally retained among the nations of the Eaſt; where the bark of the *prauſs*, an indigenous tree every where abounding, ſupplies the *paleetah*, or match, in very great perfection; merely by cauſing the ſhreds ſtripped off from the leſſer branches to be beaten with a heavy iron mall, or hammer, in the courſe of its drying, which it does in a few days; the fibres are then twiſted to about the thickneſs of a ſwan's quill, and to any length that may be judged neceſſary; the ſpare part being allowed to hang down at the ſide of the lock, or lever. The uſe of matches is not only attended with great delay, but, in conſequence of the neceſſity which exiſts for blowing the *paleetah* previous to applying it to the pan, muſt, in many inſtances, ſubject the operator to danger, or eventually to accidental contact, between the ſparks and the firing.

Match-locks, ſuch as are in Hindooſtan, which, including China and Tartary, may be conſidered their head-quarters, are not applied to the ſhoulder when about to be diſcharged; but having a long ſtock, of a batten-form, are placed under the arm. This takes off the recoil; or rather cauſes it not to be felt; an object of ſome importance when it is known that theſe pieces are generally charged heavily; and, that on account of the ſcarcity of lead, malleated iron balls are in general uſe: theſe, being very rough, require to be rammed down very hard, otherwiſe they would remain in the upper part of the bore, and ſubject the barrel to be burſt, as very frequently happens in conſequence of the immenſe reſiſtance the ball makes in its courſe through a long barrel, every where preſenting an unfiniſhed ſurface. On the other hand it is to be remarked, that match locks throw balls to great diſtances; and, owing to the deliberate manner in which they may be diſcharged, without any tug at a ſtiff trigger, or the fear of a *kick* from the butt, are found to do immenſe execution; moſt of thoſe perſons who uſe them are, indeed, as expert as the generality of rifle-men. Many of theſe pieces are ſo long and heavy, as to require moveable reſts: thoſe mounted as wall pieces, and called *jinjauls*, often throwing a ball near a mile, and weighing from fifty to ſixty pounds.

The muſkets in uſe among the armies in Europe are far more compact, carrying a larger ball, and in every reſpect better finiſhed. Theſe are provided with ſpring-locks, which impel the flint towards a ſteel plate, called the hammer, by which the ſparks are directed into the pan. It is to be regretted that the flint uſually provided for our military are not of a better quality; ſo as to inſure their ſtriking fire with greater certainty. Our fire-locks are indeed far too heavy, for which it is aſſigned as a reaſon, that lighter pieces would not ſend the balls to a ſufficient diſtance; but if we conſider the well aſcertained fact, that not one muſket ball in an hundred ſtrikes upon an oppoſing line of troops, we certainly ſhould ſet our minds rather more at eaſe, on the ſcore of impetus in a weapon ſo very little contributing to the ſucceſs of the day. It may not be too much to aſſert, that the decreaſe of weight, whereby fatigue and labour would be greatly leſſened, would enable our brave ſoldiers to act with greater promptitude in general, and to uſe their bayonets, which are really efficient in their hands, with more activity and vigour.

Engliſh fire-arms of every kind are made to the greateſt perfection; their bores being perfectly ſmooth, and the locks remarkably neat, ſtrong, and active. The ſizes of the balls are all regulated when for public ſervice; being caſt in moulds of particular diameters; ſo that no miſtake can be made, unleſs through ſhameful neglect, in ſupplying ammunition to the ſeveral corps. The Britiſh ſtandard is as follows:

Nature of the Piece.	Number of Balls to one Pound of Lead.	Diameter of each Ball in Inches.
Wall Pieces - -	6¾	.89
Muſkets - - -	14½	.68
Carabines - - -	20	.60
Piſtols - - -	34	.51
7 Barrel Guns - -	46½	.46

In order to preſerve a regularity in the ſupply of balls for pieces not on any regular ſcale, or eſtabliſhment, it is uſual to aſcertain what ball will fit the bore in a proper manner; ſo as to allow of four folds of paper, (*i. e.* two on each ſide,) neceſſary to wind around the ball when made into a cartridge. The ball is then tried in a gauge, that is, a bar pierced with holes, all declining in ſize, in regular order, and numbered from one, which ſuits a wall-piece, to buck-ſhot; which is ordinarily eſtimated at about No. 30 or 32. Whatever hole the ball may paſs through, but in ſo cloſe a manner, as to ſtop in the next ſmaller hole, gives the deſignation of the bore on the regiſter. But it is more uſual to caſt balls in moulds, deſignated according to the number of balls of that ſize made from a pound of lead. Therefore muſket balls would be called No. 14, and carabine balls No. 20.

The mention of ſeven-barrelled-guns leads us to contemplate, with no ſlight admiration, the perfection to which this branch of mechaniſm has been brought! This perfection has naturally been produced by ſucceſſive ſtages, each of which has had numerous candidates, to whom public liberality has been the inducement, and proved the reward. When we conſider that a man provided with a muſket having ſeven barrels, yet but one lock, may diſcharge ſeven times in leſs than half a minute, without any intermediate operations of priming or loading, we muſt yield our tribute of applauſe to the ingenuity of the inventor, though we cannot refrain from reflecting on that purpoſe to which it is devoted.

As to piſtols, &c. they are made upon various ſcales, and for the particular purpoſes of thoſe who are to uſe them. Thus, what we call horſe-piſtols, are intended to occupy the holſters attached to ſaddles; duelling-piſtols, which are uſually provided with hair-triggers, that act upon the ſlighteſt touch, are deſtined to the deciſion of thoſe knotty points at which *honour* ſo ſpeedily takes umbrage; while the pocket-piſtol, made upon a diminutive ſcale, may be intended either for the uſe of the robber, or to repel his preſumption. Whatever may be the purpoſe of fire-arms, whether for the military, for ſporting, or for general defence, nothing can be more improper than leaving them loaded in places acceſſible to ſervants, ſtrangers, and eſpecially to children. We ſhould ſuppoſe that the immenſe number of accidents that happen, and are publicly notified in the daily prints, might operate as a ſtimulus towards the ſecuring of fire-arms, beyond thoſe ordinary means of acceſſibility, which place them within the reach of every one whoſe ill-fated curioſity may induce to handle them. Strange to ſay! we ſhudder at the detail of one of thoſe accidental murders which too often occurs, yet neglect to benefit by the melancholy leſſon, until ſome domeſtic calamity of the ſame nature may burthen the negligent proprietor with ſhame, affliction, and remorſe.

FIRE-*arrow* is a ſmall iron dart furniſhed with ſprings and bars, together with a match impregnated in powder and ſulphur, which is wound about its ſhaft. It is uſed by privateers and pirates to fire the ſails of the enemy, and for this purpoſe is diſcharged from a muſket or a ſwivel-gun. The match being kindled by the exploſion, communicates the flame to the ſail, againſt which it is directed, where the arrow is faſtened by means of its bars and ſprings. As this is peculiar to hot climates, particularly the Weſt Indies, the ſails being extremely dry, are inſtantly ſet on fire, and the fire is conveyed to the maſts, rigging, and finally to the veſſel itſelf.

FIRE-*ball*, a compoſition of meal-powder, ſulphur, ſalt-petre, roſin, pitch, &c. about the bigneſs of a handgranade, made of an iron ſheet, filled and covered over with ſeveral coats of the above mixture, the laſt coat being of grained powder. Thick brown paper made into the form of a ſhell adapted to the ſize of the mortar, and filled with an equal quantity of ſulphur, pitch, roſin, and meal powder, well mixed and put in warm, will anſwer the purpoſe as well as any thing elſe. This is to be thrown into the enemy's works in the night-time, to diſcover where they are; or to fire houſes, galleries, or blinds of the beſiegers. The balls uſed for this intention are prepared with mealed powder, ſalt-petre, ſulphur, roſin, ſteel or iron filings, fir-tree ſawduſt boiled in ſalt-petre ley, and birchwood charcoal, well rammed into a ſhell, having various holes filled with ſmall barrels, loaded with muſket-balls, and immerſed in melted pitch, roſin, and turpentine oil. They are ſometimes armed with ſpikes or hooks of iron, that they may not roll off, but ſtick or hang where they are deſired to have any effect. See BALLS.

FIRE-*bare*, in our *Old Writers*, is uſed for a beacon. "Quod ſine dilatione levari & reparari fac ſigna & fire-bares, ſuper montes altiores in quolibet hundredo, ita quod tota patria per illa ſigna, quotieſcunque neceſſe fuerit, præmunire poteſt." Ordin. Obſervand. Temp. Edw. II.

FIRE-*barrels*. See BARRELS, and FIRE-*ſhip*.

FIRE-*blaſt*, a diſeaſe or accident to which the hop plant is much expoſed. It chiefly occurs towards the later periods of the growth of the crops. It is ſuppoſed by moſt hop-planters to depend upon the particular ſtate of the air or weather at the time; but it is more probable that it may be cauſed by lightning, as it takes place very ſuddenly at thoſe ſeaſons when it moſtly prevails, and generally affects the moſt forward and luxuriant binds. See HOPS.

FIRE, *bon*. M. Mahudel has a diſſertation on the origin of bon-fires, wherein he endeavours to make it appear that they were unknown to the ancients, and conſequently muſt be a modern invention.

He does not deny that the ancients had rejoicings on occaſion of the concluſion of a peace or alliance, or the news of a victory's being obtained againſt their enemies, on the birth-day, proclamation, or marriage of their prince; as alſo when they recovered from a dangerous ſickneſs; but, according to him, the fire on all theſe occaſions ſerved only to burn the victims or the incenſe; and as theſe ſacrifices were moſtly offered in the night-time, the illuminations were only intended to give light to perform the ceremonies. Hiſt. Acad. Inſcrip. tom. ii. p. 330, ſeq.

Fire-*bote*, a term ſignifying a quantity of wood bound up for fuel, which, by the common law, the tenants may, for neceſſary firing, take out of the lands that have been granted to them.

Fire-*clay*, is that particular kind of clay which is proper for making bricks or veſſels intended to ſtand a high degree of heat. The third coal ſhale or ſeries of argillaceous coal meaſures, between the third and fourth grit rock, reckoning from the mill-ſtone grit upwards, which traverſes Derbyſhire and part of Yorkſhire, and produces *crow-ſtone* and foſſil *reeds* in great abundance, contains a very excellent fire-clay, which is dug at Heaze-nether-end, Wheatcroft, Birkin Lane, and other places. The fiſſures of the fourth or lower limeſtone of this diſtrict ſometimes produce alluvial maſſes of fire-clay, of good quality, as at Milk hill gate, near Water-houſe, Staffordſhire, and near Newhaven-houſe, Derbyſhire.

It is found that clay, more or leſs fit for fire-bricks, is found immediately beneath almoſt every ſeam of coals, and where it is not ſoft in the form of clay, the clunch and other indurated ſubſtances compoſing the immediate floor of coals, will generally fall by expoſure to the weather, into a brick clay or earth. See Floor.

Fire-*cocks*. Churchwardens in London, and within the bills of mortality, are to fix fire-cocks at proper diſtances in ſtreets, and written marks near them, and to keep in every houſe thus marked an inſtrument or key for opening the plug, and a large engine and hand-engine for extinguiſhing fire, under the penalty of 10*l*. The turn-cock whoſe water ſhall come firſt into a main-pipe at a fire, ſhall have 10*s*. the firſt engine that is brought ſhall entitle to 30*s*. the ſecond to 20*s*. and the third to 10*s*. 6 Ann, cap. 31. 12 Geo. III. cap. 73. To prevent fires, it is required that workmen in the city of London, &c. build all front and rear walls of brick or ſtone; and that the front walls be 18 inches above the gutter, and coped with ſtone, tile, or brick; and party-walls between houſe and houſe, thoſe belonging to houſes, the expence of building which is more than 120*l*. to be of the thickneſs of 1 foot nine inches, or 2½ bricks in the loweſt ſtory; and of 2 bricks, or 1 foot 5½ inches from thence to the garret floor; and from the garret upwards 1½ brick, or 13 inches, and to be carried up to the full height of 18 inches above the adjoining gutters; and it is alſo required, that no timbers, except the girders, binding and trimming joints, and the templets under the ſame, ſhall be laid into ſuch party-walls; and that there ſhall be 5 inches of ſolid brick-work left at or between the ends of all lentils, wall-plates, and bond-timbers. See Building, and ſtat. 7 Anne, c. 17. 11 Geo. I. c. 28. 33 Geo. II. cap. 30. and 4 Geo. III. cap. 14. And on the breaking out of any fire, all the conſtables and beadles ſhall repair to the place with their ſtaves, and be aſſiſting in putting out the ſame, and cauſing people to work, &c. No action ſhall be had againſt any perſon in whoſe houſe or chamber a fire ſhall begin, 6 Anne, 10 Anne, c. 14. But if ſuch fire happens through negligence of any ſervant, ſuch ſervant ſhall forfeit 100*l*. to be diſtributed among the ſufferers; or, in default of payment, ſhall be committed to ſome work-houſe, and there kept to hard labour for eighteen months. See Arson.

All the laws relating to the prevention, &c. of fire, are reduced into one ſtatute, and former ſtatutes repealed, by 12 Geo. III. cap. 73.

Fire-*damp*, in *Natural Hiſtory*. See Damp.

Fire-*eater*. We have a great number of mountebanks who have procured the attention and wonder of the public by eating of fire, walking on fire, waſhing their hands in melted lead, and the like tricks.

The moſt celebrated of theſe was our countryman Richardſon, much talked of abroad. His ſecret, as related in the Journals des Sçavans of the year 1680, conſiſted in a pure ſpirit of ſulphur, wherewith he rubbed his hands and the parts that were to touch the fire, which burning and cauteriſing the epidermis, hardened and enabled the ſkin to reſiſt the fire.

Indeed this is no new thing; Amb. Paré aſſures us he had tried on himſelf, that after waſhing the hands in urine, and with unguentum aureum, one may ſafely waſh them in melted lead.

He adds alſo, that by waſhing his hands in the juice of onions, he could bear a hot ſhovel on them while it melted lard.

Fire, *Electrical*. See Electricity.

Fire-*engine*, is a machine for extinguiſhing accidental fires by means of a ſtream or jet of water. The common ſquirting fire-engine conſiſts of a lifting pump placed in a circular or cylindric veſſel of water, and wrought by two levers that act always together. During the ſtroke, the quantity of water raiſed by the piſton of the pump ſpouts with force through a pipe joined to the pump-barrel, and made capable of any degree of elevation by means of a yielding leather pipe, or by a ball and ſocket turning every way, ſcrewed on the top of the pump. The veſſel containing the water is covered with a ſtrainer, which prevents the dirt and filth poured into it with the water from choaking the pump-work. Between the ſtrokes of this engine the ſtream is diſcontinued for want of an air-veſſel. However, in ſome caſes, engines of this conſtruction have their uſe, becauſe the ſtream, though interrupted, is much ſmarter than when the engine is made to throw water in a continued ſtream. The beſt engine of this latter kind is that of Mr. Newſham, formerly an engine-maker in London. A perſpective view of the whole engine, ready for working, is repreſented in *Plate* III. *Hydraulics*, &c. *fig.* 4. This engine conſiſts of a ciſtern A B, about three times as long as it is broad, made of thick oaken planks, the joints of which are lined with ſheet-copper, and eaſily moveable by means of a pole and croſs bar C in the fore part of the engine, which is ſo contrived as to ſlide back under the cover of the ciſtern, and on four ſolid wheels, two of which are ſeen at D and E. The hind axle-tree, to which the wheel E and its oppoſite are fixed, are faſtened acroſs under the bottom of the ciſtern; but the fore axle-tree, bearing the wheel D, &c. is put on a ſtrong pin or bolt, ſtrongly faſtened in a horizontal ſituation in the middle of the front of the bottom of the ciſtern, by which contrivance the two fore wheels and the axle tree have a circular motion round the bolt, ſo that the engine may ſtand as firm on rough or ſloping ground as if it was level. Upon the ground next to the hind part of the engine may be ſeen a leathern pipe F, one end of which may be ſcrewed on and off upon occaſion to a braſs cock at the lower end of the ciſtern: the other end is immerſed in the water, ſupplied by a pond, fire-plug, &c. and the pipe becomes a ſucking pipe for furniſhing the pumps of the engine by its working, without pouring water into the ciſtern. To the hind part of the ciſtern is faſtened a wooden trough G, with a copper grate for keeping out ſtones, ſand, and dirt, through which the ciſtern is ſupplied with water when the ſucking pipe cannot be uſed. The fore part of the ciſtern is alſo ſeparated from the reſt of its cavity by another copper grate, through which water may be poured into the ciſtern. Thoſe that work the pumps of this engine move the handles viſible at the long ſides, up and down, and are aſſiſted by others who ſtand on two ſuſpended treddles, throwing their weight alternately on each of them, and keeping themſelves ſteady by taking hold of two round horizontal rails, H, I, framed into four vertical ſtands, which reach to the bottom of the ciſtern, and are well ſecured to its ſides. Over the hind trough there is an iron handle or key K, ſerving to open or ſhut a cock placed under it on the bottom of the ciſtern, the uſe of which we ſhall explain in the ſequel of this article. L is an inverted pyramidal box or caſe which preſerves the pumps and air veſſels from damage, and alſo ſupports a wooden frame M, on which ſtands a man, who, by raiſing or depreſſing, and turning about the ſpout N, directs the ſtream of water as occaſion requires. This ſpout is made of two pieces of braſs pipe, each of which has an elbow; the lower is ſcrewed over the upper end T (ſee *fig.* 5.) of the pipe that goes through the air-veſſel, and the upper part ſcrews on to the lower by a ſcrew of ſeveral threads, ſo truly turned as to be water-tight in every ſituation. The conic form of the ſpouting-pipe ſerves for wire-drawing the water in its paſſage through it, which occaſions a friction that produces ſuch a velocity of the jet as to render it capable of breaking windows, &c. whilſt the valves and leathern pipes of the engines have ſufficient water-way to ſupply the jet in its greateſt velocity. Leather pipes of conſiderable length may be ſcrewed at one end of the noſel of the engine, and furniſhed at the other end with a wooden or braſs pipe for guiding the water into the inner apartments of houſes, &c. Between the pyramidal box L, and the fore-end of the engine, there is a ſtrong iron bar O, lying in an horizontal poſition over the middle of the ciſtern, and playing in braſſes ſupported by two wooden ſtands; one of which, P, is placed between the two fore-ſtands of the upper rails, and the other is hid in the incloſure over the hind part. Upon proper ſquares of this bar are fitted, one near each end, two ſtrong croſs bars, which take hold of the long wooden cylindrical handles, by means of which the engine is worked; and the treddles by which they are aſſiſted are ſuſpended at each end by chains in the form of a watch chain, and receive their motion jointly with the handles that are on the ſame ſide, by means of two circular ſectors of iron faſtened together, and fixed upon proper ſquares of the middle horizontal bar; the two fore ones may be ſeen at Q; the two hind ones repreſented on a large ſcale in *fig.* 6. differ from the former only in thickneſs; for the fore ſectors are made to carry only one chain each, faſtened by one end to their upper part, and by the lower end to the treddles; whereas the ſole of the two hind ſectors is wide enough to carry two chains each; one ſet faſtened like thoſe of the fore ones for the motion of the treddles: and the other two chains are faſtened by their lower ends to the lower part of theſe ſectors, and by their upper ends to the top of the piſton bars, in order to give them motion. See *fig.* 6. in which the hind ſectors and their apparatus are repreſented as they would appear to a perſon ſtanding between the two fore-wheels, and looking at the hind part of the engine. The ſquare over the letter A is the ſection of the middle bar, on which, right over the two barrels, are placed the two ſectors BCA and DEA, forged together. EGHK and *fghk* are the two piſton rods; and the openings between the letters G, H, and *g*, *h*, are the ſpaces through which the hind parts of the two treddles paſs. L and M repreſent two ſtrong ſtuds rivetted on the other ſide of the bars on which they are placed; and to each of theſe is faſtened a chain like a watch-chain, fixed by their upper ends to the upper extremities D and B of the iron ſectors, by which they are drawn up and down alternately. Theſe ſectors give alſo an alternate motion up and down to the piſton-rods, by means of two other chains left white in the figure, in order to diſtinguiſh them from the others: theſe are faſtened by their lower ends to the lower extremities of the ſectors E and C, and their upper ends terminating in a male ſcrew, are made tight to the piſton-rods at I and *f*, by two nuts. The ſhape of the piſton-rods, and the ſize and ſituation of the chains that give them motion, are ſo contrived, that the vertical axis of the piſtons is exactly in the middle of the breadth of the perpendicular part of the chains, and the upper part of the piſton-rod taken together. PQ repreſents one of the two croſs bars through the ends of which paſs the long handles to which the men apply their hands when they work the engine; theſe croſs bars are fitted on the middle bar at ſome diſtance from the ſectors.

The other parts of this uſeful engine may be underſtood by the help of *fig.* 5. which repreſents a vertical ſection taken through the middle line of the hind part of the engine, as alſo the ſection of the air-veſſel, and that of one of the barrels, and likewiſe the profiles of the hind ſectors, and of ſeveral other parts. AB is the ſection of the bottom of the ciſtern, and C that of the hindmoſt axle-tree. DE is the vertical ſection of a ſtrong piece of caſt braſs or hard metal, ſo worked as to have a hollow in it, repreſented by the white part, and fixed to the bottom of the ciſtern: this reaches from the opening D through the cock W, and afterwards divides itſelf into two branches, ſo as to open under the two barrels; one of theſe branches is exhibited in the figure, and the other is exactly behind this. Through this channel, which may be called the ſucking-piece, water is conveyed to the pumps by the preſſure of the atmoſphere, either from the ciſtern itſelf, or from any place at a diſtance, by means of a leathern pipe F, *fig.* 7, which ſcrews on to the ſucking-piece at D, *fig.* 5, under the hind trough Z, the grate of which is repreſented by the horizontal ſtrokes. FG repreſents the vertical ſection of another piece of caſt braſs or hard metal that may be called the communication-piece, having two hollows for conveying the water from under the two piſtons to the two openings of the flanch of the air-veſſel; one of theſe hollows appears in the figure; the other lies exactly behind this, though not in a parallel direction. Between the ſection of the ſucking-piece DE, and that of the communication-piece FG, may be obſerved the ſection of one of the plates of leather, which makes all tight, and forms one of the two ſucking valves, of which there is another juſt behind this under the other barrel. RST is the ſection of the copper air-veſſel, and TV that of the conduit-pipe; this veſſel is ſcrewed on to the hind part of the communication-piece, and at top is faſtened by a collar of iron to a croſs piece of timber. Between the flanch of the air-veſſel and the communication-piece may be obſerved the ſection of one of the plates of leather, making all tight, and ſcrewing one of the two forcing valves, of which there is another juſt behind this, exactly over the other opening of the communication from the air-veſſel. Theſe valves are loaded with a lump of caſt iron or lead, having a tail or teat let through the flap of the valve and croſs-pinned under it; and it is to be obſerved, that though both the valves are repreſented open in the figure, they are never both open at the ſame time; for when the engine is not at work they are cloſed down by the weights on their upper ſurfaces; and when the engine works, two are ſhut, and the other two are open alternately by the motion of the piſtons and the action of the atmoſphere, together with the re-action of the air contained in the air-veſſel. H I is the ſection of one of the barrels of the two pumps, which are both ſucking and forcing, as is evident from the poſition of the valves and the ſtructure of the piſtons, each of which is compoſed of two iron plates, of two wooden trenchers, and of two flat pieces of leather turning one up and the other down. L K repreſents one of the piſton-rods edge-wiſe, behind which is one of the chains, the top ſcrew of which, K, can only be ſeen. M is the end of the middle bar, and N a ſection of the hindmoſt of the two middle ſtands which ſupport the middle bar. O repreſents the end of the profile of one of the treddles, paſſing through the rectangular holes of the piſton-rods, as in *fig.* 8. The weight on theſe treddles brings them and the piſton-rods down alternately, and they are raiſed up again by help of the other ſet of chains, one of which may be ſeen edge-wiſe in this figure, placed on the ſole of one of the ſectors, &c. See *fig.* 6.

P Q is part of the croſs bars which carry the handles ſeen edge-wiſe, and X Y repreſents an iron handle, by the help of which the cock W may be placed in the ſeveral ſituations requiſite for the uſe of the engine. The mechaniſm of the cock W may be underſtood by *figs.* 9, 10, and 11, which repreſent the horizontal ſection of it in three different ſituations. It has three holes that are left white in theſe figures. In *fig.* 9. the poſition of the cock is repreſented when the handle X Y or K is in a direction parallel to D E, or to the middle bar, as in *fig.* 5. and *fig.* 4. In this poſition, the water ſupplied by the ſucking-piece enters at D, and proceeds directly through the cock W to the valve under the two piſtons; and there is now no communication from the barrels with the cavity of the ciſtern. In *fig.* 10. we have the poſition of the cock when the handle X Y is turned one quarter of a revolution towards the eye from the laſt mentioned ſituation, in which caſe there is no communication from the barrels with the outer extremity of the ſucking-piece, but the water poured into the fore and hind trough, and paſſing from thence into the cavity of the ciſtern, enters the cock ſide-wiſe at W, and, turning at right angles through the cock towards E, proceeds to the barrels of the pumps. *Fig.* 11. repreſents the cock W when the handle is placed diametrically oppoſite to its laſt ſituation, in which caſe there is no communication from the under-ſide of the barrels with the cavity of the ciſtern or the outward end of the ſucking-piece; but this ſituation affords a communication from the cavity of the ciſtern with the outſide of the engine, and the water left in the cavity of the ciſtern may by this means be employed when the engine has done working. Theſe engines are made of five or ſix different ſizes. See Deſaguliers's Courſe of Exper. Philoſ. vol. ii. p. 505—518.

The principles on which this engine acts, ſo as to produce a continued ſtream, are obvious; the water, being driven into the air-veſſel, as in the operation of common ſucking and forcing pumps, will compreſs the air contained in it, and proportionably increaſe its ſpring, ſince the force of the air's ſpring will always be inverſely as the ſpace which it poſſeſſes; therefore, when the air-veſſel is half filled with water, the ſpring of the included air, which in its original ſtate counterbalanced the preſſure of the atmoſphere, being now compreſſed into half the ſpace, will be equal to twice the preſſure of the atmoſphere; and by its action on the ſubjacent water will cauſe it to riſe through the conduit-pipe, and to play a jet of 32 or 33 feet high, abating the effect of friction. When the air-veſſel is two-thirds full of water, the ſpace which the air occupies is only one-third of its firſt ſpace; therefore its ſpring being three times as great as that of the common air, will project the water with twice the force of the atmoſphere, or to the height of 64 or 66 feet. In the ſame manner, when the air-veſſel is three-fourths full of water, the air will be compreſſed into one-fourth of its original ſpace, and cauſe the water to aſcend in air with the force of three atmoſpheres, or to the height of 96 or 99 feet, &c. as in the following table:

Height of the water.	Height of the compreſſed air.	Proportion of the air's ſpring.	Height to which the water will riſe.
$\frac{1}{2}$	$\frac{1}{2}$	2	33 feet
$\frac{2}{3}$	$\frac{1}{3}$	3	66
$\frac{3}{4}$	$\frac{1}{4}$	4	99
$\frac{4}{5}$	$\frac{1}{5}$	5	132
$\frac{5}{6}$	$\frac{1}{6}$	6	165
$\frac{6}{7}$	$\frac{1}{7}$	7	198
$\frac{7}{8}$	$\frac{1}{8}$	8	231
$\frac{8}{9}$	$\frac{1}{9}$	9	264
$\frac{9}{10}$	$\frac{1}{10}$	10	297

See Martin's Philoſ. Brit. vol. ii. p. 69, &c.

The fire engine, by Rowntree, is a double-force pump, of a peculiar conſtruction, ſimilar in its action to the *beer-engine*, but as it is on a much larger ſcale, its conſtructions are of courſe varied. In this engine, *figs.* 1. and 2. *Plate* IV. *Hydraulics*, are two elevations at right angles to each other, of the external part of the engine mounted on four wheels. *Figs.* 3. and 4. are two ſections perpendicular to each other, of the body of the engine or pump; *figs.* 5. and 6. are parts of the engine. The ſame letters are uſed as far as they apply in all the figures, A, A, A, A; *fig.* 3. and 4. is a caſt-iron cylinder truly bored, ten inches diameter and fifteen long, and having a flanch at each end whereon to ſcrew two covers, with ſtuffing boxes, *a*, *a*, in their centres, through which the ſpindle, B, B, of the engine paſſes, and being tight packed with hemp round the collar, makes a tight joint; the piſton, D, is affixed to the ſpindle within the cylinder, and fits it tight all round by means of leathers; at E, *fig.* 4. a partition, called a ſaddle, is fixed in the cylinder, and fits againſt the back of the ſpindle tight by a leather.

We have now a cylinder divided by the ſaddle, E, and piſton, into two parts, whoſe capacity can be increaſed and diminiſhed by moving the piſton, with proper paſſages and valves to bring and convey away the water: this will form a pump. Theſe paſſages are caſt in one piece with the cylinder: one, *d*, for bringing the water is ſquare, and extends about $\frac{1}{3}$d round the cylinder; it connects at bottom with a pipe, *e*; at its two upper ends it opens into two large chambers, *f*, *g*, extending near the whole length of the cylinder, and cloſed by covers, *h*, *h*, ſcrewed on; *i*, *k*, are ſquare openings (ſhewn by dotted ſquares in *fig.* 3,) in the cylinder communicating with the chambers: *fg*, *lm*, are two valves, cloſing their ends of the curved paſſage, *d*, and preventing any water returning down the paſſage, *d*; *n*, *o*, are two paſſages from the top of the cylinder to convey away the water; they come out in the top of the cylinder, which, together with the top of the chambers, *f*, *g*, form a large flat ſurface, and are covered by two valves, *p*, *q*, to retain the water which has paſſed through them. A chamber, K, is ſcrewed over theſe valves, and has the air-veſſel, *k*, *figs.* 1. and 2. ſcrewed into its top; from each ſide of this chamber a pipe, *w w*, proceeds, to which a hoſe is ſcrewed, as ſhewn in *fig.* 1. Levers, *x*, *x*, are fixed to the ſpindle at each end, as ſhewn in *fig.* 1, and carry the handles, H, H, by which men work the engine. When the piſton moves, as ſhewn by the arrow in *fig.* 4. it produces a vacuum in chamber, *f*, and that part of the cylinder contiguous to it; the water in the pipe, *e*, then opens the valve, *m*, and fills the cylinder. The ſame motion forces the water contained in the other part of the cylinder through the valve, *q*, into chamber, K, and thence to the hoſe through the pipe, *w*; the piſton being turned the other way, reverſes the operation with reſpect to the valves, though it continues the ſame in itſelf. The pipe, *e*, is ſcrewed by a flaunch to an upright pipe, P, *fig.* 5. connected with another ſquare iron pipe, faſtened along the bottom of the cheſt of the engine; a curved braſs tube, G, comes from this pipe through the end of the cheſt, and is cut into a ſcrew to fit on the ſuction hoſe when it can be uſed; at other times a cloſe cap is ſcrewed on, and another braſs cap at H, within the cheſt, is ſcrewed upwards on its ſocket, to open ſeveral ſmall holes made in it, and allow the water to enter into the pipe; in this caſe the engine cheſt muſt be kept full of water by buckets. The valves are made of braſs, and turn upon hinges. The principal advantage of the engine is the facility with which it is cleaned from any ſand, gravel, or other obſtructions, which a fire-engine will always gather when at work.

The chambers, *f*, *g*, being ſo large, allow ſufficient room to lodge a greater quantity of dirt than is likely to be accumulated in the uſe of the engine at any one fire, and if any of it accidentally falls into the cylinder, it is gently lifted out again into the chambers by the piſton, without being any obſtruction to its motion: to clear the engine from the dirt, two circular plates, *r*, *r*, five inches diameter, are unſcrewed from the lids, *h*, *h*, of the chambers, *f*, *g*, and when cleaned are ſcrewed on again: theſe ſcrew covers fit perfectly tight without leather, and can be taken out, the engine cleared, and encloſed again in a very ſhort time, even when the engine is in uſe, if found neceſſary.

The two upper valves, *p*, *q*, and chamber, K, can alſo be cleared with equal eaſe, by ſcrewing out the air-veſſel, *k k*, *fig.* 1. which opens an aperture of five inches, and fits air-tight, without leather, when cloſed. The valves may be repaired through the ſame openings. The uſe of the air-veſſel, *k k*, *figs.* 1. and 2. is to equalize the jet from the engine during the ſhort intermittance of motion at the return of the piſton ſtroke; this it does by the elaſticity of the compreſſed air within it, which forces the water out continually, though not ſupplied quite regularly from the engine.

The engine from which our drawing was taken was made for the Sun Fire Inſurance Company, in London, and from ſome experiments made by their agent, Mr. Samuel Hubert, appears to anſwer every purpoſe.

FIRE-*engine* is alſo a name frequently given to a machine for raiſing water by ſteam, more properly called *ſteam-engine*, which ſee.

FIRE-*eſcape*, a machine for eſcaping from windows when houſes are on fire. Various machines of this kind have been invented by different perſons; the following ſeems to be well adapted to the purpoſe for which it was deſigned. It was originally invented by the late John Daniel Maſeres, eſq.; and B. M. Forſter, eſq. has communicated to the public a deſcription of it, with ſome improvements by himſelf, in the Philoſophical Magazine. The principal parts of this machine, which is called the "fling fire-eſcape," are as follows:

1. The ſuſpenſion iron A, (*Plate* XII. *Miſcellany*, *fig.* 12.), which is formed like a ram-head commonly uſed for flinging goods from warehouſes, with this difference, the bottom hooks are turned up cloſe to the upright part, to form two cloſe rings or eyes; the length of this iron is about four inches and a half, thickneſs of the iron out of which it is hammered is about half an inch.

2. The rope B. This is made of flax, and platted in a peculiar manner, for which there was a patent taken out. It is ſold by Armſtrong, St. John's-ſquare, Clerkenwell, and meaſures about three-eighths of an inch in diameter. The rope muſt be in length ſomewhat more than twice the height of the window from the ground.

3. The regulator C. This is an oblong piece of beech wood, ſix inches and a half in length, three inches and a quarter broad, and about ſeven-eighths of an inch thick; in this there are four holes pierced for the rope to paſs through; one of theſe is open at the ſide; there is alſo a notch at the top of this piece of wood, and an oblong hole about ſeven-eighths of an inch from the bottom.

4. The upper belt D is a ſtout leathern ſtrap, about four feet three inches long, and one and a half broad, with a buckle to it.

5. The lower belt E is a ſtrap of the ſame ſort as the other; but the end, after being put through the buckle, is ſewed down: this is for the purpoſe of ſecurity, in caſe the tongue of the buckle ſhould by accident break.

6. The union ſtrap F, ſo called from its connecting the regulator to the other parts of the machine. This is leathern, and is about a foot and a half long, and an inch and a quarter broad; it has, like the others, a buckle to it. It is ſtained black, which diſtinguiſhes it from the other leathern ſtraps.

The method of putting together all theſe parts of the machine is, firſt to paſs one end of the rope through the holes in the regulator, then through the two lower rings of the ſuſpenſion iron; the upper belt is then to be paſſed through a doubling of the union ſtrap; after which the rope is to be tied to that belt, and the knot ſecured by a ſtring from ſlipping (which ſtring is to paſs through two ſmall holes in the leather); and at about a foot below the rope is to be tied to the lower belt in like manner. Next, the union ſtrap is to be put through the oblong hole in the regulator, and buckled; by which the upper belt and the regulator will be connected. The other end of the rope may be kept wound on a wooden roller, to prevent it from getting entangled.

Perſons who purchaſe theſe machines ſhould have a very ſtrong iron hook, with a ſpring-catch, fixed to ſome ſecure part of the window-frame, or elſewhere; on this hook the ſuſpenſion iron is to be hung by the upper ring, when any one wiſhes to deſcend from the window. The next operation is to ſtep into the lower belt with both feet, and draw it up ſufficiently high, ſo as to form a kind of ſwing to ſit in: the part of the ſtrap which is through the buckle is to be laid hold of with the left hand; and the buckle, with the right hand, is to be ſlipt to its proper place, according to the ſize of the perſon; the tongue is then to be put into one of the holes, as in buckling common ſtraps. After this is done, the upper belt is to be ſomewhat looſely buckled round the cheſt, and then the rope which is on the roller is to be thrown out of the window on the ground.

Now all being ready for deſcending, the perſon is to get out of the window, graſping tight with one or with both hands, the rope at ſome convenient part, taking eſpecial care not to meddle with the ſuſpenſion iron until quite out of the window; after which the rope below the regulator is to be laid hold of with the right hand, and to be let to run through the holes as faſt as there may be occaſion; for which purpoſe, if neceſſary, it may be eaſily ſlipped out of the open hole; it will then have the check of only three holes: if the motion is wanted to be retarded, the rope is to be put into the notch at the upper part of the regulator.

When one perſon has deſcended, and there is a neceſſity for a ſecond immediately to follow, the union ſtrap is to be unbuckled; when the regulator will be ſeparated from the upper belt: the belts may then be very eaſily drawn up, having the friction of the ſuſpenſion iron only, and the perſon above is to put on the belts as the other did, and is to be let down gradually, partly by the one below, and partly by managing the rope as the firſt did: in this caſe great care muſt be taken, as the check occaſioned by the regulator is gone.

Obſervations and Cautions.

It is not eaſy to lay down exact rules for what number of holes the rope muſt paſs through, as this muſt vary according to the weight of the perſon, and other circumſtances. It would be well, before the perſon gets out of the window, to examine, firſt, (abſolutely neceſſary,) whether the ſuſpenſion iron is on the hook; then, that the three buckles are faſt, the two knots tied, and that the rope is in the hole of the regulator which has the opening. Great care muſt be taken that there is not any impediment to the free running of the rope; for which the wall of the houſe muſt be examined, and any nails or hooks which may chance to be there removed; alſo iron ſcrapers, and every thing wherein the rope may be likely to hitch.

Mr. B. M. Forſter has, in ſome reſpects, ſimplified Mr. Maſeres's machine, particularly in ſubſtituting the ram-head ſuſpenſion iron in the place of a more complicated, and, in his opinion, leſs ſecure piece of mechaniſm. (See *fig.* 13.) It conſiſts of a ſolid metal (in the latter improved ones) grooved cylinder, round which the rope coiled two or three times, by which a conſiderable degree of friction was produced, and the rapid deſcent prevented, which would otherwiſe happen. The metal cylinder is ſupported on an iron frame, and ſuſpended by a ring, which ring is moveable in the ſocket. A is the moveable ring in the upper part of the frame; B is the frame, encloſing a grooved cylinder; and C is a metal bar to hold the cheeks together.

FIRE, *Everlaſting*, in *Pagan Theology*, is a kind of reputed ſacred fire worſhipped by the Gavers or Gabres in Perſia. Dr. Mounſey, formerly phyſician to the czarina's army, has given the following account of it: this perpetual fire riſes out of the ground in the peninſula of Abſcheron, about twenty miles from Baku, and three miles from the Caſpian ſhore. The ground is rocky, over which is a ſhallow covering of earth. If a little of the ſurface be ſcraped off, and fire be applied to the hollow, it catches flame immediately, and burns without intermiſſion, and almoſt without conſumption; nor is it ever extinguiſhed unleſs ſome cold earth be thrown over it, by which it is eaſily put out. There is a ſpot of ground, about two Engliſh miles in extent, which has this property, where the earth continually burns; but the moſt remarkable part of it is a hole about four feet deep, and fourteen in diameter. This fire is worſhipped, and is ſaid to have burnt many thouſand years. The cracks in the walls of the caravanſera, inhabited by the religious, are covered with flame, if a candle be held to them; and when there is occaſion for a ſmall light, no more is neceſſary than to ſtick one end of a piece of reed in the ground, and apply a lighted candle to the other; a flame will kindle at the top of the reed, and burn till it is extinguiſhed by covering it. They burn ſtones into lime, by filling a hole in the ground with a heap of them, and bringing a lighted candle to the hole, upon which the fire kindles, and in about three days burns the ſtones ſufficiently. The flame yielded by this fire, has neither ſmoke nor ſmell. This ſacred and adored phenomenon is nothing more than an inflammable vapour, which iſſues in great quantity out of the ground in this place, and is ſupplied by the naphtha with which the adjacent country abounds. Phil. Tranſ. vol. xlv. for 1748, p. 296.

FIRE, *Extinguiſhing of.* The world has long been of opinion, that a more ready way than that in general uſe, might be found for extinguiſhing fires in buildings, and it has generally been attempted upon the doctrine of exploſion. Zachary Greyl was the firſt perſon who put this plan into execution with any tolerable degree of ſucceſs. He contrived certain engines, eaſily manageable, which he proved before ſome perſons of the firſt rank to be of ſufficient efficacy, and offered to diſcover the ſecret by which they were contrived, for a large premium given either from the crown, or raiſed by a ſubſcription of private perſons. But this ſcheme meeting with no better ſucceſs than things of this nature uſually do, he died without making this diſcovery. Two years after this the people who had his papers found the method; and it was ſhewn before the king of Poland and a great concourſe of nobility at Dreſden, and the ſecret purchaſed at a very conſiderable price. After this the ſame perſon carried the invention to Paris and many other places, and practiſed it every where with ſucceſs. The ſecret was this: a wooden veſſel was provided holding a very conſiderable quantity of water; in the centre of this there was fixed a caſe made of iron plates, and filled with gun-powder; from this veſſel, to the head of the larger veſſel containing the water, there proceeded a tube or pipe, which might convey the fire very readily through the water to the gun-powder contained in the inner veſſel. This tube was filled with a preparation eaſily taking fire, and quickly burning away; and the manner of uſing the engine was to convey it into the room or building where the fire was, with the powder in the tube lighted. The conſequence of this was, that the powder in the inner caſe ſoon took fire, and, with a great exploſion, burſt the veſſel to pieces, and diſperſed the water every way: thus was the fire put out in an inſtant, though the room was flaming before in all parts at once. The advantage of this invention was, that at a ſmall expence, and with the help of a few people, a fire in its beginning might be extinguiſhed; but the thing was not ſo general as it was at firſt expected that it would prove; for though of certain efficacy in a chamber or cloſe building where a fire had but newly begun; yet when the miſchief had increaſed ſo far, that the houſe was fallen in, or the top open, the machine had no effect. This was the contrivance firſt diſcovered by Greyl, and from which our chemiſt Godfrey took the hint of the machine, which he called the water-bomb, and would fain have brought into uſe in England. Act. Eruditor. ann. 1721. p. 183. (See WATER-*Bomb*.) Dr. Hales propoſed to check the progreſs of fire by covering the floors of the adjoining houſes with earth. The propoſal is founded on an experiment which he made with a fir board, half an inch thick, part of which he covered with an inch depth of damp garden mould, and then lighted a fire on the ſurface of the mould; though the fire was kept up by blowing, it was two hours before the board was burnt through, and the earth prevented it from flaming. The thicker the earth is laid on the floors, the better; however, Dr. Hales apprehends, that the depth of an inch will generally be ſufficient; and he recommends to lay a deeper covering on the ſtairs, becauſe the fire commonly aſcends by them with the greateſt velocity. Phil. Tranſ. vol. xlv. for 1748, p. 277.

Mr. Hartley made ſeveral trials in the years 1775 and 1776, in order to evince the efficacy of a method which he had invented for reſtraining the ſpread of fire in buildings. For this purpoſe thin iron plates are well nailed to the tops of the joiſts, &c. the edges of the ſides and ends being lapped over, folded together, and hammered cloſe. Partitions, ſtairs, and floors, may be defended in the ſame manner; and plates applied to one ſide have been found ſufficient. The plates are ſo thin as not to prevent the floor from being nailed in the joiſts in the ſame manner as if this preventative were not uſed: they are kept from ruſt by being painted or varniſhed with oil and turpentine. The expence of this addition, when extended through a whole building, is eſtimated at about five *per cent.* Mr. Hartley had a patent for this invention, and parliament voted a ſum of money towards defraying the expence of his numerous experiments. (14 Geo. III. cap. 85.) The ſame preſervative may alſo be applied to ſhips, furniture, &c.

Lord Mahon (now earl Stanhope) has alſo diſcovered and publiſhed a very ſimple and effectual method of ſecuring every kind of building againſt all danger of fire. This method he has divided into three parts, *viz.* under-flooring, extra-lathing, and inter-ſecuring. The method of under-flooring is either ſingle or double: in ſingle under-flooring, a common ſtrong lath of oak or fir, about one-fourth of an inch thick, ſhould be nailed againſt each ſide of every joiſt, and of every main timber, ſupporting the floor which is to be ſecured. Other ſimilar laths are then to be nailed along the whole length of the joiſts, with their ends butting againſt each other. The top of each of theſe laths or fillets ought to be at 1½ inch below the top of the joiſts or timbers againſt which they are nailed; and they will thus form a ſort of ſmall ledge on each ſide of all the joiſts. Theſe fillets are to be well bedded in a rough plaſter hereafter mentioned, when they are nailed on, ſo that there may be no interval between them and the joiſts; and the ſame plaſter ought to be ſpread with a trowel upon the tops of all the fillets, and along the ſides of that part of the joiſts which is between the top of the fillets and the upper edge of the joiſts. In order to fill up the intervals between the joiſts that ſupport the floor, ſhort pieces of common laths, whoſe length is equal to the width of theſe intervals, ſhould be laid in the contrary direction to the joiſts, and cloſe together in a row, ſo as to touch one another: their ends muſt reſt upon the fillets, and they ought to be well bedded in the rough plaſter, but are not to be faſtened with nails. They muſt then be covered with one thick coat of the rough plaſter, which is be ſpread over them to the level of the tops of the joiſts; and in a day or two this plaſter ſhould be trowelled over, cloſe to the ſides of the joiſts, without covering the tops of the joiſts with it.

In the method of double flooring, the fillets and ſhort pieces of laths are applied in the manner already deſcribed; but the coat of rough plaſter ought to be little more than half as thick as that in the former method. Whilſt this rough plaſter is laid on, ſome more of the ſhort pieces of laths above-mentioned muſt be laid in the intervals between the joiſts upon the firſt coat, and be dipped deep in it. They ſhould be laid as cloſe as poſſible to each other, and in the ſame direction with the firſt layer of ſhort laths. Over this ſecond layer of ſhort laths there muſt be ſpread another coat of rough plaſter, which ſhould be trowelled level with the tops of the joiſts, without riſing above them. The rough plaſter may be made of coarſe lime and hair; or, inſtead of hair, hay chopped to about three inches in length may be ſubſtituted with advantage. One meaſure of common rough ſand, two meaſures of ſlacked lime, and three meaſures of chopped hay, will form in general a very good proportion, when ſufficiently beat up together in the manner of common mortar. The hay ſhould be put in after the two other ingredients are well beat up together with water. This plaſter ſhould be made ſtiff; and when the flooring boards are required to be laid down very ſoon, a fourth or fifth part of quick-lime in powder, formed by dropping a ſmall quantity of water on the lime-ſtone a little while before it is uſed, and well mixed with this rough plaſter, will cauſe it to dry very faſt. If any cracks appear in the rough plaſter-work, near the joiſts, when it is thoroughly dry, they ought to be cloſed by waſhing them over with a bruſh wet with mortar waſh: this waſh may be prepared by putting two meaſures of quick lime, and one of common ſand, in a pail, and ſtirring the mixture with water till the water becomes of the conſiſtence of a thin jelly.

Before the flooring boards are laid, a ſmall quantity of very dry common ſand ſhould be ſtrewed over the plaſter-work, and ſtruck ſmooth with an hollow rule, moved in the direction of the joiſts, ſo that it may lie rounding between each pair of joiſts. The plaſter-work and ſand ſhould be perfectly dry before the boards are laid, for fear of the dry rot. The method of under-flooring may be ſucceſsfully applied to a wooden ſtair-caſe; but no ſand is to be laid upon the rough plaſter-work. The method of extra-lathing may be applied to cieling joiſts, to ſloping roofs, and to wooden partitions.

The third method, which is that of inter-ſecuring, is very ſimilar to that of under-flooring; but no ſand is afterwards to be laid upon it. Inter-ſecuring is applicable to the ſame parts of a building as the method of extra-lathing, but it is ſeldom neceſſary.

Lord Mahon has made ſeveral experiments in order to demonſtrate the efficacy of theſe methods. In moſt houſes, it is only neceſſary to ſecure the floors; and the extra-expence of under-flooring, including all materials, is only about nine pence per ſquare yard; and with the uſe of quick-lime a little more. The extra-expence of the method of extra-lathing is no more than ſix pence per ſquare yard, for the timber, ſide-walls, and partitions; but for the ceiling, about nine pence per ſquare yard. But in moſt houſes, no extra-lathing is neceſſary. Phil. Tranſ. vol. lxviii. for 1778, part ii. art. 42. p. 884, &c.

Fire-*flaire*, in *Ichthyology*. See Raja *Paſtinaca*.

Fire-*flies*, in the *Hiſtory of Inſects*. See Lampyris. Among the flies of Guiana, there are two ſpecies of fire-flies. The largeſt is more than one inch in length, having a very large head connected with a body by a joint of a particular ſtructure, with which, at ſome times, it makes a loud knock, eſpecially when laid on its back. This fly has two feelers, or horns, two wings, and ſix legs. Under its belly, is a circular patch, which, in the dark, ſhines like a candle; and on each ſide of the head, near the eyes, is a prominent, globular, luminous body, in ſize about one third larger than a muſtard ſeed. Each of theſe bodies is like a riſing ſtar, emitting a bright, and not ſmall light; ſince two or three of theſe animals, put into a glaſs veſſel, afford light ſufficient to read without difficulty, when placed cloſe to a book. When the fly is dead, theſe bodies will ſtill afford conſiderable light, though leſs vivid than before; and if bruiſed, and rubbed over the hand and face, they become luminous in the dark, like a board ſmeared with phoſphorus. They have a reddiſh-brown colour, and live in rotten trees in the day, but are always abroad in the night. The other kind are not more than half as large as the former, and their light proceeds from under their wings, and is ſeen only when they are elevated, like ſparks of fire, appearing and diſappearing every ſecond. Of theſe the air is full in the night, though they are never ſeen in the day. They are common, not only in the ſouthern, but northern parts of America, during the ſummer. In Siam, the trees on the banks of the river Main in ſummer are beautifully illuminated with ſwarms of fire-flies, which emit and conceal their light as uniformly as if it proceeded from a machine of the moſt exact contrivance.

Fire, *Line of*; the direction in which balls, &c. are impelled from cannon and muſketry, is called "the line of fire," and this again is divided, when ſpeaking of the diſcharge of ſhots from cannon, againſt any fortified place, as in ſieges, into two diſtinct branches; namely, the *plongant*, or direct fire, which plunges into a wall, &c. at right angles therewith; and the *razant*, or grazing fire, which ſtrikes ſuch wall at a greater or leſſer angle, in proportion as the piece from which the ſhot proceeds, may be more or leſs obliqued from a direct fire. It ſcarcely need be pointed out, that the direct fire is by far the moſt deſtructive to that object againſt which it is peremptorily pointed; it is therefore a deſideratum always to be able to take up ſuch a poſition with the breaching-batteries as may admit of this forcible mode of attack, the effects of which ſoon become viſible. Nor can it be leſs obvious that the force with which a ſhot obliquely directed againſt any work, will gradually diminiſh according as the line of fire may approach to a parallel with the face to be battered; therefore the *grazing-fire* is ſuited only to particular purpoſes, ſuch as where an enfilade cannot be made *direct*, that is, in the exact line with the platforms on the battery to be enfiladed, but rather in reverſe; that is towards its rear.

Now it is evident that *grazing-ſhots* will do little ſervice when they make an angle of leſs than 60° with the wall to be battered, eſpecially if reveted with maſonry. They will however, do great execution, provided they touch on the merlons above the cordon, and eſpecially if they fall within the embraſure, which at ſuch an angle muſt afford a front nearly at right angles with ſuch otherwiſe *oblique* fire, and of courſe, owing to that obliquity, render it a *direct* one in ſuch particular ſituations. This, however, will only happen in front of the merlon; in its rear the obliquity will be rather encreaſed, whereby the ſhot will have ſtill leſs power. But, as ſhewn under the head of Enfilade, ſuch ſhots as may be thrown juſt over the epaulement at the angle of a baſtion, &c. at an angle not exceeding five or ſix degrees, (or perhaps a little more,) in reverſe, will generally do full as much damage, as when the enfilade proceeds from a direct line of fire; and this will be conſiderably aided by the parapet being reveted with maſonry, from which, not only will ſplinters be knocked off, but the ſhots will be thrown in ſuch direction as may ſuffice to render the battery untenable: unleſs, indeed, numerous buttreſſes, called *traverſes*, be thrown up for the purpoſe of arreſting the progreſs of all ſuch enfilading viſitors.

In viewing the exterior of a work, we generally conſider each face or battery as having its line of fire directly at right angles with itſelf: that is, that the cannons ſhould ſeverally be brought as ſquare to *genoulieres*, againſt which they reſt, when brought forward to the embraſures. It is true, that, for the ſake both of allowing greater ſcope to the direction of each piece, as well as for avoiding the ſhock which would attend the formation of narrow embraſures with parallel ſides, they are made to diverge perhaps to the extent of 12° on each ſide, the line of fire may be inclined five or ſix degrees towards either ſide; but, in ſuch caſe, the revetement would ſoon be deſtroyed: in faſcine revetements, not only would the percuſſion be felt, but flames ſoon make their appearance.

The defects attendant upon embraſures would long ſince have cauſed them to be exploded, were it not that the merlons afford ſo excellent a ſhelter for the men at the guns; in every other reſpect, parapets on a low conſtruction, over which the muzzles of the ſeveral pieces can be laid, at the ſame angle of depreſſion as the ſuperior ſlope, have the preference; as they allow the *line of* fire to be changed full fifteen degrees towards either ſide of the *direct line of fire*; whence, eſpecially in a tide's way, where a ſhip may be paſſing, the moſt important advantages may be gained. This kind of battery is beſt ſuited to ſituations not liable to be attacked by muſketry, particularly from the poops and tops of ſhipping, nor within the ordinary reach of grape or caſe-ſhot. Guns thus laid over parapets are ſaid to be "en barbet."

Fire-*lock*, in ſtrictneſs applies to every ſpecies of fire-arms, which are diſcharged by means of locks containing ſprings, &c., that impel a flint fixed in a ſpecies of vice, at the head of that part called the cock, againſt a curved ſteel plate, called the *hammer*, ſo as to produce from their colliſion ſufficient fire, in the form of ſparks, or ſcintillations, which being by the action of the device directed into a hollow called the *pan*, before covered by the *hammer*, cauſe the gunpowder depoſited in that hollow, and which is called the *priming*, (it being the firſt portion of that combuſtible to be ignited,) to take fire, and of courſe, by means of the *touch-hole*, which opens into the *pan*, to explode the *charge* that is rammed into the bottom of the barrel. The deſignation fire-lock was in conſequence of this ingenious contrivance attached to all pieces acting upon the above principle, in contra-diſtinction to *match-locks*, which derive their appellation from the circumſtance of the powder in their pans being ignited by the application of a match. See Fire-*arms*, and Match-lock.

The fire-locks uſed by the Britiſh are rather ſhorter than thoſe in general uſe on the continent; yet are the former ſomewhat the heavieſt; and that too, notwithſtanding the French, in particular, brace their barrels to the ſtocks by means of braſs collars, two, three, or even four in number, whereas we affix them merely by wire pins paſſing through eye-loops attached under the barrel.

The fire-lock conſiſts of the following parts. The barrel, which is commonly about 40 inches in length, and carries a ball of fourteen to the pound. The charge being ſix drachms of powder; ſo that including the ball, the paper, and the twine, the entire weight of the cartridge ſhould be 1oz. 9dr. 11gr. This barrel is affixed to the ſtock, not only by the pins above deſcribed, but by a flat projection at its butt, about two inches long, through which a very ſubſtantial flat-headed ſcrew paſſes into the more ſubſtantial part of the ſtock; which is moſtly made from the beſt walnut wood; obſerving that the grain follows the curve of the ſtock where it bends between the gripe, that is where held by the right hand and the ſtraight part, which receives the butt and lock, and paſſes all the way under the barrel, to within about three inches of the muzzle. The ſtock is furniſhed at its butt with a ſtout braſs plate, a little concave, ſo as to fit eaſy in the hand, when the piece is ſhouldered. The part under the *trigger* is covered by a *guard* made of braſs, which allows acceſs to the finger, but ſerves to prevent the trigger from being adventitiouſly hitched by boughs, &c. The *lock* is faſtened to the right ſide of the barrel, in a poſition not to obſtruct the ſight along the barrel, whereby aim is taken, and at the ſame time is in a convenient poſition for all the operations attendant upon priming, cocking, half-cocking, &c. The mode of faſtening is by two ſcrews, which having wood heads, paſs under the butt of the barrel, from the left ſide of the ſtock, and are received by two female ſcrews, formed in the main plate, on which the ſeveral parts of the lock are faſtened. The *ram-rod*, which is of iron, and of the ſame length as the whole of the barrel, fits into three or four ſmall braſs tubes, faſtened to the ſtock, called pipes, and tail-pipes: at its end it is turned into a male ſcrew, for the purpoſe of fitting to a *worm*, by aid of which the charge may be drawn, and the piece cleaned. The bayonet fixed at the muzzle with great eaſe, being ſecured in its place, with ſufficient firmneſs, by a ſtrong ſtud on the upper line of the barrel, which, being uſed to direct the aim, is called the *ſight*.

It being ſometimes neceſſary for ſoldiers, and eſpecially artillery-men, to be liberated from the handling of their arms, yet without totally relinquiſhing them, each *fire-lock* is furniſhed with a leathern *ſling*, which affixes to two ſwivels placed under the fore-part of the guard, and the fore-part of the ſtock; this ſling is eaſily braced up, ſo as to lie flat under the ſtock, when not required to be paſſed over the ſoldier's breaſt, in form of a belt paſſing over the left ſhoulder, and cauſing the piece to be ſuſpended in an oblique direction over the back. The value of a fire-lock compleat may vary from 15 to 40 ſhillings.

FIRE-*maſter*, in our *Train of Artillery*, is an officer who gives the directions and the proportions of the ingredients for all the compoſitions of fire-works, whether for ſervice in war, or for rejoicings and recreations. He has a mate to aſſiſt him.

His orders are given to the fire-workers and bombardiers, who are obliged to execute them.

FIRE-*office*, an office of inſurance *from fire*. See INSURANCE.

FIRE-*ordeal*. See ORDEAL.

FIRE-*philoſophers*, or *Philoſophi per ignem*, a fanatical ſect of philoſophers who appeared towards the cloſe of the ſixteenth century, and made a figure in almoſt all the countries of Europe. The diſtinguiſhing tenet from which they derived this appellation was, that the intimate eſſences of natural things were only to be known by the trying efforts of fire, directed in a chemical proceſs. They were alſo called *Theoſophiſts*, from their declaring againſt human reaſon as a dangerous and deceitful guide, and repreſenting a divine and ſupernatural illumination as the only means of arriving at truth; they were likewiſe denominated *Paracelſiſts*, from the name of Paracelſus, the eminent phyſician and chemiſt, who was the chief ornament and leader of this extraordinary ſect. It was patronized in England by Mr. Robert Flood or Fludd, who endeavoured to illuſtrate the philoſophy of Paracelſus in a great number of treatiſes; in France, it was zealouſly propagated by Rivier; in Denmark, by Severinus; in Germany, by Kunrath, an eminent phyſician of Dreſden; and in other countries by warm and ſucceſsful votaries, who aſſumed a ſtriking air of piety and devotion, and propoſed to themſelves no other end than the advancement of the Divine glory, and the reſtoration of peace and concord in a divided church; accordingly they were joined by ſeveral perſons eminent for their piety, and diſtinguiſhed by their zeal for the advancement of true religion. One of the moſt celebrated of theſe was Daniel Hoffman, profeſſor of divinity in the univerſity of Helmſtadt, who, availing himſelf of ſome unguarded paſſages in the writings of Luther, extravagantly maintained, that philoſophy was the mortal enemy of religion; that truth was diviſible into two branches, the philoſophical and theological; and that what was true in philoſophy was falſe in theology. Hoffman was afterwards obliged, by the interpoſition of Henry Julius, duke of Brunſwick, to retract his invectives againſt philoſophy, and to acknowledge in the moſt open manner the harmony and union of ſound philoſophy with true and genuine theology. Moſheim's Eccl. Hiſt. by Maclean, vol. iv. p. 17, 18. 8vo. edit. 1768.

FIRE-*places* are contrivances for communicating heat to rooms, and alſo for anſwering various purpoſes of art and manufacture.

For the latter kind, ſee FURNACE and STOVE. The principal objects with regard to the former are leſſening the charge of fuel, and augmenting the benefit of fire. The general properties of air and fire, on which their conſtruction chiefly depends, are the following, *viz.* that air is rarefied by heat, and condenſed by cold; *i.e.* the ſame quantity of air takes up more ſpace when warm than when cold; air rarefied and expanded by heat is ſpecifically lighter than it was before, and will riſe in other air of greater denſity; ſo that a fire being made in any chimney, the air over the fire is rarefied by the heat, becomes lighter, and immediately riſes in the funnel, and goes out; the other air in the room, flowing towards the chimney, ſupplies its place, is rarefied in its turn, and riſes likewiſe; and the place of the air thus carried out of the room, is ſupplied by freſh air coming in through doors and windows, or, if they be ſhut, through every crevice with violence; or if the avenues to the room be ſo cloſed up, that no freſh ſupply of air can be obtained, the current up the funnel muſt flag; and the ſmoke, no longer driven up, float about in the room. Common fire throws out light, heat, and ſmoke; the light and heat move in right lines with great ſwiftneſs, but the ſmoke is but juſt ſeparated from the fuel, and moves only as it is carried off by the ſtream of rarefied air; and without a continual acceſſion of air, will remain crowded about the fire, and ſtifle it. Heat may be ſeparated from the ſmoke and light, by means of a plate of iron; and the greateſt ſenſible heat is directly over the fire, where, beſides the rays of heat ſhot upwards, there is a continual riſing ſtream of hot air, heated by thoſe rays that are ſhot round on every ſide.

The fire-places moſt in uſe are, 1. The large open fire-places, that were commonly uſed in former times, and are ſtill continued in the country, and in kitchens. Theſe require a large funnel, conſume a great quantity of fuel, generally ſmoke, if the door be not left open, and contribute little to warm a room. Their ſpaciouſneſs is their greateſt convenience.

2. Inſtead of theſe old-faſhioned chimnies, the modern fire-places, eſpecially in towns, have been conſtructed with low breaſts and hearths, narrowed by jambs. Fire-places of this contracted form will keep rooms generally free from ſmoke; but the funnel requires a conſiderable quantity of air, which ruſhes in at every crevice, ſo as to render the ſituation of perſons continually expoſed to it uncomfortable and dangerous. Many of the diſeaſes proceeding from colds may be aſcribed to ſtrong drawing chimnies, whereby, in ſevere weather, perſons are ſcorched before, while they

are frozen behind. Theſe fire-places are of little uſe in warming a room; becauſe the air round them, which is warmed by the direct rays of the fire, does not continue in the room, but is continually collected into the chimney, by the current of cold air coming behind it, and is preſently carried off. Beſides, the greateſt part of the fire is loſt, being abſorbed by the back jambs and hearth, which are ſo dark and porous as to reflect very little, and the upright heat flies directly up the chimney. To remedy this inconvenience the Sieur Gauger, in his book entitled La Mechanique de Feu, publiſhed in 1709, and ſince tranſlated by Dr. Deſaguliers, (ſee CHIMNEY) propoſed ſeven different conſtructions of, 3. A third ſort of chimnies, in which there are hollow cavities made by iron plates in the back, jambs, and hearth, through which plates the heat paſſing, warms the air in thoſe cavities, which is continually coming into the room freſh and warm. This conſtruction had many obvious advantages; but the expence and difficulty attending it diſcouraged the propagation of the invention. However, the upright heat was almoſt wholly loſt in theſe as in the common chimnies. 4. Another kind of fire-place is the Holland iron-ſtove, with a flue proceeding from the top, and a ſmall iron door opening into the room. Theſe ſerve to warm a room, ſave fuel, and produce a conſtant change of air. But the fire is not ſeen, and little uſe can be made of it beſides that of warming the room. It is therefore rarely uſed in England, except in ſome work-ſhops.

5. The German ſtove is compoſed of five iron plates ſcrewed together, and fixed ſo as that the fuel may be put into it from another room, or from the outſide of the houſe. It is a kind of oven reverſed, its mouth being without, and body within the room that is to be warmed by it. This ſtove warms a room with little fuel, and is attended with no danger from the irruption of cold air; but the fire is not ſeen, and there is no change of air in the room heated by it. For an account of the Chineſe ſtove, ſee KANG.

6. Another kind of convenience for warming rooms is a charcoal fire kindled in pots and chaffing diſhes. This is chiefly uſed in the ſhops of handicraftſmen. But the ſulphureous fumes ariſing from the coals render this mode of giving heat diſagreeable and dangerous, and in a cloſe room ſometimes fatal.

The ingenious Dr. Franklin, whoſe name we have had frequent occaſion of recording in this work, having recounted the inconveniences and advantages of fire-places in common uſe, propoſes a new contrivance for this purpoſe, called the Pennſylvania fire-place. 1 This machine conſiſts of a bottom plate or hearth-piece (ſee *Plate* XIV. *Miſcellany*, *fig.* 2.) with a riſing moulding before for a fender, two perforated ears F, G, for receiving two ſcrew-rods; a long air-hole *a a*, through which the outward air paſſes into an air-box; and three ſmoke-holes repreſented by dark ſquares in B C, through which the ſmoke deſcends and paſſes away; beſides double ledges for receiving between them the lower edges of the other plates. 2. A back plate without holes, and furniſhed with a pair of ledges to receive 3. The two ſide-plates, each of which has a pair of ledges to receive the ſide-edges of the front plate, with a ſhoulder on which it reſts; two pair of ledges to receive the ſide-edges of the two middle plates which form the air-box, and an oblong air-hole near the top, through which the air warmed in the box is diſcharged into the room, and a wing or bracket, as H, and a ſmall hole, as R, for the axis of the regiſter to turn in. See *fig.* 3. which repreſents one of theſe plates. 4. An air-box, compoſed of the two middle plates D E and F G, *figs.* 4. and 5. The firſt has five thin ledges or partitions caſt on it, the edges of which are received into ſo many pair of ledges caſt in the other; the tops of all the cavities formed by theſe thin deep ledges are alſo covered by a ledge of the ſame form and depth caſt with them; ſo that when the plates are put together, and the joints luted, there is no communication between the air-box and the ſmoke. In the winding paſſages of this box, freſh air is warmed as it paſſes into the room. 5. A front plate, which is arched on the under ſide, and ornamented with foliages, &c. 6. A top plate, with a pair of ears M, N, (*fig.* 6.) anſwerable to thoſe in the bottom plate, and perforated for the ſame purpoſe. It has alſo a pair of ledges running round the under ſide to receive the top edges of the front, back, and ſide plates. The air-box does not reach up to the top plate by $2\frac{1}{2}$ inches.

All theſe plates are of caſt iron; and when they are all in their proper places, they are bound firmly together by a pair of ſlender rods of wrought iron with ſcrews, and the machine appears as in *fig.* 6. There are alſo two thin plates of wrought iron, *viz.* 7. The ſhutter, which is of ſuch a length and breadth as to cloſe well the opening of the fire-place, and ſerving to blow up the fire, and to ſecure it in the night. It is raiſed or depreſſed by means of two braſs nobs, and ſlides in a groove left between the foremoſt ledge of the ſide plates and the face of the front plates. 8. The regiſter, which is placed between the back plate and air-box, and furniſhed with a key; ſo that it may be turned on its axis and made to lie in any poſition between level and upright. The operation of this machine, and the method of fixing it, may be underſtood by obſerving the profile of the chimney and fire-places in *fig.* 7. M is the mantle-piece or breaſt of the chimney; C the funnel; B the falſe back, made of brick-work in the chimney, four inches or more from the true back, from the top of which a cloſing is to be made over to the breaſt of the chimney, that no air may paſs into the chimney except that which goes under the falſe back, and up behind it; E the true back of the chimney; T the top of the fire-place; F the front of it; A the place where the fire is made; D the air-box; K the hole in the ſide-plate, through which the warmed air is diſcharged out of the box into the room; H the hollow, formed by removing ſome bricks from the hearth under the bottom plate filled with freſh air, entering at the paſſage I, and aſcending into the air-box through the air-hole in the bottom plate near G, the partition in the hollow, deſigned to keep the air and ſmoke apart; P the paſſage under the falſe back, and part of the hearth for the ſmoke; and the arrows in the figure ſhew the courſe of the ſmoke. The fire being made at A, the flame and ſmoke will aſcend, ſtrike the top T, and give it a conſiderable heat; the ſmoke will turn over the air-box, and deſcend between it and the back plate to the holes near G, in the bottom plate, heating in its paſſage all the plates of the machine; it will then proceed under and behind the falſe back, and riſe into the chimney. The air of the room contiguous to the ſeveral plates, and warmed by them, becomes ſpecifically lighter than the other air in the room, and is obliged to riſe; but, being prevented by the cloſure over the fire-place from going up the chimney, is forced out into the room, and riſing by the mantle-piece to the cieling, is again driven down gradually by the ſteam of newly-warmed air that follows; and thus the whole room becomes in a little time equally warmed. The air, alſo, warmed under the bottom plate and in the air-box, riſes and comes out of the holes in the ſide plates, and thus warming and continually changing the air of the room. In the cloſing of the chimney a ſquare opening for a trap-door ſhould be left open for the ſweeper to go up: the door may be made of ſlate or tin, and ſo placed, that by turning up againſt the back of the chimney when open, it cloſes the vacancy behind the falſe back, and ſhoots the ſoot that falls in ſweeping out upon the hearth. It will alſo be convenient to have a ſmall hole about five or ſix inches ſquare, cut near the cieling through into the funnel, and provided with a ſhutter, by occaſionally opening which, the heated air of the room and ſmoke of tobacco, &c. may be carried off without incommoding the company. For a farther account of the manner of uſing this fire-place, the advantages attending it, anſwers to objections and directions to the bricklayer in fixing it, the curious reader may conſult Franklin's Letters and Papers on Philoſophical Subjects, p. 284—318. edit. 1769. For a farther account of improved fire-places, ſee CHIMNEY.

FIRE-*pots*, in the *Military Art*, are ſmall earthen pots into which is put a grenade, filled with fine powder till the grenade be covered; and then the pot is covered with a piece of parchment, and two pieces of match laid acroſs and lighted. This pot being thrown where it is deſigned to do execution, breaks and fires the powder, and thereby fires the powder in the grenade, which ought to have no fuze, that its operation may be the quicker.

FIRE, *Razant*, or *raſant*, is a fire from the artillery and ſmall arms directed in a line parallel to the horizon, or to thoſe parts of the works of a place that are defended.

FIRE, *Running*, is when a rank or ranks of men drawn up fire one after another; or when the lines of an army are drawn out to fire on account of a victory; in which caſe each ſquadron or battalion takes it from that on its right, from the right of the firſt line to the left, and from the left to the right of the ſecond line, &c.

FIRE-*ſhip*, is a veſſel fitted up with combuſtible apparatus, ſo arranged as to appear ſuddenly in a blaze, at any given time, or ſituation. It is obſerved by Anderſon in his Hiſtory of Commerce, vol. i. p. 432, that ſome Engliſh veſſels, filled with combuſtible matter, and ſent among the Spaniſh ſhips compoſing the Invincible Armada in 1588, are ſaid to have given riſe to the terrible invention of fire-ſhips. However, Livy informs us, that the Rhodians had invented a kind of fire-ſhips which were uſed in junction with the Roman fleet in their engagement with the Syrians, in the year before Chriſt 190; cauldrons of combuſtible and burning materials were hung out at their prows, ſo that none of the enemy's ſhips durſt approach them: theſe fell on the enemy's gallies, ſtruck their beaks into them, and at the ſame time ſet them on fire. Liv. lib. xxxvii. cap. 30. tom. iii. p. 322. Ed. Crevier.

There is nothing peculiar in the conſtruction of a modern fire-ſhip, except the apparatus by which the fire is inſtantly conveyed from one part to another, and from thence to the enemy: for this purpoſe the fire-room, in which the combuſtibles are incloſed, is built between decks, and extends from the bulk-head at the forecaſtle to a bulk-head raiſed behind the main-maſt. The train incloſed in this apartment is contained in a number of wooden troughs which interſect each other in different parts of the ſhip's length, being ſupported at proper diſtances by croſs pieces and ſtanchions. On each ſide of the ſhip are cut out ſix or ſeven port-holes, in ſize about fifteen by eighteen inches, with their lids opening downward, and cloſe caulked up. Againſt each port is fixed an iron-chamber, which, when the ſhip is fired, blows out the port-lid and lets out the flame. Under the main and fore ſhrouds is fixed a wooden funnel, one end of which communicates with a fire-barrel, and deſigned to convey the flames to the ſhrouds. Between the funnels, called alſo fire-trunks, are two ſcuttles or ſmall holes in the upper deck, ſerving alſo to let out the flames. Both funnels and ſcuttles muſt be ſtopped with plugs, and have ſail-cloth or canvas nailed over them, to prevent any accident happening from above to the combuſtibles below. The port-holes, funnels, and ſcuttles, ſerve not only to communicate the flames to the outſide and upper works of the ſhip and her rigging, but likewiſe to open a paſſage for the inward air confined in the fire-room, ſo that it may expand itſelf without blowing up the decks. On each ſide of the bulk-head behind is cut a hole big enough to receive a trough of the ſame ſize as the others; leading troughs whoſe foremoſt ends communicate with other troughs within the fire-room, extend obliquely from theſe openings to ſally-ports cut through the ſhip's ſide: the decks and troughs are well covered with melted roſin. When either of the leading-troughs is fired, the flame is immediately conveyed to the oppoſite ſide of the ſhip, and both ſides burn together.

The cabins of the lieutenant and maſter are behind the fire-room, one on the ſtarboard and the other on the larboard ſide. The captain's cabin is ſeparated from theſe by a bulk-head.

Of theſe fire-ſhips we have two ſorts, *viz.* the *conflagrating* and the *exploding*. The former have been long in uſe, but the latter appears to be of rather later adoption. The veſſels employed may be from 60 to 200 tons, or more; their ſize being uſually adapted to the ſervice they are to perform. The following detailed account of the preparations and proportions of the requiſite materials will give our readers a perfect idea of this horrible contrivance.

Proportion of combuſtible Stores for a Fire-Ship of 150 Tons.

Fire-barrels, filled with compoſition		8
Iron chambers to blow open the ports		12
Compoſition for priming	barrels	3½
Quick match	ditto	1
Curtains, dipped		48
Reeds, long, ſingle dipped		150
Ditto, ſhort, Single dipped		75
Ditto, ſhort, Double dipped		75
Bavins, ſingle dipped		250

The fire-barrels are about 2 feet 4 inches high, and 1 foot 6 inches in diameter. Each barrel muſt have 4 holes of about 6 inches ſquare cut in its ſides; and theſe holes muſt have a ſquare piece of canvas nailed over them quite cloſe. They are then filled with the ſame compoſition as for carcaſes; and 4 plugs of about 1 inch in diameter and 3 long, and well greaſed, are thruſt into the top, and then left to dry. When dry, the plugs are taken out, and the holes filled with fuſe compoſition, with quick-match at the top. After this, the whole is ſmeared over with mealed powder, mixed with ſpirits of wine. When dry again, a ſheet or two of brown paper is laid over the top, and then one of the canvas covers, which is made ſecure by the upper hoop of the barrel.

The compoſition for dipping reeds, bavins, and curtains, conſiſts of

Roſin	120 lb.
Coarſe ſulphur	90
Swediſh pitch	60
Tallow	6
Mealed powder	12

This will dip about 100 reeds and 25 bavins.

Each curtain contains 1 ſquare yard of barras; and each cover for fire-barrels, 1 ſquare yard of ſacking. Immediately that the curtains, covers, &c. are dipped, they are to be ſtrewed over with fine brimſtone, before the compoſition grows cold. The iron chambers for blowing open the ports, hold from 9 to 11 ounces of powder. They are fixed in ſuch manner as to prevent their recoil, and to inſure the ports being blown open. The vents are uſually corked up, and covered with a piece of barras, till required to be primed, for which the following compoſition is prepared:

Saltpetre pulverized	-	22½ lb.
Roſin ditto	-	2
Sulphur ditto	-	18
Mealed powder	-	45
Linſeed oil	- -	1 pint.

The ſhip ſhould not be primed when fitted out, but only when intended to be fired. The mode of fitting out is this: The whole breadth of the fire-room is to be divided into nine parts; and troughs, about 4 inches wide and as many deep, are laid both along the whole length of that room, and acroſs; ſo as to form a general communication, and to inſure that the whole of the combuſtibles may be ignited nearly at the ſame moment. The eight fire-barrels are ranged along the two ſides; and over them are two fire-ſcuttles, or openings with fire-trunks, by which the flames are directed upwards towards the reſt of the apparatus. The reeds and bavins are tied down to the troughs, to prevent their rolling out of their places, as the ſhip may roll or pitch; and the curtains are nailed up to the beams, equally throughout the fire-room.

When the veſſel is about to be fired, all the reeds and bavins are to be taken up, and a little of the priming compoſition ſprinkled in the bottoms of the troughs: the reeds, &c. are then to be lightly tied down as before. Quick match, of ſix or eight threads, doubled, muſt be laid along on the tops of all the reeds, &c. and abundance of priming compoſition ſtrewed over it, as well as over all the fire-room. The covers of all the fire-barrels muſt be cut open, and made to hang down on the ſides of the apertures. Leaders, of ſtrong quick-match, muſt be laid from the reeds to the barrels, and to the iron chambers; tying them to the ſeveral vents, to inſure their not falling off. Strong leaders of quick-match, four or five times doubled, muſt be laid from the reeds to the ſally-ports; and theſe laſt muſt be connected by quick-match, that the whole may take fire at once.

The following mode is now in uſe for producing an external fire, in addition to that kindled within. Fire-boxes, filled with carcaſe-compoſition, are diſtributed in the following manner in a ſhip with three maſts:

	Boxes.
1 box is ſuſpended from each of the cat-heads and davits, on each ſide of the bow, in all -	4
8 ſlung acroſs the bowſprit - -	8
4 acroſs each of the out-riggers abaft -	8
2 from the graplins of each of the lower yard-arms	12
1 from the dead-eyes on each ſide of the tops	6
1 from the middle of the inſide of the fore, main, and mizen ſhrouds - - -	6
Total boxes of compoſition	44

Theſe boxes are ſuſpended by chains and hooks; but thoſe thrown acroſs the bowſprits and out-riggers are fixed by ſtaples. The two inner ones are laid with leaders of quick-match, which fire inſtantly; or elſe with port-fires, cut to burn a given time: they communicate with the outer ones by reeds tied down on the bowſprit and out-riggers. The boxes that hang from the dead-eyes and ſhrouds are fired by curtains ſuſpended from the ſhrouds; the lower ones hanging immediately over the large fire-barrels. The two boxes on each yard-arm are hung the one over the other; the upper one having a leader of quick-match carried along the yard from the ſhrouds: this in burning will doubtleſs fire the lower one. Beſides the boxes, there are fire-barrels arranged as follows: Two half-barrels on the fore-caſtle; two abaft the main-deck, and four on the main-deck; two in each top, placed againſt the maſts; and four large fire-barrels, under fire-trunks, to convey fire to the curtains on the ſhrouds.

All theſe fire-barrels and boxes are to be fired by ſeparate leaders of quick-match or port-fire, ſo that every part of the ſhip may be fired, and envelope her in ſmoke during her approach to the enemy; while the reſidue need not be ignited until the crew may be quitting to eſcape in their boats. This is certainly a very hazardous duty; the attention of the enemy being always attracted by ſuch fire-ſhips as appear likely to take effect: hence the boats are manned, and every endeavour is made by long poles, like boat-hooks, to get hold ſo as to tow away into a contrary direction; or long-boats, &c. are moored with chains extending upon the ſurface of the water, for the purpoſe of arreſting the progreſs of the flaming viſitor. Whether it be from a refined idea, or from the moſt determined reſentment towards thoſe who act in fire-ſhips, may be difficult to judge; but there is rarely any quarter given to ſuch as fall into the enemy's power. However, under ordinary circumſtances, the evacuation is not attended with much difficulty, unleſs there be much ſwell, by which the boat's return may be greatly impeded, thereby ſubjecting the crew to a heavy fire from every quarter. When we underſtand that two men, furniſhed with lighted port-fires, can ſet fire to the whole of the leaders on the deck, &c. in leſs than a minute, we may collect that after once the veſſel has got into a proper direction, within a few minutes ſail of the enemy, no occaſion for remaining in her, ſo as to riſk the crew, need ever exiſt. In general, the fire becomes univerſal in the courſe of five minutes; the ports being blown open by the chambers, and allowing the flames to ruſh out in the moſt awful manner;—in ſuch a manner as to preclude the poſſibility of approach in boats, which cannot act when the fire has become general.

Exploding fire-ſhips are conſtructed on a ſimilar principle; adapting it to the exploſion, at a given time, of an immenſe trough of powder running the whole length of the veſſel, for the purpoſe of burſting her to pieces, and of deſtroying whatever veſſels may be within reach of the ſhock.

FIRE-*ſtone* is a coarſe, harſh, duſty free-ſtone, of a moderately compact texture, of a pale greyiſh colour, nearly white, with a very ſlight greeniſh tinge. This ſtone is moderately hard and heavy, and ſlightly colours the hands; it is compoſed of a ſmall fine angular grit, cemented by an earthy ſparry matter, intermixed with numerous ſmall ſpangles of a ſilvery mica: it will not ſtrike fire with ſteel, and in the fire changes to a ſlight reddiſh hue. It is called alſo Ryegate-ſtone, from the place whence it is chiefly brought; it bears the fire and a high degree of heat, without melting or exfoliating; and is much uſed for chimnies, hearths ovens, ſtoves, &c.

It does not bear the weather, and is therefore unfit for building.

The beſt fire-ſtone that England affords, is perhaps that obtained from the mill-ſtone grit ſtrata, from a bed with globular ochry ſtains in it, and which is uſed for lining the iron furnaces of Derbyſhire and other diſtricts; it is dug at the Rooks quarry, in Aſhover, on Stanton Moor, and other places. Of late years a good fire-ſtone has been uſed at Butterly furnace, by Mr. Jeſſop, junior, from the fine micaceous grit-ſtone in the ſhale, (ſhale free-ſtone) at Bull Bridge, near Crich. The loweſt and moſt ſilicious beds of the chalk ſtrata anſwer the end of a fire ſtone, for which purpoſe they are dug at Ryegate, Godſtone, and other places on the ſouthern ſkirt of the North Downs, in Surry, for the uſe of the metropolis: the celebrated free-ſtone at Tottenhoe, in Bedfordſhire, is of this ſtratum, and makes a tolerable fire-ſtone.

Fire-*water*, a name given to alkaheſt. See Ignis *aqua*.

Fire, *wild*, is a kind of artificial or factitious fire, called by the Greeks the liquid, or maritime fire, which burns even under water, and that with greater violence than out of it.

It is compoſed of ſulphur, naphtha, pitch, gum, and bitumen; and it is only extinguiſhable by vinegar, mixed with ſand and urine, or by covering it with raw hides.

Its motion or tendency is ſaid to be contrary to that of natural fire, and always following the direction in which it is thrown, whether it be downwards, ſidewiſe, or otherwiſe. For the annoyance of the enemy, it was employed with equal effect by ſea and land, in battles or in ſieges. It was either poured from the rampart in large boilers, or launched in red-hot balls of ſtone and iron, or darted in arrows and javelins, twiſted round with flax and tow which had deeply imbibed the inflammable oil: ſometimes it was depoſited in fire-ſhips, and was moſt commonly blown through long tubes of copper, which were planted on the prow of a galley, and fancifully ſhaped into the mouths of ſavage monſters that ſeemed to vomit ſtreams of liquid and conſuming fire.

The French call it *Greek fire*, or *feu Grecois*, becauſe firſt uſed by the Greeks about the year 660, as is obſerved by the Jeſuit Petavius, on the authority of Nicetas, Theophanes, Cedrenus, &c.

The inventor according to the ſame Jeſuit, was an engineer of Heliopolis, in Syria, named Callinicus, who firſt applied it in the ſea-fight commanded by Conſtantine Pogonates againſt the Saracens, near Cyzicus, in the Helleſpont; and with ſuch effect, that he burnt the whole fleet therewith, wherein there were thirty thouſand men.

But others will have it of a much older date; and hold Marcus Gracchus the inventor; which opinion is ſupported by ſeveral paſſages, both in the Greek and Roman writers, which ſhew it to have been anciently uſed by both theſe nations in the wars. See Scaliger againſt Cardan.

Conſtantine's ſucceſſors uſed it on divers occaſions, with equal advantage as himſelf; and what is remarkable enough is, that they were ſo happy as to keep the ſecret of the compoſition to themſelves, as the palladium of the ſtate, though their gallies and artillery might occaſionally be lent to the Romans, ſo that no other nation knew it in the year 960.

Hugh, king of Burgundy, demanding ſhips of the emperor Leo for the ſiege of Freſne, deſired likewiſe the Greek fire. Chorier, Hiſt. De Dauph.

By various precautions, the ſecret was confined above 400 years to the Romans of the Eaſt, and at the end of the 11th century, the Piſans, to whom every ſcience and every art were familiar, ſuffered the effects, without underſtanding the compoſition of the Greek fire. It was at length either diſcovered or ſtolen by the Mahometans, and in the holy wars of Syria and Egypt, they retorted an invention contrived againſt themſelves, on the heads of the Chriſtians.

F. Daniel gives us a good deſcription of the Greek fire, in his account of the ſiege of Damietta, under St Louis. Every body, ſays that author, was aſtoniſhed with the Greek fire which the Turks then prepared, and the ſecret whereof is now loſt. They threw it out of a kind of mortar; and ſometimes ſhot it with an odd ſort of croſs bow, which was ſtrongly bent by means of a handle, or winch, of much greater force than the bare arm.

That thrown with the mortar ſometimes appeared in the air of the ſize of a tun, with a long tail, and a noiſe like that of thunder. It came flying through the air, ſays Joinville in his "Hiſtoire de St. Louis," like a winged, long-tailed dragon, about the thickneſs of an hogſhead, with the report of thunder and velocity of lightning; and the darkneſs of the night was diſpelled by this deadly illumination. The uſe of the Greek, or, as it might now be called, the Saracen fire, was continued to the middle of the 14th century, when the ſcientific or caſual compound of nitre, ſulphur, and charcoal effected a new revolution in the art of war and the hiſtory of mankind. Leonard da Vinci, in his MSS., publiſhed by Venturi, deſcribes the compoſition of the Greek fire as formed by mixing over the fire, the charcoal of willow, nitre, brandy, roſin, ſulphur, pitch, and camphor. A woollen cord is then plunged in the mixture, and made into balls, which may afterwards be provided with ſpikes. Theſe balls, being ſet on fire, are thrown into the enemy's veſſels. A ſimilar compoſition has been given by Baptiſta Porta, in his "Mag. Natur. l. xii. c. 2." The modern diſcoveries reſpecting combuſtion have diſcloſed the whole ſecret of compoſitions which burn without acceſs to the atmoſphere, but by means of oxygen afforded from nitre. The balls deſcribed by Frezier, (Des Faux d' artifices) which ſhine on the ſurface of water are nothing elſe but the Greek fire.

Fire-*works*, or *artificial fires*, are preparations made of gunpowder, ſulphur, and other inflammable and combuſtible ingredients, uſed on occaſion of public rejoicings, and other ſolemnities.

The principal of theſe are rockets, ſerpents, ſtars, hail, mines, bombs, garlands, letters, and other devices. See Rockets, Star, Bomb, &c.

The invention of fire-works is by M. Mahudel attributed to the Florentines and people of Sienna; who found out likewiſe the method of adding decorations to them of ſtatues, with fire iſſuing from their eyes and mouths.

The art of preparing and managing fire-works is called *Pyrotechny*.

The making or ſelling of fire-works, or ſquibs, or throwing them about in any ſtreet, is, on account of the danger that may enſue to any thatched or timber buildings, declared to be a common nuſance, by 9 and 10 W. III. cap. 7. and puniſhed by a fine of 20*s*.

Fire-*workers*, were formerly ſubordinate officers to the fire-maſters, who commanded the bombardiers, but they are now ſecond lieutenants to the royal regiment of artillery.

Theſe receive the orders from the fire-maſters, and ſee that the bombardiers execute them.

Fire, *Iſland*, in *Geography*, a ſmall iſland in the Indian ſea, near the coaſt of Africa; S. lat. 17° 30′.

FIRENZUOLA, Agnolo, in *Biography*, an Italian poet, born at Florence in 1493, was ſon of Baſtiano de' Giovannini, a perſon of conſiderable note in his own country. He ſtudied at Sienna and Perugia; and in the latter place he contracted an intimacy with the famous Peter Aretin, whom he accompanied to Rome. He was intended for the profeſſion of the law, and exerciſed the duties of an advocate, which he at length quitted to enter the congregation of monks of Vallombroſa, with the expectation of attaining ſome preferment in the church. He died at Rome about the year 1545, having paſſed much of his life in ill health. His writings rank among the lighter productions of Italian literature. They have been frequently printed ; and were collected in three volumes at Florence in the year 1763. Theſe conſiſt of works in verſe and in proſe ; of novels ; amorous diſcourſes ; a piece againſt the new letters introduced into the Italian by Triſſino ; diſcourſes in natural hiſtory ; two comedies ; a tranſlation of the Golden Aſs of Apuleius, adapted to himſelf and the circumſtances of his own time. In almoſt all his pieces he exhibits a cultivated and elegant taſte, but is often more free in his manners than became the clerical character. Moreri.

FIRGOS, in *Geography*, a town of the iſland of Samos ; 3 miles W.N.W. of Cora.

FIRING, in the *Manege*, denotes a kind of correction or diſcipline of the whip, uſed by horſe-dealers ; and which they cruelly practiſe in order to terrify a horſe, and thus to rouſe his mettle, that he may appear to the beſt advantage. Whereas this object is moſt honeſtly and moſt effectually attained by a moderate uſe of the whip.

FIRING, in the *Military Art*, denotes the diſcharge of the fire-arms ; and its object is to do the utmoſt execution to the enemy.

The preſent method of firing by platoons is ſaid to have been invented by Guſtavus Adolphus, and firſt uſed about the year 1618 ; the reaſon commonly given for this method is, that a conſtant fire may be always kept up. There are three different ways of platoon firing ; *viz.* ſtanding, advancing, and retreating. But previous to every kind of firing, each regiment or battalion muſt be told off in grand diviſions, ſubdiviſions, and platoons, excluſively of the grenadiers, which form two ſubdiviſions, or four platoons, of themſelves. In firing ſtanding, either by diviſions or platoons, the firſt fire is from the diviſion or platoon on the right ; the ſecond fire, from the left ; the third, from the right again ; and ſo on alternately till the firing comes to the centre platoon, which is generally called the colour platoon, and does not fire, remaining as a reſerve for the colours. Firing advancing is performed in the ſame manner, with this addition, that before either diviſion or platoon fires, it advances three paces forward. Firing retreating varies from either of the former methods ; for, before either diviſion or platoon fires, if they are marching from the enemy, it muſt go to the right about, and after firing, to the left about again, and continue the retreat as ſlow and orderly as poſſible.

In hedge-firing the men are drawn up two deep, and in that order both ranks are to fire ſtanding. Oblique firing is either to the right and left, or from the right and left to the centre, according to the ſituation of the object. The Pruſſians have a particular contrivance for this purpoſe ; if they are to level to the right, the rear ranks of every platoon make two quick but ſmall paces to the left, and the body of each ſoldier turns one-eighth of a circle, and *vice verſâ*. Parapet firing depends on the nature of the parapet over which the men are to fire, and alſo upon that of the attack made to poſſeſs it. This method of firing is ſometimes performed by ſingle ranks ſtepping on the banquette and firing ; each man inſtantly handing his arms to the centre rank of the ſame file, and taking his back in the room of it ; and the centre rank giving it to the rear to load, and forwarding the arms of the rear to the front rank ; by which means the front rank men can fire ſix or ſeven rounds in a minute, with exactneſs. Parapet firing may alſo be executed two deep, when the banquette is three feet broad, or in field works, where no banquettes are made. Square firing is performed by a regiment or body of men drawn up in a hollow ſquare, in which caſe each front is generally divided into four diviſions or firings, and the flanks of the ſquare, being the weakeſt part, are covered by four platoons of grenadiers. The firſt fire is from the right diviſion of each face ; the ſecond from the left diviſion of each face, &c. and the grenadiers make the laſt fire. Street firing is practiſed in two ways ; either by making the diviſion or platoon that has fired to wheel by half-rank to the right and left outwards from the centre, and to march in that order by half diviſions down the flanks on each ſide of the column, and to draw up in the rear, and go on with their priming and loading ; or, to make the diviſion or platoon, after firing, to face to the right and left outwards from the centre, and one half rank to follow the other ; and in that order to march in one centre file down on each ſide of the column into the rear, and there draw up as before.

FIRING *iron*, in the *Manege*, is a piece of copper or iron, about a foot long, one end of which is made flat, and forged like a knife ; the back of it being half an inch thick, and the fore-edge about the fifth or ſixth part of this. When the farrier has made his firing-iron red hot in his forge, he applies the thinneſt part to the horſe's ſkin, and ſo gives the fire to the hams, or ſuch places as ſtand in need of it.

The utility of firing, or of applying the actual cautery in ſtrains is doubtful. Mr. Lawrence tried it without ſucceſs. Its uſe is ſaid to be to diſcuſs ſwellings by promoting abſorption, and by contracting the ſkin to form a conſtant bandage round the ſinews, both during the cure, and even afterwards : when the paſtern-joints are exceedingly full and ſwelled, the legs gorged, the tendons enlarged, and, indeed, the parts indurated, bliſtering and firing ſeem to be abſolutely neceſſary, when no other meaſures will be ſufficiently uſeful. In the Veterinary college, it is the practice, in this operation, to draw the lines vertically round the affected limb ; the contraction of the ſkin in that direction forming the moſt effectual and uniform bandage on the part. See SPAVIN, RINGBONE, &c.

FIRKIN, an Engliſh meaſure of capacity, for things liquid, containing the fourth part of the barrel.

The firkin of ale contains eight gallons ; and that of beer, nine ; two firkins of beer make the kilderkin ; two kilderkins the barrel ; and two barrels the hogſhead. In the country a firkin of ale and beer is 8½ Wincheſter gallons.

The firkins of herrings, ſoap, and butter are on the footing of the firkin of ale ; *viz.* a gallon per firkin leſs than that of beer.

FIRLAYENKA, in *Geography*, a town of Poland, in the palatinate of Lemberg ; 48 miles E. N. E. of Lemberg.

FIRLOT, in *Agriculture*, is a term which is generally applied to a dry meaſure of grain in the northern parts of the kingdom ; but which differs in ſize, according to Mr. Sommerville, in the proportion of 21, 25 to 31. There is therefore a *ſmall* and a *large* firlot. Wheat, rye, beans, and peas are uſually ſold by the ſmall firlot ; but malt, barley, and oats by the large firlot. Four ſmall firlots are, according to the ſame writer, 4.087276 Wincheſter buſhels ; four large ones 5,96263 Wincheſter buſhels. Four firlots make a boll. See WEIGHTS and MEASURES. The firlot is likewiſe diſtinguiſhed into the *oat* and the *wheat* kinds. The oat firlot, which contains twenty-one and a quarter Scotch pints, is nineteen and a half inches in diameter, both at the top and bottom, being of a perfectly cylindrical form, and ſeven and a half inches in depth. The wheat firlot contains about 2211 cubical inches, and that for barley thirty-one ſtandard pints ; it ſeems therefore that the Scotch wheat firlot exceeds the Engliſh buſhel, by thirty-three cubical inches.

FIRMAMENT, (from the Latin *firmamentum*.) This word has been uſed with great latitude by ſacred writers, by aſtronomers, by poets, and other writers. When Ptolemy of Egypt endeavoured to reconcile the phenomena of the celeſtial bodies with the prevailing philoſophy of the times, he ſuppoſed that the earth was immoveably fixed in the centre of the univerſe, and that the moon, mercury, venus, the ſun, mars, jupiter, and ſaturn, were carried round the earth by different ſpheres of ſolid but tranſparent matter. Beyond them he ſuppoſed the exiſtence of an eighth ſphere whereon the fixed ſtars were ſituated, and this he called the *firmament of the fixed ſtars*; and beyond this firmament be placed the *primum mobile*, and the *cælum empyreum*. In proceſs of time the abſurdity of this aſtronomical hypotheſis was clearly demonſtrated, in conſequence of which the Ptolemaic ſpheres were utterly diſregarded; yet the word firmament ſtill remained in uſe; its meaning, however, became leſs limited; ſo that ſometimes it was uſed to expreſs the region of the fixed ſtars; at other times it denoted a peculiar region, or ſome peculiar regions of the heavens, as may be deduced from the expreſſions, *the middle firmament*; *the various firmaments*. It has alſo been uſed to ſignify the ſky, or the whole expanſe of the heavens. Derham ſays (in his Aſtro. Theol.) "what an immenſe ſpace is the firmament, wherein a great number of ſtars are ſeen with our naked eye?". Dr. Keill, in his Aſtronomical Lectures; ſays, "a ſpectator therefore living in the ſun, when he looks towards the heavens, will obſerve its ſurface to be ſpherical-concave, and concentrical to his eye, in which ſurface he will obſerve an innumerable multitude of ſtars, which we call fixed, every where diſperſed throughout the whole heavens, which like ſo many gilded ſtuds, with a bright luſtre, adorn the firmament."

In various parts of the ſcripture, the middle region of the air is called the firmament.

It is curious to obſerve that whilſt moſt writers, ancient no leſs than modern, ſeem to conſider the firmament as ſomething aerial, or fluid; others, with Ptolemy, have conſidered it as ſolid and tranſparent like cryſtal. Indeed, upon the leaſt reflection, this laſt idea ſeems to be more conſonant with the nature of the word, which ſuggeſts the idea of ſomething firm and ſubſtantial, a ſort of foundation fit to ſupport great, heavy, and magnificent objects. In fact, ſome writers of note have uſed it in this ſenſe, and entirely independent on aſtronomy. Thus Bacon (in his Advancement of Learning) ſpeaking of the principles of every ſubject, which human induſtry always endeavours to find out, ſays, "The mind of man doth wonderfully endeavour, and extremely covet this, that it may not be penſile; but that it may light upon ſomething fixt and immoveable, on which, as on a firmament, it may ſupport itſelf it its ſwift motions and diſquiſitions."

Conſidering that ſtriking circumſtance of the fixed ſtars conſtantly preſerving their relative ſituations; it muſt be allowed, that Ptolemy was, not without apparent reaſon, induced to conſider the firmament of the ſtars, as ſomething ſolid and permanent. Previous to the very recent moſt accurate obſervations, which have ſhewn that very ſlight alterations of diſtances do actually take place among the ſtars, it was not even ſuſpected that any ſuch thing exiſted; and the daily movement which they were obſerved to have, was conſidered as the common movement of them all, or rather of their firmament, which appeared to revolve round the earth once in each 24 hours.

Beſides this apparent daily motion, it is to be remarked that the ſun returns to the equinox every year before it returns to the ſame point in the heavens, hence the equinoctial points have a retrograde motion, which, though very ſmall, in proceſs of time amounts to ſomething conſiderable, and it will complete a whole revolution, ſo as to return to the ſame point, after a great number of years. (This is called the PRECESSION *of the equinoxes*, which ſee; and the whole revolution round the ſtarry firmament is called the great year, or *annus magnus*.) This circumſtance did not eſcape the notice of ancient aſtronomers, and their calculations reſpecting the quantity of the annual preceſſion, or of the whole revolution, were not much leſs accurate than thoſe of latter times. Ptolemy reckoned the *annus magnus*, or the grand revolution of his ſtarry firmament, equal to 36,000 ordinary years. Hipparchus came to the ſame concluſion. Tycho Brahe reckoned it equal to 25,412 years. And the more modern aſtronomers, though not quite agreeing among themſelves, generally reckon it equal to about 26,000 years.

FIRMAN, in the Eaſt Indies, and particularly in the territories of the Great Mogul, is the paſſport, or permit, granted to foreign veſſels, to trade within their juriſdiction.

FIRMICUS, MATERNUS, JULIUS, in *Biography*, an eccleſiaſtical writer, flouriſhed about the middle of the fourth century. He is ſaid to be a Sicilian by birth; to have practiſed for ſome time as an advocate in the Forum at Rome; and, in his old age, to have become a convert from heatheniſm to Chriſtianity. He was author of a treatiſe, "De Errore profanarum Religionum," which was addreſſed to the emperors Conſtantius and Conſtans. It is a learned and well-written performance, and ſets forth, by way of contraſt, the reaſonableneſs and excellence of the Chriſtian ſyſtem, in compariſon with the abſurd and immoral tenets of the Gentile creed. It had been well had he been ſatisfied with demonſtrating by argument the ſuperior excellence of his religion; but unfortunately he called upon the civil power to propagate it by force, and by ſevere edicts to cruſh and overwhelm the abettors of error. This work has often been reprinted; and in the year 1666 it was publiſhed at Paris, at the end of Cyprian's works; and it is inſerted in the 4th volume of the "Bibliotheca Patrum." A mathematical, or, perhaps, more properly, an aſtrological treatiſe, entitled, "Aſtronomicorum, ſeu de Matheſi, lib. viii." is aſcribed to Firmicus, though not without diſpute. It was firſt publiſhed at Venice, in 1497, in folio, from a copy brought by Peſcennius Niger from Conſtantinople: and has been frequently reprinted ſince, together with the works of Manilius, and the aſtronomical pieces of Ptolemy. It treats of the power and influence of the ſtars, according to the doctrine of the Egyptians and Babylonians; and contains a curious mixture of mathematical ſcience with the reveries of judicial aſtrology. Moreri.

FIRMILIAN, an eminent Chriſtian biſhop, who flouriſhed in the third century, was deſcended from an honourable family in Cappadocia. He was ordained biſhop of Cæſarea about the year 233, and was held in the higheſt eſtimation for learning and for the excellence of his moral character by his contemporaries. In all the important eccleſiaſtical matters that were agitated in his time, the opinion of Firmilian was looked up to with profound reſpect and veneration. He was preſent at the council of Iconium, held in 235; at the council of Antioch, in 252, convened on the ſubject of Novatian's ſchiſm; he was alſo preſident of the council held, ſome years after, at the ſame place, to examine into the opinions of Paul of Samoſata. He was again invited to the council held at Antioch, in the year 270, by which Paul was condemned and depoſed; but died at Tarſus, on his journey, about the end of the year 269. This was an unfortunate event for Paul, who had already been ſaved by his influence, and who would probably have again experienced his kindneſs in this new attack on his principles and character, had he lived to argue the matter in council. Firmilian was not much diſtinguiſhed as an author; yet his merits, moderation, and candour, entitle his memory to the reſpect of poſterity. Theodoret characterized him as "an illuſtrious perſon, equally maſter of human and divine knowledge." He was united in ſtrict friendſhip with Origen, whom he invited into his own country, and to whom he paid ſeveral viſits, for the ſake of improving by his inſtructions in divine knowledge. He took the part of St. Cyprian, in the diſpute about baptiſing heretics that returned to the catholic church; and wrote a long letter to St. Cyprian on the ſubject, in which he expoſed the inhumanity, pride, and inſolence of Stephen, biſhop of Rome. St. Baſil mentions with reſpect the works of Firmilian, but without expreſsly naming them. He was a man zealouſly attached to the truth, but candid and liberal to thoſe who differed from him, and anxiouſly deſirous that they ſhould never be moleſted on account of their opinions. Moreri. Lardner.

FIRMIN, Thomas, was born at Ipſwich, in Suffolk, in the year 1632, where he was educated under the eye of his parents, who were ſtrictly religious; and with regard to this world's goods, they were reſpectable but not rich. "God gave them," ſays the friend and biographer of Firmin, the wiſh of Solomon, "neither poverty nor riches, but that middle eſtate and rank, which contains all that is valuable and deſirable in wealth, without the parade, vanity, and temptations that generally adhere to riches." When Thomas was of a proper age, he was bound apprentice to a tradeſman in London. In this ſituation he was remarkable for his diligence and activity, as well as for his amiable and obliging manners. With his maſter he uſually attended the ſermons of the celebrated Arminian preacher, Mr. John Goodwin: by this he became an early convert from Calviniſm, in which he had been brought up, to the principles of Arminius. At the expiration of his apprenticeſhip he entered into buſineſs on his own account, with a capital of 100*l.* only, which in 1660 was increaſed by an addition of 500*l.* that he received with a citizen's daughter whom he married. By ſkill and induſtry he ſoon acquired property; but, what was of infinitely more importance, he became eminently known for the excellence of his diſpoſition, the integrity of his dealings, his ſolicitude to promote the happineſs of others, and his kind and conſtant exertions for alleviating the diſtreſſes of the poor and unfortunate. He was, from his firſt commencement in buſineſs, deſirous of obtaining the friendſhip of perſons eminent for moral worth, foreigners as well as his own countrymen, and particularly of the clergy of different denominations. From theſe connections he, in future life, was enabled to derive eſſential aſſiſtance in promoting the benevolent and uſeful deſigns for which he afterwards became ſo eminently diſtinguiſhed. Among other perſons, he was intimately acquainted with Mr. John Biddle, who confirmed him in his Arminian ſentiments, and made him a proſelyte to Unitarianiſm, for the ſake of which Biddle himſelf was perſecuted and baniſhed. (See Biddle.) Firmin was not to be diverted from his kind intentions, becauſe the tyranny of Cromwell fell heavily upon him: he ſhewed him every attention while here; and when he was ſent, by the protector, a priſoner to the Scilly iſles, he procured for him a penſion, which Cromwell had virtue enough to allow him to receive during his baniſhment. Mr. Firmin enrolled among his intimate friends Dr. Whichcote, Dr. Worthington, Dr. Tillotſon, and Dr. Wilkins. By the intercourſe which he thus maintained with the clergy, and the great confidence placed in his judgment to recommend men of abilities and worth to ſituations for which they were adapted, he was enabled to ſerve the intereſts of many promiſing young preachers and ſcholars, who were candidates for lectureſhips, ſchools, &c. In the year 1664, Mr. Firmin, being a widower, married again; and with his wife he had a very conſiderable fortune. In 1666, his houſe was deſtroyed by the great fire of London; but his character as a tradeſman was now ſo well known, that by the increaſe of buſineſs he ſoon repaired the loſs which he ſuſtained by that event, and might have amaſſed much property, had not his heart prompted him to devote a great proportion of his profits to benevolent and humane purpoſes. In the year 1676, he erected large premiſes, and eſtabliſhed a linen manufacture, for the ſake of affording employment to a number of poor children, who were uſeleſs to, and a burden on, the community. Here he found conſtant work for many hundreds, who were either acquainted with the different branches of the buſineſs, or were willing to be inſtructed in them. The returns proved, as he expected, very inadequate to the expences incurred; yet, from his own funds, and from the aſſiſtance which he obtained from well-diſpoſed perſons, he was enabled to bear the loſs, and to give away occaſional ſums of money, more than their earnings, and to diſtribute fuel and clothing among the poor manufacturers in ſevere ſeaſons. In the year 1678, he publiſhed "Propoſals for employing the Poor, eſpecially in and about the City of London, and for the Prevention of Begging, &c. in a Letter to a Friend." In this tract he deſcribes the progreſs and good effects of his inſtitution, and makes a number of valuable obſervations relative to the moſt proper means of providing for the neceſſities of the poor. After this he attempted to ſet up a woollen manufacture; but the loſſes which he ſuſtained, through the ignorance of the perſons employed, obliged him to relinquiſh his project. He erected a large warehouſe on the banks of the Thames, in which he depoſited corn and coals, purchaſed in the cheapeſt ſeaſons, to be ſold at prime coſt, in times of ſcarcity, to the poor. Mr. Firmin was ſignalized by the zeal and activity which he diſplayed in liberating poor debtors from priſon, and in providing for the more comfortable ſubſiſtence of others whom he was unable to redeem. He was, however, the means of opening the priſon doors to many, whoſe families were ready to periſh for want; and his recommendation and influence are ſaid to have had great weight with ſome leading members of parliament, in the paſſing of certain acts of grace in behalf of poor debtors. Mr. Firmin was one of the governors of St. Thomas's hoſpital, and extremely active to render it as uſeful as poſſible: he was alſo a governor of Chriſt's hoſpital, of which he proved himſelf a great benefactor and conſtant ſuperintendant. When the French proteſtants fled into England, to eſcape the perſecution of Louis XIV., Mr. Firmin was active in providing for their relief; and ſeveral thouſand pounds were entruſted to his care and management, for the benefit of the refugees. He was equally zealous in behalf of thoſe who fled from Ireland to England, to eſcape the perſecutions of James II. He was, in ſhort, a moſt aſſiduous aſſertor of the civil and religious liberties of mankind; and in no inſtance did he ſtand by to witneſs oppreſſion, without endeavouring to aſſert the rights of the oppreſſed. By the diſtribution of publications written in defence of public freedom, he endeavoured to rouſe his countrymen to a vindication of their rights, in oppoſition to the king (James II.); and he may be regarded as a zealous promoter of the revolution in 1688. After that event, he gave evidence that his benevolence was attached to no party, but was active in relieving thoſe who were ſuffering for conſcience ſake. The high character which this excellent man ſuſtained attracted the notice of the queen, who expreſſed a deep concern that ſo good a man was not orthodox in his religious ſentiments; and intreated archbiſhop Tillotſon to endeavour to convince him of his error. The prelate replied, that he had already made the attempt; but that Mr. Firmin had been too early and too deeply impreſſed with Unitarian principles, to admit now of contrary impreſſions. After this, Dr. Tillotſon publiſhed ſome ſermons on the points in diſpute, and ſent one of the firſt copies to Mr. Firmin; who immediately drew up an anſwer to them, which he preſented to the archbiſhop: ſtill, however, their friendſhip for one another did not abate. With Dr. Compton, biſhop of London, Mr. Firmin was equally in favour: and it muſt not be forgotten, that the annual collections for the poor, which are made in and about London at Chriſtmas, under the authority of the king's letter, were ſet on foot by Mr. Firmin, who had the direction of the buſineſs ſeveral years. This excellent man died, December 20th, 1697, in the 66th year of his age. He was interred, according to his own deſire, in the cloyſters belonging to Chriſt's hoſpital, where the following inſcription was erected to his memory.

"Under that ſtone, near this place, lyeth the body of Thomas Firmin, late citizen of London, a governor of this and Saint Thomas's hoſpital; who, by the grace of God, was created in Chriſt Jeſus to good works, wherein he was indefatigably induſtrious, and ſucceſsfully provoked many others thereto; becoming alſo their almoner, viſiting and relieving the poor at their houſes, and in priſons, whence alſo he redeemed many. He ſet hundreds of them at work, to the expending of great ſtocks. He rebuilt, repaired, and added conveniences to hoſpitals, weekly over-ſeeing the orphans. The refugees from France and from Ireland have partaken largely of his charity, pains, and earneſt ſolicitation for them. He was wonderfully zealous in every good work, beyond the example of any of our age. Thus ſhewed he his faith by his works, and cannot reaſonably be reproached for that which brought forth ſuch plenty of good fruits." Life of Firmin in Unitarian Tracts, vol. v. 1806.

Firmin, in *Geography*, a town of France, in the department of the Rhône and Loire; 5 miles W. of St. Etienne.

Firmin, *St.*, a town of France, in the department of the Higher Alps, and chief place of a canton, in the diſtrict of Gap: the place contains 851, and the canton 4477 inhabitants, on a territory of 222½ kiliometres, and in 9 communes; 13 miles N. of Gap.

FIRMITZ, a town of Bohemia, in the circle of Leitmeritz; 8 miles N.W. of Leitmeritz.

FIRMNESS, Firmitas, in *Philoſophy*, denotes the conſiſtence of a body; or that ſtate, wherein its ſenſible parts cohere, or are united together, ſo that the motion of one part induces a motion of the reſt. In which ſenſe, firmneſs ſtands oppoſed to fluidity.

Some authors confound firmneſs with denſity; as thinking the ſame ſtate or property of body implied by both; or at leaſt, that firmneſs follows denſity: but this is a miſtake. For mercury, the denſeſt body in nature excepting gold, is yet one of the moſt fluid; and even gold itſelf, with all its denſity, when fuſed, wants firmneſs, or coheſion.

Many of the Carteſians, and others, hold firmneſs to conſiſt in the mere quiet of the particles of the body, and their mutual immediate contact; urging, that a ſeparation of parts can only ariſe from ſome matter interpoſed between them, which is excluded by the motion of contiguity.

But the inſufficiency of this hypotheſis is evident: for mere ſimple reſt has no force, either to act or reſiſt; and conſequently two particles only joined by reſt and contiguity, would never cohere ſo as that a motion of the one ſhould induce a motion of the other. This is obvious in the caſe of two grains of ſand, which, however contiguous, and at reſt, will never conſtitute a firm coherent body.

The firmneſs of bodies, then, depends on the connexion or coheſion of their particles. Now, the cauſe of coheſion, ſir I. Newton, and his followers, hold to be an attractive force, inherent in bodies, which binds the ſmall particles thereof together; exerting itſelf only at, or extremely near, the points of contact, and vaniſhing at greater diſtances.

The firmneſs of bodies, therefore, follows the laws of the coheſion of bodies. See Cohesion.

Hence, firmneſs in all bodies muſt be as the ſurfaces and contacts of the component parts: thus a body, whoſe parts are by their peculiar ſhapes capable of the greateſt contacts, is moſt firm; and that, whoſe parts are capable of the leaſt contact, will be moſt ſoft.

In the former, the greateſt requiſite is to be as near to cubes as poſſible, and in the latter to ſpheres. And in the ſame manner are to be accounted for, not only all the intermediate degrees between the moſt firm and the moſt ſoft bodies, but thoſe different conſiſtencies, which are diſtinguiſhed by other names, as friable, tenacious, glutinous, and the like; for the greater are the ſolidities of the component parts of any body, in proportion to their ſurfaces, though that body, by the aptitude of the contacts, may be what we call *very hard;* yet it will be moſt friable or brittle. And where the ſurfaces of the component particles are much extended upon a ſmall quantity of matter, the bodies they compoſe, though they may be light and ſoft, yet they will be tenacious or glutinous; for although the flexibility of their compounding parts admits of their eaſy changing of figure by any external force, yet by their touching one another in ſo many points, they are very difficultly ſeparated.

The former is the caſe in cryſtallized ſalts, reſins, and the like; the latter in turpentines, gums, and all of that ſort.

FIRM-ORE, a kind of lead-ore.

FIRMUM, in *Ancient Geography*, *Fermo*, a town of Italy, in Picenium, nearly S. of Potentia; ſituated at ſome diſtance from the ſea. In the courſe of the Punic war, it ſent ſuccours to the Romans againſt Hannibal. It was taken by Totila, in the year 544.

FIROSAPOUR, in *Geography*, a town of Hindooſtan, in Mewat; 13 miles W. of Cottilah. See alſo Ferosapour.

FIROUSABAD, a town of Perſia, in the province of Mecran; 60 miles N.W. of Ermajal.

FIROUZABADI, Ibrahim Abou Ishak, in *Biography*, a Perſian doctor of high reputation for knowledge of the principles of the Mahometan law, who flouriſhed in the eleventh century of the Chriſtian era, and was born at Firouzabad, a town near Shiraz. Here and at Baſſora he received the fundamental principles of his education. From

Baſſora he repaired to Bagdat, at that time the imperial city and reſidence of the caliphs, where he placed himſelf under the ableſt inſtructor, and was afterwards invited by the illuſtrious Nezam Molk, grand-vizier, to undertake the direction of the ſince celebrated college, which had juſt been erected at his expence. The duties of this important office, which at firſt he would gladly have declined, he performed with honour to himſelf, and to the great advantage of thoſe who were committed to his charge, till his death in the year 1083, when he was in the 82d year of his age. His loſs was ſo generally regretted, that his diſciples went into mourning for his death; and the college over which he had preſided was ordered to be ſhut up for a whole year, in teſtimony of the public ſorrow which was univerſally felt. He was author of a work, which is highly eſteemed by the Mahometans, entitled, "Al Tanbih," or "General Information;" in which the principal rites and obſervances of the Muſſulman law are fully treated of and explained. Gen. Biog.

Firouzabadi, Megdeddin Abou Thaler Mohammed Ben Jacob, a learned Oriental lexicographer, was born in the year of the hegira 729, or in 1328 of the Chriſtian era. He had the high honour of being noticed, on account of his great learning, by the moſt celebrated potentates of his time, particularly by Ben Abbas, Tamerlane, and Bajazet, firſt emperor of the Turks, who at different times made him many valuable preſents. He died at the age of 88, in the year 817 of the hegira. His works are a dictionary of the Arabic language, entitled, "Camus," or "the Ocean:" it conſiſted of two volumes. He was author likewiſe of a work entitled, "Ahaſſan al Lathaif," which is a collection of pleaſantries and witty ſayings; and of another, "On the Means of being happy." Moreri.

FIROZABAD, in *Geography*, a town of Hindooſtan, in the ſoubah of Agra; 16 miles E.S.E. of Agra.

FIROZEPOUR, a town of Hindooſtan, in the circar of Sumbul; 5 miles N.E. of Sumbul.

FIRST Mover, in the *Ancient Aſtronomy*. See Primum *Mobile*.

First-*Fruits*, *Annates* or *Primitiæ*, the profits of a benefice for the firſt year after avoidance. See Annates and Primitiæ.

The firſt-fruits were formerly eſtimated according to a rate or *valor* made under the direction of pope Innocent IV. by Walter biſhop of Norwich, in 38 Hen. III. and afterwards advanced in value by commiſſion from pope Nicholas III. A.D. 1292, 20 Edw. I. which valuation of pope Nicholas is ſtill preſerved in the exchequer; and the tenths or *decimæ* were the tenth part of the annual profit of each living by the ſame valuation: claimed by the holy ſee on the authority of the precept recorded in Numb. viii. 26. Theſe papal uſurpations were firſt introduced into this kingdom by Pandulph the pope's legate, during the reigns of king John and Henry III. in the ſee of Norwich, and afterwards attempted to be made univerſal by the popes Clement V. and John XXII. about the beginning of the fourteenth century. Theſe claims were often oppoſed by the Engliſh parliament; but they continued till the reformation in the reign of Henry VIII. at which period it was computed, that in the compaſs of 50 years, 800,000 ducats had been ſent to Rome for firſt-fruits only. This revenue was annexed to the crown by 26 Hen. VIII. cap. 3. confirmed by 1 Eliz. cap. 4. and a new *valor beneficiorum* was then made, by which the clergy are at preſent rated. By theſe ſtatutes all vicarages under ten pounds a-year, and all rectories under ten marks, are diſcharged from the payment of firſt-fruits; and if the incumbent lives but half a year, he ſhall pay only one quarter of his firſt-fruits; if one whole year, half of them; if a year and a half, three quarters; and if two years, the whole. By ſtat. 27 Hen. VIII. cap. 8. no tenths are due to be paid for the firſt year; and by other ſtatutes of queen Anne, in the fifth and ſixth years of her reign, if a benefice be under fifty pounds *per annum*, clear yearly value, it ſhall be diſcharged of the payment of firſt-fruits and tenths. Queen Anne granted her royal charter, confirmed by ſtat. 2 Ann. cap. 11. whereby the whole revenue of firſt-fruits and tenths is veſted in truſtees for ever, to form a perpetual fund for the augmentation of poor livings, uſually called queen Anne's bounty. Blackſt. Comm. vol. i. p. 284, &c. See Augmentation.

First-*Fruits*, *Office of*, is kept in the Temple, under the direction of a remembrancer, receiver, and comptroller, and their deputies and clerks.

FIRUZABAD, Firous-abad, or *Giaur*, in *Geography*, a town of Perſia, in the province of Farſiſtan; 65 miles S.S.W. of Schiras. N. lat. 28° 49′. E. long. 51° 58′.—Alſo, a town of Perſia, in the province of Irak; 12 miles W.N.W. of Nehavend.

FIRUZINUS Color, a term that frequently occurs in ſome of the old writers on gems, and has been miſtaken by many to mean a ruſty brown; and by others, black; but theſe are not colours to be ſought after among the gems, and yet it is to thoſe that this epithet is uſually applied. We find it uſed for a blue kind of jaſper by ſome authors, the ſame with the jaſpis boreas of Pliny and Dioſcorides, and by others for the ſapphire, which ſome of the ancients, particularly Theophraſtus, having called it μελανχ, that is, black in its deepeſt colour, authors have been led to ſuppoſe that this word ſtood for black; but as there are not, nor ever were, any black ſapphires, it is certain from this, as well as many other inſtances, that the ancients uſed this word, μελας, for a deep blue, and in that ſenſe, firuzinus color does ſignify the ſame thing; it being the aerinus color of the ancients, or what we call ſky colour, or a fine blue: ſuch as the colour of the fineſt ſapphires.

FIRUZKOH, in *Geography*, a fortreſs of Greater Bucharia, on the mountains that ſeparate Balk from Segeſtan, taken in 1404, by Timur Bec; 30 miles S. of Gaur.

FIS, German, a ſharp in muſic.

FISA, in *Geography*, a town of South America, in the province of Tucuman; 25 miles N.W. of St. Fernando.

FISANELLE, in *Ornithology*, a name given by the Venetians to a water-fowl of the colymbus kind, called by authors the colymbus major, or great diver. Very common in the markets of Italy. See Colymbus.

FISC, Fiscus, in the *Civil Law*, the treaſury of a prince, or ſtate; or that to which all things due to the public do fall.

The word is derived from the Greek φισκος, *a great baſket*, uſed when they went to market.

By the civil law, none but a ſovereign prince has a right to have a fiſc, or public treaſury. See Ærarium.

FISCAL, ſomething relating to the pecuniary intereſt of the king, the public, or a private perſon.

The emperor Adrian erected the office of fiſcal advocate in the Roman empire.

FISCARD, or Fishgard, in *Geography*, is a ſmall market and fiſhing town in the hundred of Cemmaes, Pembrokeſhire, South Wales, diſtant from London 150½ miles, and by the returns made under the population act, contained, in 1801, 344 houſes, and 1505 inhabitants. The town is ſituated on the declivity of a high cliff, near where the river Gwayne, which ſeparates the hundred of Cemmaes from the hundred of Pebidiog, falls into the ſea, forming a convenient road with good anchorage, veſſels lying ſafely in five and ſix fathom water. The church is remarkable for little, but being deſtitute of a ſteeple. In the town are two other places of worſhip, one for baptiſts, and another for methodiſt diſſenters. There are very few good houſes, and the narrow, unpaved, filthy ſtreets are ſtrongly contraſted, by the cottages being wholly white-waſhed, both walls and roofs. The town is however in an improving ſtate, and lately it has received the advantages of a poſt-office, and a weekly market held on Fridays, which is well ſupplied with corn and other proviſions, cloth, flannels, ſtockings, &c. Yet ſtill its public accommodations are ſo few and indifferent, that Mr. Malkin's advice to travellers, "that they ſhould aim to avoid paſſing a night here," is ſtill eligible. A road cut through a rock, forming a communication between the upper and lower parts of the town, opens a fine view to the bay. The harbour, having been recently aſſiſted by the erection of a pier, is of great advantage to the Iriſh trade, as Fiſhgard is the only port on this part of the Welſh coaſt, unincommoded with thoſe dangerous ſands, denominated bars: and its ſituation to the north of Milford renders it a ſafe retreat for ſhips in blowing weather, unable to get round St. David's head. The port has a ſmall coaſting trade, which employs about fifty veſſels, from 20 to 100 tons burthen in the conveyance of butter and corn. A manufacture of coarſe cloth is carried on in the town, but the principal part of the inhabitants is occupied in the herring-fiſheries, quantities of which in the ſeaſon are caught and cured here, particularly what are termed red herrings, by the proceſs of ſmoking. Several ſmoking-houſes are in the vicinity, and from *fern* being uſed for the purpoſe of drying, the fiſh are eſteemed for their ſuperior flavour. From the north-eaſt wall of the church is a remarkable echo, which repeats ſentences diſtinctly three times. In a dingle below the church is a ſtrong chalybeate ſpring, celebrated for its ſanative virtues: and between the church and the river is a vaſt ſtone, calculated to weigh more than nine tons, flat at top, meaſuring nine feet in diameter, and reſting upon three others placed in the ground, evidently one of thoſe Britiſh Druidical monuments, denominated cromlecheu.

This place was brought into general notice a few years ſince, by the circumſtance of two hoſtile frigates appearing off the port, and afterwards landing at Llanano, in the neighbourhood, 1400 French invaders, who, after alarming the whole kingdom, and keeping poſſeſſion of this part of the country a few days, were oppoſed by the ſea-fencibles, and a troop of yeomen cavalry, amounting to 666 effective men, under the command of lord Cawdor, to which inferior force, after a ſmall reſiſtance, they ſurrendered, and were marched priſoners to Haverfordweſt. A curious incident on that occaſion deſerves notice. To the ſpeedy and favourable termination of this, at firſt, formidable aggreſſion, it appears the females contributed. Numbers aſſembled upon the ſurrounding heights, clad in their ſcarlet *whittles*, (long mantles), and drawn up in ranks, the enemy took *them* for additional forces.

FISCEL, a town of Spain, in Arragon; 15 miles N.W. of Ainſa.

FISCELLUS Mons, *Mount Fiſcallo*, a mountain of Italy, between the country of the Sabines and Picenum.

FISCHAMUND, a town of Auſtria, ſituated at the junction of the river Fiſcha with the Danube; 12 miles E.S.E. of Vienna.

FISCHAUSEN, a town of Pruſſia, in the Friſch-hoff, anciently the reſidence of the biſhop of Samland; 5 miles W. of Konigſberg. N. lat. 54° 45'. E. long. 20° 2'.

FISCHBACH, the name given to ſeveral towns of Germany, in the biſhopric of Bamberg, in the territory of Nuremberg, and in the principality of Bayreuth.—Alſo, a town of Swabia, in the county of Limburg.

Fischbach, or *Viſp*, a town of Switzerland, in the Vallais; 27 miles E. of Sion.

FISCHBRUN, a town of Germany, in the territory of Nuremberg: 4 miles N.E. of Herſbruck.

FISCHER, John Christian, in *Biography*, the moſt pleaſing and perfect performer on the hautbois, and the moſt ingenious compoſer for that inſtrument that has ever delighted our country during full ſixty years, that is to ſay, ſince Batiſta San Martini ceaſed to be heard. Fiſcher was born at Friburg, and brought up at one of the common reading ſchools in a village in Bohemia, where all the children learn muſic, with reading and writing, as a thing of courſe. The firſt inſtrument put into his hands was the violin, but after he had made ſome progreſs in it, taking up the hautbois in ſport, he fancied he could expreſs his feelings better with the reed than the bow; he therefore attached himſelf to that inſtrument, and became, early in life, ſo excellent a performer on it, that he was appointed one of the king of Poland's celebrated band at Dreſden. Here he remained till its diſſolution, when he went to Berlin, without any intention of continuing there; however, arriving at a critical time, he was retained, and had the honour, during a month, to accompany his majeſty, Frederic the late king of Pruſſia, alone, four hours every day. This circumſtance was occaſioned by an offence having been given by C. Ph. Em. Bach, who, in going with the reſt of the band from Potzdam to Sans Souci in winter, had been ſo frightened by the badneſs of the road, as to exclaim to one of the houſehold on his arrival, in rather ſtrong terms; "tell our maſter, ſir, that no honour or profit will be a ſufficient compenſation to us for ſuch dangerous ſervice; and unleſs the roads are rendered ſafer, we" (ſpeaking in the name of the whole band), "can come hither no more." It is true that the roads were very bad, and it is as true that Bach was extremely frightened in paſſing them. But cowardice ſometimes is deſperate; ſituations give a courage in remonſtrance, of which the greateſt heroes are not in poſſeſſion; for Bach's boldneſs in this particular not only ſurpaſſed that of all his brethren, but of the moſt intrepid generals, and great captains in the Pruſſian army; none of whom, however they might have wiſhed it, had the audacity to complain of this dangerous paſs ere they could arrive at Sans Souci. But a court is at all times, and in all countries, of difficult acceſs! The conſequence of the tranſport that had eſcaped Bach was temporary diſgrace and baniſhment from court; and this accounts for Fiſcher being the only muſician allowed to accompany his Pruſſian majeſty in his retirement and muſical recreations. From Berlin he went to Manheim, to hear and be heard, and thence to Paris, where he performed at the "Concert Spirituel;" and of the ſenſation which his performance produced there, an enthuſiaſtic account is given in the Mercure de France. As Fiſcher, like Abel, was obliged to work his way hither by concerts, as ſoon as he had a little repleniſhed his purſe, he came over to England, where it was always his intention to ſettle, and where, as ſoon as he had been once heard in public, at a benefit concert, no other concert, public or private, was thought complete without his performance; and being engaged to play a concerto every night at Vauxhall, he drew thither all lovers of muſic, but particularly profeſſors, among whom the elder Park, who played the hautbois at Drury Lane theatre, uſed to quit his poſt, and forfeit half his night's ſalary in order to run to Vauxhall to hear him; which he did not unprofitably, for no tone approaches ſo near to that of Fiſcher, in richneſs and power, as that of the elder Park. When the queen's band was formed, Fiſcher was appointed one of her majeſty's chamber muſicians; and when Bach and Abel, uniting, eſtabliſhed a weekly ſubſcription concert at Hanover-ſquare, where, for a long time, no muſic was heard but that of theſe excellent maſters, Fiſcher was allowed to compoſe for himſelf, and in a ſtyle ſo new and fanciful, that in point of invention, as well as tone, taſte, expreſſion, and neatneſs of execution, his piece was always regarded as one of the higheſt treats of the night, and heard with proportionate rapture. Here Cramer, Croſdil, Cervetto, and other eminent profeſſors, eſtabliſhed their reputation, and by every new performance mounted ſtill higher in the favour of the public.

In all muſical performances at the univerſities, the triennial meetings at Worceſter, Hereford, and Glouceſter, at Saliſbury, Wincheſter, and other provincial towns, Fiſcher's concertos were eagerly expected and heard with rapture. Fiſcher's tone was not only uncommonly ſweet, but ſo powerful, that Giardini, who never could praiſe a German but through the medium of abuſe, uſed to ſay that he had ſuch an *impudence* of tone as no other inſtrument could contend with. Then his execution was quite as much as the inſtrument would bear to produce an agreeable effect. His taſte and chiaro-ſcuro were exquiſite, and he had his reed under ſuch command, as more ſeldom to canarder or cackle like a duck, than any player we ever heard. And as to his compoſition, though it was inſinuated by Bach and Abel that he had not ſtudied regularly, and was no very profound theoriſt, he was always ſo original, intereſting and pleaſing, that he may be pronounced one of the few intuitive muſicians who had powers which he knew not how he acquired, and talents at which ſtudy alone can never arrive. A certain muſical traveller has drawn a parallel between the performance of Fiſcher and Berozzi of Dreſden, nephew to the two celebrated Berozzis of Turin, on hearing him play a very difficult concerto on the hautbois in a very pleaſing and maſterly manner; owning, at the ſame time, that the leſs he thought of Fiſcher, the more he was delighted with Berozzi. However, he tried to diſcriminate, and to diſcover in what each differed from the other: and firſt, Fiſcher ſeemed the moſt natural, pleaſing, and original writer of the two for the inſtrument, and was the moſt certain of his reed; which, whether from being in leſs conſtant practice, or from the greater difficulty of the paſſages, he knew not, failed Berozzi, in rapid diviſions, more frequently than Fiſcher; however, Berozzi's ſwell, or meſſa di voce, was prodigious; indeed he continued to augment the force of a tone ſo much, and ſo long, that it was hardly poſſible not to fear for his lungs.

His taſte and ear were exceeding delicate and refined; and he ſeemed to poſſeſs a happy and peculiar faculty of tempering a continued tone to different baſes, according to their ſeveral relations: upon the whole, his performance was ſo capital, that a hearer muſt be extremely faſtidious not to receive from it a great degree of pleaſure.

Fiſcher left England in 1786, and in the beginning of the next year had not been heard of. His majeſty enquired ſeveral times, with ſome ſolicitude, whether he had written to any of his friends in England, and was anſwered in the negative; one of them underſtood, by report, that he was at Straſburg. He returned, however, at the end of 1787, and continued in England during the reſt of his life. About the year 1777 he had married a daughter of the admirable painter, Gainſborough, an enthuſiaſtic lover of good muſic and performance, and of none ſo much as Fiſcher's; indeed he enchanted the whole family with his ſtrains, which were beyond meaſure captivating, and he ſtood ſo well at his inſtrument, that his figure had all the grace of a Tibian at the altar of Apollo. But, alas! ſomething elſe beſides a fine figure and fine muſic are neceſſary to conſtitute domeſtic happineſs. The marriage was not auſpicious; the minds were not in tune together, the temperaments were diſſonant, and the coincidence too infrequent to produce harmony. But we wiſh not to "draw their frailties from their dread abode;" ſhe had external beauty, grace, and accompliſhments; but he, with a good perſon, and ſuperior genius for his art, was extremely deficient in colloquial eloquence, and in all thoſe undefinable charms of converſation which engage the attention, and endear the ſpeaker. He had not a grain of ſenſe but what he breathed through his reed; he never ſpoke more than three words at a time, and thoſe were negatives or affirmatives. But peace to his aſhes. Though he had few charms for a friend or companion, he delighted the public at large in a higher degree than is allowed to any but gifted mortals. This admirable muſician was ſeized with an apoplectic fit during the performance of a ſolo at the queen's houſe, at his majeſty's concert. Prince William of Glouceſter, obſerving his ſituation, ſupported him out of the apartment, whence he was conveyed to his reſidence in Compton-ſtreet, Soho, where he expired about an hour afterwards.

Fischer, John Andrew, a phyſician of Erfurt, was born on the 28th of November, 1667, his father was a celebrated apothecary of that place. He graduated in the univerſity of his native city, in April, 1691. He was appointed profeſſor extraordinary in the faculty of Erfurt in 1695, and profeſſor of logic in the Evangelical College in 1699; but he relinquiſhed both theſe appointments in 1718, in order to aſſume the duties of the profeſſorſhip of pathology and of the practice of medicine, to which he had been nominated three years before. Fiſcher acquired conſiderable reputation at Erfurt, and in the courts in the vicinity of that city. He had been ten years phyſician to the court of Mayence, when he died on the 13th of February 1729 He had left ſeveral eſſays in the form of inaugural theſes; which were publiſhed between the year 1718, and that of his death; but he was alſo author of ſome more important works: *viz.* 1. "Conſilia Medica, quæ in uſum practicum et forenſem, pro ſcopo curandi et renunciandi adornata ſunt." Three volumes of this work were publiſhed ſucceſſively at Francfort, in the years 1704, 1706, and 1712. —2. "Ilias in nuce, ſeu Medicina Synoptica," Erfurt, 1716.—3. "Reſponſa Practica," Leipſie, 1719.—Eloy.

Fischer, in *Geography*, a town of the duchy of Carniola; 17 miles S.E. of Stein.

FISCHERLIN, in *Ornithology*, a name given by many of the northern nations to a ſmall ſpecies of the larus or gull, called by Mr. Ray *larus piſcator*, by Linnæus *larus minuta*, and in the Engliſh, the leſſer ſea-ſwallow. See Larus.

FISCHGEYER, a name given to the *falco rufus*; which ſee.

FISCHIARE, *Ital.* to hiſs. *Fiſchiata*, hiſſed.

FISCHIETTO, *Ital.* a whiſtle, a hiſs, a cat-call.

FISCHOTTER, in *Zoology*, a name given by Ridinger to the *muſtela lutra*; which ſee.

FISGARD. See Fiscard.

FISH, in *Zoology*, a claſs of animals which have either a naked or ſcaly body, always having fins, but without feet. For a further deſcription of the characters of this claſs, and of the different orders into which it is diſtributed; ſee Piscis. See alſo Ichthyology.

Fish, or Fishes, *Anatomy of*, has engaged much of the attention of phyſiologiſts, on account of its affording many examples of organs on a ſimple plan, or palpable ſcale, which in other animals poſſeſs either an obſcure or minute ſtructure. The brain, the ear, the organ of ſmelling, the digeſtive and abſorbent ſyſtems, have been eſpecially ſtudied in this claſs, with the view of illuſtrating their anatomy and functions in other creatures.

The continual reſidence and progreſſion of fiſhes in ſo denſe a medium as water, neceſſarily occaſion remarkable peculiarities in their organs of motion, as well as a different mode of expoſing the blood to the influence of the air, and conſequently a different arrangement of the circulating veſſels than is uſually met with in other animals; theſe parts of the anatomy of fiſhes are inſtructive both to the natural hiſtorian and to the phyſiologiſt.

The very extraordinary property which ſome fiſhes poſſeſs of communicating an electric ſhock, forms one of the moſt intereſting ſubjects in the hiſtory of the animal economy.

In compoſing the preſent article, we have drawn our information, as far as our opportunities permitted, from actual diſſection and obſervation; frequent references to the writings of other anatomiſts are therefore not introduced. It is neceſſary, however, to acknowledge, that we have derived great aſſiſtance from the comprehenſive ſyſtem of M. Cuvier, particularly with reſpect to the anatomy of the rare and exotic ſpecies of fiſhes; and that we are indebted for ſeveral intereſting facts to the very valuable, though compendious work, of profeſſor Blumenbach on comparative anatomy, tranſlated by Mr. Lawrence.

Organs concerned in the exerciſe of the vital functions.

The mouth and its contained parts.—The *poſition* of the mouth of fiſhes is ſomewhat various. It may be ſtated generally, that it is ſituated under the ſnout in the *chondropterygii*, in the *ſturgeons* (*acipenſer*), and the *pegaſus*. In other fiſhes it is placed at the end of the ſnout.

The *orifice* of the mouth in fiſhes has uſually the appearance of a tranſverſe ſlit, as in mammalia; but in ſeveral ſpecies, particularly amongſt the *abdominal* fiſhes, the aperture of the mouth is made by a fiſſure paſſing obliquely downwards and backwards. In the *lamprey* (*petromyzon*) the mouth is nearly round, and reſembles a ſucker.

Fiſhes cannot, with propriety, be ſaid to poſſeſs *lips*. Many of them have ſome folds of the integuments, which overlap and conceal the edges of the jaws and teeth; but theſe parts poſſeſs neither the ſtructure, nor perform the functions, of the lips in mammalia. In ſeveral fiſhes with large ſcales no ſoft parts are diſcoverable about the edge of the mouth.

The *cavity* of the mouth of fiſhes is uſually very great, in proportion to the ſize of the animal; a circumſtance highly neceſſary to them on account of the manner in which theſe animals take their prey: for the ſame reaſon alſo, the mechaniſm of the jaws is ſuch as to allow the mouth to be protruded or puſhed forwards, and opened to a great extent. In ſome ſpecies the mouth is capable of being opened ſufficiently wide to take in a body even larger than that of the fiſh to which it belongs. The great capacity of the mouth, and the peculiarity in the motions of the jaws, depend upon the number of bones or cartilages which enter into the compoſition of the face of fiſhes, and upon the exiſtence of certain muſcles. Theſe parts will be deſcribed along with the other organs of motion.

The *internal ſurface* of the mouth in fiſhes bears conſiderable reſemblance to the common ſkin; it is, however, diveſted of ſcales, and is generally white, although in ſome fiſhes it partakes of the colour of the ſurface of the body; in the *mackarel* (*ſcomber ſcombrus*) for inſtance, it is of a ſilver hue, tinged with blue.

Every part of the mouth is covered with a very tenacious ſlime, or mucus; the glands which ſecrete it are not in general eaſily ſeen, and do not commonly appear to be congregated in particular parts of the mouth or pharynx, as in mammalia.

As fiſhes do not chew their food, they do not require an extenſive motion of the *tongue;* in moſt ſpecies this organ performs no movement, except what is dependant upon the parts with which it is connected. Cuvier has deſcribed two muſcles of the tongue in the *conger eel* (*murena conger*) analogous to *hyo gloſſi*, and ſome tranſverſe fibres extending from the edges to the middle of the tongue in the ſame fiſh. We have not diſcovered any muſcles correſponding to theſe in ſome other ſpecies we have examined. If the tongue of fiſhes were generally provided with muſcles, it uſually forms ſo inconſiderable a projection into the cavity of the mouth that it could not ſerve as an organ of maſtication; in many ſpecies it is ſcarcely to be diſtinguiſhed from the other parietes of the mouth, and in the *ray* genus there is, properly ſpeaking, no tongue, the place of the lingual bone being ſupplied by a mere rim of cartilage.

Salivary glands do not appear to exiſt in the claſs of fiſhes, with the exception of the *carp* (*cyprinus*), in which there is a glandular body of conſiderable ſize placed under the baſe of the cranium, exactly before the grinding teeth; the gland is of an uniform ſtructure and a yellowiſh red colour, it adheres firmly to the membrane of the palate which covers it. In this genus the teeth of the pharynx are conſtructed for dividing or triturating the food.

In the *ſkate*, *thornback*, and others of the *ray* genus, there are many glandular bodies, about the ſize of pins' heads, lying under the membrane of the palate, upon the muſcles for depreſſing the lower jaw: their internal ſtructure is cellular, and they appear to ſecrete the mucus with which the mouth of theſe fiſhes is ſo abundantly ſupplied.

The *teeth* of fiſhes are very remarkable, whether we conſider them with reſpect to the number, ſituation, or figure.

In thoſe inſtances where the teeth are ſufficiently large to be diſtinctly ſeen, ſome hundreds have been reckoned in a ſingle fiſh; the *white ſhark* has upwards of two hundred around the aperture of the mouth, and when the teeth are minute and cloſely ſet, as in many of the oſſeous fiſhes, their number exceeds all calculation.

The *ſituation* of the teeth in fiſhes is extremely ſingular; they are not confined to the jaws, but are found alſo in the palatine arches, on the bone analogous to the vomer, which deſcends from the cranium to form the middle of the roof of the mouth, on the lingual bone, on the internal or concave ſurface of the arches which ſuſtain the branchiæ, and upon thoſe bones which are placed in the pharynx or commencement of the œſophagus. Some fiſhes, as the *ſalmon* and *pike*, have teeth in all theſe ſituations. The *trachinus draco*, and *perch*, want them on the tongue; the *uranoſcopus* has none on the tongue and branchiæ. The palatine and lingual teeth are abſent in others, as the genus *gadus*, the *gurnards* (except the *trigla volitans*), the *eels*, *turbot*, *ſole*, and *dory*. The genus *lutianus* have only the maxillary, branchial, and pharyngeal teeth. The *trigla cataphracta* is without all, except the branchial and pharyngeal, and the laſt kind of teeth only are found in the *carp*. The *ray* and *ſhark* genera have the maxillary alone. The *ſturgeon* is perhaps the only fiſh which is entirely deprived of teeth.

The *ſhape* of the teeth in fiſhes is very various. Cuvier has, however, eſtabliſhed four principal forms to which he thinks all the others may be referred: the firſt are the *hook-ſhaped* teeth, which have ſharp points bent towards the back part of the mouth; theſe are uſually of a ſmall ſize, and are very numerous, they are by far the moſt common: moſt fiſhes have them in ſome part of the mouth. The ſecond kind of teeth are truly *conical* in their form; the anterior teeth of the *anarrhichas lupus* afford the beſt examples of theſe. The third ſort have the *crowns* either *flat* or blunt, and *rounded*; the pharyngeal teeth of the *carp* (*cyprinus carpio*) are broad and flat, like plates, and as inſtances of thoſe with round crowns may be mentioned, the poſterior teeth of the *dorado* and others of the genus *ſparus*. The fourth diviſion of Cuvier includes the teeth with a *cutting* edge, or the *wedge-ſhaped*; theſe may either have the edge plain, as in the *plaiſe* (*pleuronectes plateſſa*), or denticulated, as in the *teuthis*.

Different ſpecies of teeth frequently exiſt in different parts of the mouth in the ſame fiſh; thus, the genera *teuthis*, *oſtracion*, and *baliſtes*, have hook-ſhaped teeth poſteriorly, and inciſive in the front of the mouth. In the *anarrhichas lupus*, and ſome of the genus *ſparus*, there are hook-ſhaped teeth behind, plates or flat-crowned in the middle of the mouth, and conical teeth before; the *ſparus ſargo*, and ſome others, have the front teeth inciſive, the middle flat-crowned, and the poſterior hook-ſhaped.

Cuvier has given a deſcription of the form and ſituation of the teeth in moſt of the principal genera of fiſhes; but, as much minuteneſs or detail on this ſubject cannot prove intereſting in an anatomical point of view, we ſhall confine ourſelves to the more ſtriking varieties in the teeth of fiſhes.

In the genus *raja* the jaws are beſet with a number of teeth arranged in the manner of a pavement; theſe are uſually of the ſame ſize, and diſpoſed in ſquares cloſely ſet to each other. In ſome ſpecies, eſpecially in the foreign *rays*, the middle teeth are the largeſt, and run in bands acroſs the jaws: in ſome of theſe alſo this pavement of teeth is prolonged towards the palate; in the *torpedo*, and ſome other ſpecies of *raja*, each of the teeth is elevated in the middle into a ſpine or ſharp point.

In the *ſhark* genus (*ſqualus*) there are ſeveral rows of teeth; thoſe of the front row are the largeſt and oldeſt, and ſtand up on the jaw; the ſucceeding rows are of later growth, and are laid down with their points turned towards the mouth; the number of the rows that are turned inwards varies even in the ſame ſpecies. The form of the teeth in this genus is uſually that of a triangular plate; they are attached at their baſe, and the other edges are more or leſs denticulated or grooved.

Amongſt the *branchioſtegi* there is very conſiderable variety. The genera *baliſtes* and *oſtracion* have eight teeth upon each jaw; in the former they are wedge-ſhaped, broad, and flat, and with oblique edges; in the latter they are compreſſed upon the ſides. The pharynx of the *baliſtes* is furniſhed above and below with two rows of fine, conic, cloſe-ſet teeth.

The *lump fiſh* (*cyclopterus lumpus*) has one or two rows of ſmall pointed teeth upon the jaws and the pharynx.

The *frog-fiſh* (*lophius piſcatorius*) has two rows on each jaw, a ſmall one on each ſide of the palate, and the four plates of the pharynx furniſhed with tolerably ſtrong hooked teeth.

In the *ſpatularia* there are a number of very minute teeth upon the jaws and lateral parts of the palate.

In the *ſturgeon* (*acipenſer*) there are no teeth of any kind found.

In the *chimæra* the lower jaw furniſhes two naked projections, which are ſtriated and ſharp-edged, and the upper jaw has two others of nearly a ſquare figure, which correſpond to theſe. In the palate there are two triangular oſſeous plates.

Cuvier thus deſcribes the ſingular formation of the jaws, which ſupplies the place of teeth, in the genera *diodon* and *tetraodon*.

The lower jaw of a *diodon* preſents two eminences, which are uſed for maſtication, *i. e.* the border of the jaw, which is parabolic, and a round diſk in the middle.

A large canal runs in the interior of the bone, and ſeparates the maſs of the diſk from that of the border, and tranſmits to both theſe parts their nerves and blood-veſſels. The triturating ſurface of the diſk exhibits ſome tranſverſe and parallel ſtriæ; on cutting it in a vertical direction each of the ſtriæ is perceived to be the termination of a plate or lamina, which aſcends a little poſteriorly from the canal to the diſk. Theſe laminæ are all laid one upon the other, and by this poſition the ſuperior laminæ are moſt expoſed to friction, and conſequently the ſhorteſt. They are evidently alſo the oldeſt; they are hard and conſolidated together, in proportion as they deſcend they are ſofter and more ſeparate from each other. The loweſt do not reach the triturating ſurface, but are covered by the bone of the jaw; theſe are quite diſtinct from each other, and ſhew the original and proper ſtructure of the plates.

Each of theſe laminæ is divided by a fiſſure in its middle. The inferior and poſterior ſurface is tolerably ſmooth, but the oppoſite one exhibits, when viewed through the microſcope, an extremely fine net work of little canals; this is occaſioned by the impreſſions left by veſſels which have run upon it, and which came from the large canal where the baſes of the laminæ reſt; in fact, the parietes of the canal are preceded by an infinite number of ſmall holes, which lead into the intervals between the laminæ.

The border is alſo furniſhed with laminæ which increaſe in an oppoſite order to thoſe of the diſk; the anterior laminæ being inferior and of the lateſt growth. The laminæ alſo are parallel with the ſurface of the maſticating border. The firſt lamina which is uſed preſents its flat ſurface, and is conſequently entirely worn before the one which ſucceeds it.

The deſcription here given of the lower jaw of the *diodon* applies equally to the upper jaw, provided the names of the laminæ are changed according to their different poſition, as ſuperior for inferior, and *vice verſâ*.

The genus *tetraodon* reſembles the *diodons*, in having the laminated borders, but wants the triturating diſks. Each of their jaws is divided into two pieces by a denticulated ſuture.

Fig. 1. *Plate* I. *Anatomy of Fiſhes*, exhibits the lower jaw of a *diodon*, cut through longitudinally; *a*, the central plate, or triturating ſurface; *b*, the ſection of the laminæ, the edges of which conſtitute the triturating ſurface; *c*, the large canal through which the veſſels and nerves of the laminæ are tranſmitted; *d*, the border of the jaw; *e*, the laminæ which form it; *f*, a ſmaller canal for accommodating their veſſels and nerves.

Amongſt the *apodal* fiſhes, the *anarrhichas lupus* has the teeth of the front of the jaws very ſtrong, and conical in their figure; thoſe of the ſide, and on the vomer, form large hemiſpherical tubercles; the internal row of each palatine arch is ſimilar to the ſecond, and the external to the firſt; the pharynx is ſet with ſmall conic teeth.

The *murena helena* has the teeth compreſſed, with thin edges, and ſharp-pointed; thoſe of the common *eel* and the *conger* (*murena anguilla* and the *conger*) are ſmall, ſtraight, ſtrong, blunt, and cloſe ſet; the firſt teeth of the vomer in the *helena* is at a diſtance from the others, which it alſo much exceeds in ſize.

The *jugular* order of fiſhes alſo exhibits conſiderable varieties in the form and number of the teeth.

The *blennius ſupercilioſus* has a very regular cloſe row on each jaw of long narrow teeth: the *blennius ocellaris* has beſides a ſtrong hooked tooth placed at the back part of each jaw.

The *trachinus draco* poſſeſſes teeth in all the different ſituations except the tongue; they are very minute and cloſe-ſet, reſembling the pile of velvet.

The *uranoſcopus ſcaber* has twelve or fourteen teeth, of a hook ſhape, on the lower jaw, and numerous minute teeth on the upper jaw and pharynx, and two little lateral plates on the fore-part of the vomer.

In the *thoracic* fiſhes there is perhaps ſtill greater variety than in the preceding orders; the individuals of the ſame genus often differing from each other.

The *flying gurnard* (*trigla volitans*) has only ſome ſmall blunt tubercular teeth upon the jaws; the *armed gurnard* (*trigla cataphracta*) has ſome cloſe ſet teeth, like villi, upon the branchial arches and vomer, and none at any other place. The *common gurnards* have fine teeth upon the jaws and branchiæ, and a little plate on the anterior part of the vomer.

The *dory* (*zeus faber*) has ſome ſmall hooked teeth upon each jaw, the vomer, and the branchial arches. The *zeus vomer* has on the lower jaw only a row of teeth, ſo fine as ſcarcely to be felt.

In the genus *pleuronectes* there is conſiderable variety with reſpect to the form and ſituation of the teeth.

The *chetodons* have upon the jaws long, fine, ſetaceous teeth, like the briſtles of a bruſh.

The pharyngeal teeth of the genus *labrus* are broad and hemiſpherical, and are diſpoſed exactly like pavement; the anterior teeth vary in the different ſpecies.

The *labrus niloticus*, however, differs remarkably from the reſt of the genus; the jaws are furniſhed with ſeveral rows of long, ſlender teeth, which have two or three points; the teeth of the pharynx are ſtraight, ſlender, ſharp, and very long.

In the genus *ſparus*, the lateral teeth of the jaws are arranged in the manner of a pavement, in two or more rows. In ſome ſpecies two of theſe teeth are diſtinguiſhed from the reſt by being larger, and of a more flattened oval figure; the anterior teeth vary much with reſpect to their form.

The *perches*, and the genus *holocentrus*, in general have numerous minute teeth, like villi, upon the two jaws, the anterior part of the vomer, each ſide of the palate, the tongue, and the pharynx.

The jaws of the genus *ſcarus* are naked, and project ſomewhat like the beak of a parrot; each mandible is divided by a middle ſuture; the border is furniſhed with ſome little ſhort cutting teeth, which are very cloſely applied to each other.

In the genus *cepola* there is a ſingle row of teeth to each jaw. Thoſe of the lower jaw are remarkably ſpread out.

In the *abdominal* order of fiſhes, the genera *ſilurus* and *ſalmo* exhibit great variety with reſpect to their teeth; in the latter genus particularly the differences are very remarkable.

The *ſilurus clarias* has the teeth of the upper jaw ſtraight, ſlender, and ſharp, but thoſe of the lower jaw are bent into the form of an overturned italic ∽; they are long, compreſſed, and terminated by a point.

The *common ſalmon* and *trouts* (*ſalmo ſalar*, and *ſalmo fario*) have hook-ſhaped teeth in all the parts of the mouth where they are met with in other fiſhes, and likewiſe upon the arches which form the extenſile lip of fiſhes.

The *ſalmo dentex* has ten or twelve large hook-ſhaped teeth upon the jaws; thoſe of the pharynx are fine, like villi.

The *ſalmo neſaſch* has the maxillary teeth ſetaceous, like thoſe of the *chetodon*, but forked at the extremity, and the pharynx covered like velvet.

The maxillary teeth of the *nilotic ſalmon* are thick and truncated, and have the crowns furniſhed with two or three conic tubercles, like the molar teeth of ſome quadrupeds.

The *ſerra ſalmo* of La Cépede has ten or twelve teeth on each of the jaws, in the form of ſharp wedges, with three or five notches on the edge.

The jaws of the *ſalmo rhomboides* have very ſmall, ſhort, flexible, ſetaceous teeth.

None of the laſt mentioned five ſpecies have the interior of the mouth furniſhed with teeth in the ſame manner as the *common ſalmons* and *trouts*.

The whole of the genus *cyprinus* poſſeſs only teeth in the pharynx. The ſuperior pharyngeal bone preſents a ſingle plate; and the two inferior bones of the pharynx are each furniſhed with very thick, ſtrong teeth, which vary in number and form in the different ſpecies.

The *carp* (*cyprinus carpio*) has four or five of theſe teeth; the three or four poſterior and ſuperior of which are flat-crowned and tranſverſely grooved; the one moſt anterior is round, with a little point in the middle.

Some other ſpecies of *cyprinus*, as the *auratus*, the *bipunctatus*, the *bream*, *tench*, and *rud*, have the teeth compreſſed, and their edge applied obliquely to the ſuperior pharyngeal bone.

The *barbel* (*cyprinus barbus*) has nine pharyngeal teeth, four below, three in the middle, and two above; they are club-ſhaped, and end in points a little bent.

The *cyprinus dobula* has ſeven teeth in two rows, all pointed, and a little like hooks.

The *cyprinus naſus* has twenty-one compreſſed teeth.

In the *nilotic carp* there are eleven of theſe, the points of which are worn down by friction againſt the plate of the ſuperior pharyngeal bone.

The genus *eſox* are well ſupplied with teeth. The common *pike* (*eſox lucius*) has teeth in all the parts of the mouth where they are found in other fiſhes; thoſe of the vomer are tubercular, the others are hook-ſhaped; the *eſox belone* has the maxillary teeth ſtrong, hook-ſhaped, and in one row; it wants the lingual teeth.

There are three different *ſtructures* to be obſerved in the teeth of fiſhes.

The firſt kind of ſtructure exiſts in the conic and hook-ſhaped teeth, which are generally found in the oſſeous fiſhes; their teeth are implanted in alveoli, as the teeth of mammalia; they conſiſt of oſſeous ſubſtance, covered externally by a layer of enamel: after the eruption of the crown or external part, the roots of their teeth become anchyloſed with the bone which contains them ſo firmly, that they cannot be ſeparated without a fracture of the latter. The growth of the teeth ſituated in ſockets is effected by the developement of internal oſſeous layers.

The ſecond kind of ſtructure is found in the teeth of the genus *ſqualus*. Theſe are not immediately connected with the jaws, but are contained in the gums, or ſoft parts covering them. They increaſe in the manner of the epiphyſes of bones: their oſſeous part is at firſt ſoft and porous, and afterwards acquires throughout the denſity and hardneſs of ivory.

The third ſort of ſtructure belongs to the flat or blunt teeth, which are arranged in the manner of a pavement, as thoſe on the jaws in the *ray* genus, and in the palates of ſeveral other fiſhes. They are compoſed of a number of minute oſſeous tubes, arranged in the direction of the teeth, intimately connected together, and covered upon their external extremities by a common layer of enamel. From this ſtructure Cuvier has diſtinguiſhed theſe teeth by the term *compound*. They are not implanted in the ſubſtance of the bone, but adhere to the membrane which covers it; they evidently, however, conſiſt of two parts correſponding to the root and crown; the former is marked by regular and cloſe furrows, and contains a number of pores, which receive and tranſmit the nerves and blood-veſſels of the teeth; the tubes of the crown are more denſe in their ſtructure than the reſt of the teeth.

The jaws of the *anarrhichas lupus* are furniſhed with a number of dentiform eminences, which are compoſed of oſſeous tubes, or fibres that run from the baſe to every point of the ſurface. The baſe adheres to the jaw by its circumference only; this circumference exhibits many foramina, through which the veſſels and nerves paſs to the tubes when in a ſtate of growth. All theſe eminences are placed upon a ſubſtance much more ſpongy than the reſt of the jaw, which ſerves as the medium by which they are united. On the middle of each eminence a little tooth grows, but is caſt off very early, ſo that, except when the fiſh is young, the dentiform eminences alone ſeem to ſupply the place of teeth. *Fig.* 2. of *Plate* I. of the *Anatomy of Fiſhes*: *a* is the dentiform eminence; *b*, the ſmall teeth on it. *Fig.* 3. of *Plate* I. ſhews the ſurface on which the eminence is fixed.

The triturating ſurfaces of the jaws in the genera *diodon* and *tetraodon* might be conſidered as compound teeth; the laminæ are analogous to the tubes, and are covered, like them, by enamel.

The mode of *ſucceſſion* of the teeth of fiſhes varies according to their ſtructure. Thoſe that grow in ſockets are replaced by others which form at their roots, when the root of the old tooth becomes conſolidated with the ſocket which contains it; it is nouriſhed like the reſt of the bone, and acquires a cellular ſtructure, which it did not originally poſſeſs. In proportion as the new tooth increaſes, the ſubſtance of the jaw grows into the cavity of the old one, which it fills up to the crown. This then ſeparates from the reſt of its root by a regular fracture which exhibits ſome radiated lines.

The new teeth in many ſpecies penetrate the cellular oſſeous ſubſtance, which fills up the cavity of the root, and exactly occupies the ſituation of the tooth that is caſt off. In the large, pointed teeth, ſuch as thoſe of the genus *eſox*, &c. the eruption of the new tooth is on the ſide of the one that is ſhed.

In the *anarrhichas lupus*, not only the teeth are ſhed, but thoſe ſingular eminences on which they grow are alſo caſt off, and replaced by others. Theſe eminences appear to reſemble in ſtructure and mode of growth the horns of the *deer*; they are ſhed preciſely in the ſame manner; thoſe which ſucceed grow on the ſide of the eminences they replace, and do not, until they increaſe in ſize, fill the vacancy left by the latter.

When the flat teeth of the *rays* are loſt they appear to be replaced by others, which grow in the ſame ſituation.

The cutting teeth of the *ſharks*, as already mentioned, are in ſeveral rows, the anterior of which only is uſed by the animal; the poſterior rows are of ſucceſſive growths, and are deſigned to ſupply the place of thoſe in the front row, in the ſame manner as the venomous teeth of *ſerpents* are ſucceeded by thoſe of a later growth ſituated behind.

The laminæ which compoſe the triturating ſurface of the jaws of the *diodons* and *tetraodons* are replaced in a manner analogous to the cutting teeth of the *ſhark*; theſe laminæ grow and come into uſe ſucceſſively, by which means the maſticating ſurface is always preſerved.

In the genus *ſcarus* the teeth are replaced by others growing from behind, but which do not make their appearance until they are wanted. On examining the jaws of one of this genus, a number of tubercles are obſerved on the forepart, which are the remains or roots of the teeth that have been worn down; and if the jaw be divided, a multitude of the germs of teeth will be diſcovered internally, which are afterwards to come into uſe.

The mechaniſm of the jaws, the ſmall ſize and immobility of the tongue, the want of ſalivary glands, and the uſual form and poſition of the teeth, in fiſhes, all conſpire to point out the manner in which theſe animals take their food, and that they do not, but with very few exceptions, maſticate it, or even in any degree divide it previous to its being received into the ſtomach.

Pharynx and œſophagus.

The pharynx of fiſhes is rather diſtinguiſhed from the reſt of the œſophagus by analogy of ſituation, and for the convenience of deſcription, than from any reſemblance it bears to the pharynx of mammalia.

The paſſage from the poſterior part of the mouth into the œſophagus is diminiſhed by the exiſtence of certain bones, which are attached to the baſes of the branchial arches, and enter into the compoſition of the parietes of the commencement of the alimentary canal.

Theſe are very properly called the *pharyngeal bones*; they are uſually beſet with teeth, as already mentioned; the laſt branchial arches and the pharyngeal bones can be approximated by certain muſcles, ſo as nearly, if not entirely, to ſhut up the communication between the mouth and œſophagus: immediately behind the branchial arches and pharyngeal bones there is a very ſtrong ſphincter muſcle, which ſurrounds the origin of the œſophagus, and appears to be the continuation of thoſe fibres which cloſe the branchial arches. This muſcle ſeems to have the power of perfectly ſhutting the pharynx. The deſign of this mechaniſm is evidently to enable the fiſh to convey its prey, without any preparation, and while it is ſtill alive, into the ſtomach. The teeth ſituated on the pharyngeal bones, and on the inſide of the branchiæ, are well calculated for aſſiſting in this operation: to underſtand the effect of the teeth of a fiſh in the act of deglutition, it is only neceſſary to introduce the hand into the back part of the mouth, even after the animal is dead, when it will be found that the retreat of the hand is oppoſed by the points of a number of teeth at all ſides. The conſtruction of the interior parts of the mouth and pharynx appears to be entirely ſubſervient in fiſhes to the performance of deglutition.

In *Plate* I. of the *Anatomy of Fiſhes*, *fig*. 4. exhibits a view of the back part of the mouth or pharynx of the *carp* (*cyprinus carpio*); *a*, the inferior pharyngeal bones beſet with ſtrong grinding teeth; *b*, the ſuperior pharyngeal bones with flat ſurfaces; *c*, the ſuperior parietes of the mouth; *d*, the tongue; *e, e*, the branchial arches of each ſide; *f*, the aperture left between theſe parts which leads into the œſophagus.

The *œſophagus* of fiſhes is commonly very ſhort; in ſome inſtances the mouth might almoſt be ſaid to open into the ſtomach; it is by no means unfrequent, on ſeparating the jaws of a fiſh extenſively, to bring into view the contents of that cavity.

The œſophagus is generally very wide, often of the ſame capacity as the ſtomach itſelf. A free paſſage into the ſtomach becomes neceſſary to thoſe animals, on account of the ſize of the fiſhes they prey upon, and their voracity in catching them. Fiſhes ruſh upon whatever appears to be their prey impetuouſly, and ſometimes without diſcrimination. In this manner they ſometimes ſwallow other ſubſtances along with, or in place of, their proper food. We lately took a large ſtone out of the ſtomach of a *dory* (*zeus faber*), which bore all the marks of having reſided there ſome time: it was from a knowledge of the rapacious habits of this fiſh, that the ſtory of St. Peter's taking the tribute money out of its mouth probably originated.

The œſophagus is covered internally, as in other animals, by cuticle, which terminates abruptly at the ſtomach in ſome fiſhes; this however is not perceptible; in which caſes it is difficult to determine exactly the limits of theſe two portions of the alimentary canal. The internal membrane is uſually white and ſmooth, and forms ſome longitudinal wrinkles, folds, or ſpiculæ. In ſeveral of the *ray* and *ſhark* genera this ſtructure is very evident, although Cuvier deſcribes the internal ſurface of the œſophagus and ſtomach in theſe fiſhes to be alike. In the *maid* (*raja clavata*) the diſtinction between the ſtructure of the œſophagus and that of the ſtomach is ſtrikingly plain. In the *dog-fiſh*, the laminæ of the internal membrane of the œſophagus are numerous, prominent, and terminate in points which are directed backwards. Theſe diminiſh the capacity of the canal, and thus ſerve to detain any fiſh the animal may ſwallow; but the moſt remarkable contrivance of this ſort is that lately diſcovered by Mr. Home in the *baſking ſhark* (*ſqualus maximus*). In this fiſh, in addition to the ſpiculæ obſerved in the other ſpecies of *ſqualus*, the œſophagus produces, around its termination in the ſtomach, a number of fringed proceſſes, very much reſembling ſhoulder-knots; theſe appear to be muſcular internally, and probably are capable of entirely cloſing the entrance of the œſophagus into the ſtomach. In *fig.* 5. of *Plate* I. of the *Anatomy of Fiſhes*, the ſtomach and œſophagus of the *baſking ſhark* (*ſqualus maximus*) is repreſented upon a very reduced ſcale: *a* ſhews the ſpiculated part of the œſophagus; *b b*, the fringed termination of that canal.

In the *ſpatularia*, the parietes of the œſophagus have three ſtrong longitudinal rugæ, and ſome others between them of a ſmaller ſize. In the *ſturgeon*, the internal membrane produces ſpines like thoſe of the dog-fiſh; which, when minutely examined, are ſeen to be reticulated upon the ſurface. The *ſygnathus pelagicus*, and *ſparus ſiganus*, have large longitudinal folds in the œſophagus. The latter has likewiſe an œſophagus of ſome length: at the place where it joins the ſtomach, it forms a cæcal proceſs or cul-de-ſac of a conical figure, the end of which is turned forwards.

In the *oſtracion cubicus*, and ſome other fiſhes, there is a circular fold of the internal membrane, which clearly marks out the termination of the œſophagus; in other inſtances, this part may be diſtinguiſhed from the ſtomach by the ſtrength and arrangement of its muſcular fibres, but in every inſtance, if the blood-veſſels of theſe parts have been previouſly injected with a coloured fluid, there will be no difficulty in determining which is the œſophagus and which is the ſtomach, the former being always leſs vaſcular.

The œſophagus in fiſhes is particularly well ſupplied with mucus, to facilitate the paſſage of any body through it; this mucus is furniſhed by follicular glands, which are ſituated behind the internal membrane; they are more numerous in ſome fiſhes than others: we have found them very plain and arranged in cluſters round the œſophagus of the *mullet*. There is on the œſophagus of the *torpedo* a very remarkable glandular apparatus for the ſecretion of mucus.

Of the Abdominal Cavity.

The abdomen of fiſhes is a diſtinct cavity, containing only the viſcera proper to that part; it differs therefore from the common cavity of the body in birds and reptiles: it however uſually occupies the greater part of the trunk in fiſhes in which it does not reſemble the abdomen of mammalia. Its parietes are chiefly compoſed of the portion of the great lateral muſcles which are ſpread upon the ſides of the body, the ribs being too ſhort in fiſhes to form a frame for the abdomen; the cavity is every where covered with peritoneum, except next the ſpine, where that membrane is reflected acroſs the air-bladder and kidnies, leaving thoſe parts on the outſide of the peritoneum. The reflections of this membrane, which embrace the different abdominal viſcera, are very thin, but the part which lines the abdomen is ſufficiently ſtrong. In the *moon fiſh* (*tetraodon mola*), and in many other tetraodons, it is ſtated by Cuvier to be thick, ſoft, and as it were gelatinous; although in the *ſturgeon*, and others of the *branchioſtegi*, its texture is firm and tendinous looking.

The portion of peritoneum which lines the muſcular parietes of the cavity very frequently partakes of the colour of the external ſurface of the body, in conſequence of there being a pigment placed behind it. In the *plaiſe* (*pleuronectes plateſſa*) the two ſides are of different colours, correſponding to the brown and white ſides of the body in that fiſh.

In ſome fiſhes there are proceſſes of the peritoneum which go on each ſide of the inferior ſpinous bones of the tail, under the lateral muſcles; theſe form ſacs for containing uſually the organs of generation and part of the kidnies, and in ſome inſtances a convolution of the inteſtines: thus the bag which goes out on the dark ſide of the *ſole* receives a long coil of the inteſtinal canal.

There are ſome very remarkable circumſtances to be noticed in the abdomen of the *ray* kind and the *ſturgeon* (*acipenſer*): there have long been obſerved in the former two foramina, one on each ſide of the anus, which lead by a ſhort oblique canal into the cavity of the abdomen; they are wide enough to admit a gooſe-quill in a large ſkate, but contain within them a ſemilunar fold, which acts as a valve in obſtructing the paſſage of the water into the abdomen, but does not prevent fluids to paſs out of this cavity. Doctor Monroe, who aſſumed the diſcovery of theſe foramina, was inclined to ſuppoſe that the ſea water occaſionally was admitted by them; he ſays, "the great quantity and evidently ſalt taſte of the liquor of the abdomen, lead him to look for paſſages by which the ſea water might get into the cavity." In one inſtance, he had the fluid analyſed, when he found that it contained about one ſeventy-eighth part of ſalt, which, however, he admits to be not one-half the quantity that exiſts in common ſea water. "Further," he ſays, "I diſcovered that in the *ſkate*, the bottom of the pericardium is lengthened into the ſhape of a funnel, which divides into two branches which are tied cloſely to the lower part of the œſophagus, and open into the cavity of the abdomen: from the obliquity of theſe branches, and their intimate adheſion to the œſophagus, neither air nor water can be forced into them from the abdomen. Hence, unleſs we ſuppoſe that in the living animal they take up the fluid from the abdomen, in the way our puncta lachrymalia take up the tears, which is highly improbable, we muſt conclude that they ſerve to convey the liquor of the pericardium into the cavity of the abdomen." Monroe's Phyſiology of Fiſhes, p. 23.

In the *ſturgeon* (*acipenſer ſturio*) Doctor Monroe has alſo deſcribed and figured two openings near the anus, ſimilar to thoſe found in the *ſkate*, and further, he diſcovered in the *ſturgeon* a large membranous funnel, ſituated upon each kidney, into the middle of the pelvis of which its bottom opens by a wide orifice. "We can have little or no doubt," he ſays, "that the liquor of the abdomen of the *ſturgeon* paſſes into the pelvis of the kidney, for we cannot ſuppoſe that the urine paſſes through the holes deſcribed into the cavity of the abdomen, as the pelvis has large openings into the common cloaca, as in other fiſhes." (Monroe, loc citat.) He concludes by expreſſing his opinion, that the deſign of the holes on the ſide of the anus is to admit the ſea water, and that the funnels connected with the kidney are for the purpoſe of diſcharging it again. From the circumſtance of the water of the abdomen containing ſo much leſs ſalt than ſea water, and even leſs than that found within the cranium of fiſhes, which is a ſhut cavity, he is diſpoſed to admit that it is in part a ſecretion from the arteries. In our opinion, it appears more reaſonable and conſiſtent with general analogy to ſuppoſe, that all the fluids moiſtening the cavities of theſe fiſhes are produced in the uſual way, and that the openings are merely for carrying the ſuperabundant liquor out of the body, than to imagine that an extraneous fluid ſhould be admitted to ſupply the place of a peculiar ſecretion; conſidering the matter in either point of view, however, the anatomical fact of a communication between the interior cavities of the body and the external element, is not only highly curious, but without example in any other claſs of animals.

Stomach.

This cavity is commonly ſituated immediately behind the ſeptum which ſeparates the heart and branchiæ from the abdominal viſcera to which it is attached, as well as to the ſurrounding parts by reflections of peritoneum.

The form which the ſtomach of fiſhes moſt commonly poſſeſſes has been very aptly compared to the head of the chemical veſſel, called an alembic, ſuppoſing it to be inverted and a little elongated; the large opening correſponds to the œſophagus; the ſmall or lateral part to the contracted portion, which ends at the pylorus, and the bottom to the cul-de-ſac of the ſtomach. The moſt common deviations are produced by the bottom of the cul-de-ſac, or cæcal portion of the ſtomach, being either longer or ſhorter than what has been propoſed as the ſtandard ſhape. There are alſo other varieties in the figure of this viſcus which will be noticed in the following deſcription.

The muſcular coat of the ſtomach varies very much in thickneſs, and likewiſe with reſpect to the diſtinctneſs and arrangement of its fibres.

Between the muſcular and internal coats there is often found a layer of mucous follicles.

The internal membrane varies very much as to thickneſs, and its ſurface is either ſmooth, reticulated, or plicated.

The ſtructure of the ſtomach in fiſhes does not correſpond with any natural claſſification of theſe animals, and therefore does not admit of a ſyſtematic deſcription.

The *rays* have the ſtomach nearly of the common form. There are ſome folds of the internal membrane; in the *maid* (*raja clavata*) it is a thick ſpongy maſs, which peels off eaſily after maceration. The irregularities of the ſurface look like the rugæ of the human ſtomach, they are not however produced by the folding of the coat, but by the thinneſs or actual deficiency of ſome parts of it, we obſerved very thinly ſcattered over it thoſe ſmall round depreſſions which Mr. Home has conceived to be the glands for ſecreting the gaſtric juice; in this as well as other inſtances theſe glands bear no ſort of proportion to the quantity of the fluid which phyſiologiſts have hitherto ſuppoſed requiſite for digeſtion.

The ſtomach in the *ſharks* conſiſts of two portions; the firſt is much longer and wider than the ſecond, which is ſtraight, and has the appearance of an inteſtine; the two portions communicate by a ſmall opening, which will only permit ſubſtances to paſs into the ſecond ſtomach, that are reduced into a ſmooth and fluid ſtate. There are well marked longitudinal rugæ in the firſt ſtomach, but thoſe in the ſecond are but little apparent.

In the *baſking ſhark* (*ſqualus maximus*) the firſt ſtomach is reticulated at the beginning, and towards the pylorus has very prominent, longitudinal folds, and there is a globular cavity interpoſed between the pylorus and the inteſtine, which communicates with each by a very contracted aperture.

In the *greater dog-fiſh* (*ſqualus canicula*) the muſcular fibres of the ſtomach are moſtly longitudinal; they are numerous at the cardiac and pyloric extremities, but not well marked elſewhere. The muſcles of the ſtomach are much ſtronger in the *greater cat-fiſh* (*ſqualus ſtellaris*) than in many other ſpecies; they are extended over the whole of both portions; their courſe is longitudinal. The internal membrane in this ſpecies forms large and numerous folds, which have different directions; behind the internal membrane of the large portion of the ſtomach there is a glandular layer of a greyiſh colour and ſome thickneſs.

The *ſqualus naſus* has two ſorts of rugæ in the firſt ſtomach; the one are longitudinal, and lie parallel to each other; the ſecond are tranſverſe, and perpendicular to the firſt.

The internal membrane of the firſt portion of the ſtomach in the *ſaw ſhark* (*ſqualus priſtis*) has twelve or fourteen very large longitudinal and parallel folds, which are grooved tranſverſely; the ſecond ſtomach in the ſame fiſh is perfectly ſmooth.

The ſtomach of the *lamprey* (*petromyzon marinus*) is not to be diſtinguiſhed from the other parts of the alimentary canal, except from its ſituation.

In the *ſturgeon* (*acipenſer ſturio*) the ſtructure of the ſtomach is ſingular; after being prolonged for ſome way as a ſimple tube, it is bent ſo as to make a complete turn, it becomes contracted on this ſide of the pylorus, and then again forms an enlargement of a pyriform figure, the baſe of which correſponds to the pyloric opening; this enlargement is produced by a very thick muſcle, the fibres of which run obliquely from without inwards; the pyloric orifice is really very ſmall, and bounded by a circular fold. The internal membrane is ſmooth and without villi, except at the part correſponding to the enlargement, at which place there are thin, long folds of a pyramidal figure, the baſes of which touch the pylorus, and are covered with a net-work, ſimilar to that in the œſophagus of this fiſh.

The ſtomach of the *ſpatularia* is very wide, and fills a great part of the abdominal cavity; it has a round figure, and forms a cul-de ſac which is not as uſual in the direction of the œſophagus, this canal and the inteſtine opening near each other. The internal ſurface of the ſtomach is ſmooth: there is a circular valve at the pylorus.

In the *ſygnathus pelagicus* the alimentary canal proceeds from the mouth to the anus, as in the *lampreys*, without forming any convolution: the part which correſponds to the ſtomach is, according to Cuvier, the one-ſeventh of the whole; it is diſtinguiſhed from the reſt by a ſlight contraction, and by two layers of muſcle: the external layer is formed of circular fibres, which ſurround the ſtomach; the internal layer is longitudinal. The internal membrane has ſome large longitudinal folds.

The ſtomach in the genus *baliſtes*, and in the *oſtracions*, bears conſiderable reſemblance to that of the *ſygnathus*. It has thick parietes plicated internally, and is diſtinguiſhable from the other parts of the canal by its thick muſcular coat; in the *baliſtes* there is a denticulated valve interpoſed between the ſtomach and inteſtines. In the *oſtracion cubicus*, the part correſponding to the ſtomach may be known by its form; its parietes are thin, tranſparent, and wider than the reſt of the canal; its internal membrane is ſmooth, except next the œſophagus, where it produces ſome waving folds; from that place the canal gradually diminiſhes, its coats become thicker, and the internal ſurface villous and plicated.

The form of the ſtomach in the *oblong tetraodon* is very different from the uſual one in fiſhes. It is the ſhape of a globe, a little extended at the œſophageal and pyloric orifices, which are ſituated exactly oppoſite to each other; the one before and the other behind. The coats of the ſtomach are thin and weak, and apparently without muſcular fibres: the internal ſurface does not preſent any inequalities, and the orifices are unfurniſhed with any valve.

Cuvier deſcribes the ſtomach of the *lophius piſcatorius* as a bag, having the ſame capacity and direction as the œſophagus, and extending nearly the whole length of the abdominal cavity. The internal membrane is confounded with the cellular coat, is very thick, ſoft, and pulpy, and forms a great number of thin proceſſes and large irregularly ſhaped rugæ; the firſt are particularly remarkable around the cardia, where they ſeem to produce many glandular maſſes, ſome of which extend into the œſophagus. There are further to be obſerved ſome little orifices of cells equally ſmall, placed in the ſubſtance of the internal membrane, which appear to be deſigned for the ſecretion of mucus. The aperture of the pylorus is much contracted; it is ſurrounded by a very thick circular border, which projects conſiderably into the inteſtine. The muſcular coat of the ſtomach is very ſtrong at every part, its fibres are longitudinal.

In the *lump fiſh* (*cyclopterus lumpus*) the figure of the ſtomach is nearly that of two ovals united at their ends; the angle formed by their junction correſponds to the cæcal portion of the ſtomach in other fiſhes, and the other ends receive the œſophagus and the inteſtine; the ſtomach is ſmooth upon the internal ſurface, except near the pylorus, at which place there are ſome plicæ; it exhibits a number of opaque ſpots, which are occaſioned by the union of very ſmall lenticular cells ſituated between the muſcular and internal coats. They have each a ſmall orifice in the centre, and appear to be deſtined to ſecrete the mucus of the ſtomach; the muſcular coat is confined to the ſecond oval part of the ſtomach, and near the cardiac orifice; the parietes are in other places thin and tranſparent.

In the *eel* the cæcal portion of the ſtomach is very much elongated, and of a taper or funnel-ſhape; the pylorus is ſituated very near the œſophagus, and appears to be formed by two portions; one from the œſophagus, and the other from the elongated part of the ſtomach, from which it would appear that all the food does not in this fiſh paſs through that part; the internal membrane produces ſome longitudinal plicæ at the pylorus, which become leſs eminent and waving towards the bottom of the funnel part of the ſtomach. The fibres of the muſcular coat are circular; although they are longitudinal on the œſophagus; there is a tubercle of the internal membrane, which conſtricts the aperture of the pylorus.

The *conger* has very nearly the ſame ſort of ſtomach as the *common eel*; the prolonged part is, however, leſs taper, the muſcular fibres are more curved, and the pylorus is bordered by a broad lamina; the internal membrane is firm and white, and forms a few long folds which extend from the œſophagus to the bottom of the cul-de-ſac, or cæcal portion.

The *jugular* order of fiſhes afford many examples of the uſual or proper figure of the ſtomach.

In the *trachinus draco* the ſtomach varies but little from the ſtandard form; it is ſomewhat larger than the œſophagus, and its parietes are thrown into a few irregular and oblique folds, which are viſible even on the external ſurface.

The genus *gadus* does not afford much ſingularity in the formation of the ſtomach. The *cod* (*gadus morrhua*) has the cæcal portion very ſhort, or, in other words, the part which goes to end in the inteſtine runs near the bottom of the ſtomach.

The *hake* (*gadus merlucius*) has this part placed forwards, and the *whiting* (*gadus merlangus*) has it ſtill more ſo.

The *ling* (*gadus molua*) has the cul-de-ſac much elongated, but without any alteration in its capacity. In all theſe fiſhes the part which ends in the inteſtine is much contracted.

Amongſt the *thoracici* we obſerve the following varieties of ſtructure in the ſtomach.

In the *father laſher* (*cottus ſcorpius*), and *bull-head* (*cottus gobio*) the ſtomach is very muſcular and of an irregular ſhape. The cæcal portion is conſiderably larger than the œſophagus; the part which ends in the inteſtine is ſituated near the entrance of the œſophagus. In the *goby* of the *Nile* (*cottus niloticus*) the cæcal portion is ſmaller than the other parts of the ſtomach, and the inteſtine ariſes far from the œſophagus.

The ſtomach of the *ſcorpæna horrida* reſembles that of the *nilotic goby*.

In the *lyre* (*callionymus lyra*) the cul-de-ſac is formed immediately at the commencement of the ſtomach, which is at firſt globular, and is afterwards contracted poſteriorly to nearly the ſize of the œſophagus; on the right ſide of the dilatation, the part which ends in the inteſtine goes off anteriorly; the valve of the pylorus is produced by the projection of that part of the ſtomach into the inteſtine.

In the *remora* the right part of the ſtomach has not, as in general, a ſmall bowel ariſing from the ſide of the cul-de-ſac, but a ſhort prolongation of that part which is bent forwards, and forms an angle poſteriorly. The muſcular coat is very ſtrong, and the internal furniſhed with very prominent longitudinal rugæ.

The figure of the ſtomach differs very much in the different ſpecies of the genus *pleuronectes*.

In the *turbot* (*pleuronectes maximus*) the middle portion of the ſtomach is a little enlarged, but the cul-de-ſac is very ſhort; the pylorus being nearly at the bottom of the ſtomach: neither the figure given by Cuvier of the *turbot*'s ſtomach, nor that contained in Blaſius Anatomie Animalium, is correct.

In the *pleuronectes lineatus* the ſtomach is wide, irregularly round, with thin coats, and ſmooth on the internal ſurface.

The ſtomach of the *ſole* (*pleuronectes ſolea*) has a bent figure like a portion of an S; there is a ſlight dilatation at the greateſt curvature, which takes the place of the uſual cul-de-ſac. There is no contraction of the canal at the pylorus; the diſtinction between the ſtomach and inteſtine, however, is marked both on the outſide, and internally, by a whitiſh line; the inner ſurface is thrown into ſome irregular longitudinal folds.

Cuvier deſcribes the ſtomach of the *plaiſe* (*pleuronectes plateſſa*) as forming a continuous canal with the œſophagus and inteſtine; there is, however, always a degree of dilatation at one ſide of the ſtomach, which varies according as it may be diſtended by food; this correſponds to the common cul-de-ſac ; the parietes of the ſtomach are thin and ſmooth on the internal ſurface ; at the pylorus there is a funnel-ſhaped valve, which projects into the cavity of the inteſtine for ſome diſtance.

The ſtomach of the *flounder* (*pleuronectes fleſus*) reſembles that of the *plaiſe*, except that it is contracted at the pylorus, which gives it a conical figure.

In the *John dory* (*zeus faber*) the ſtomach is round and very capacious; in one inſtance we found it contain eight moderate ſized *flounders*. Cuvier deſcribes the internal membrane as being irregularly rugous, but we have obſerved that the ſurface is covered with ſmall meſhes ; each of which contains within it a ſtill finer reticulation ; the meſh-work is wanting, however, upon that part of the internal membrane which lies between the entrance of the œſophagus and the pylorus ; the pyloric orifice is abridged by a circular projection of the internal coat.

The form of the ſtomach in the *chetodon zebra*, as deſcribed by Cuvier, is ſingular : it follows the ſame direction as the œſophagus from before backwards, but is diſtinguiſhed from it by having a greater capacity ; it dilates ſuddenly, and preſents on the ſide of the cardia very ſhort cul-de-ſac, of which the bottom is turned forwards, and the cavity is ſeparated from the cardiac orifice by an internal projection ; the ſtomach is ſlightly contracted before its termination, and its coats, which were before thin and tranſparent, acquire conſiderable thickneſs, more particularly the muſcular tunic ; the termination of the ſtomach at the inteſtine is marked by a conſiderable projection. The internal coat is without rugæ.

The *chetodon ciliaris* has a large ſtomach bent into an arch.

The *chetodon arcuatus* has the ſtomach at firſt continued for ſome way as a large canal, in the ſame direction of the œſophagus, it then bends to form a right angle, and becomes dilated into a conſiderable oval ſac, of which the oppoſite extremity opens into the inteſtine by a very contracted orifice ; the parietes of the firſt portion are thin and tranſparent ; thoſe of the ſac are more muſcular ; the internal ſurface is ſmooth in both diviſions.

In the *teuthis* the ſtomach at firſt forms a canal, with thick coats, the internal of which is plicated throughout its length; it then bends from behind forwards to join a ſecond portion, which is wider, and of which the coats are thin and tranſparent, but become more ſubſtantial towards the other extremity ; the part of the ſtomach which forms the curve is elongated, and correſponds to the cul-de-ſac of other fiſhes.

In the *holocenthrus ſogo*, the ſtomach is an elongated bag, with the bottom contracted ; the parietes are moderately ſtrong, the internal coat produces ſeven or eight broad rugæ, which diſappear in the portion which goes off very near the bottom to form the pylorus.

There is conſiderable variety in the form of the ſtomach in the genus *ſparus*. The *ſparus ſpinifer* has a very large ſtomach, which occupies a great part of the abdomen ; it reſembles a round bottle or flaſk, with a wide neck, which correſponds to the œſophagus ; the inteſtine, compared with the ſtomach, is very ſmall, and ariſes abruptly from the lower part of the neck, and conſequently very far from the bottom of the ſtomach ; the parietes of the bag are thin, and the internal ſurface of it quite ſmooth. The *ſparus ſiganus* has a conical ſhaped dilatation where the œſophagus joins the ſtomach, the bottom of which is turned forwards. This, which is wider than the œſophagus, paſſes firſt from before backwards, then bends from behind forwards ; the curvation produces a conſiderable cul-de-ſac. The portion which ſucceeds it is longer and leſs wide than the firſt part of the ſtomach.

Cuvier ſtates the ſtomach of the genus *labrus* to poſſeſs the ordinary form and ſtructure. In the *gibbous wraſſe* (*labrus tinca*) however, we have found the œſophagus, ſtomach, and firſt or ſmall inteſtine, to make a continuous canal, without any material difference in capacity or in ſtructure ; each of theſe parts is reticulated upon the internal ſurface.

In the *perches* (*genus perca*) there is nothing in genera very peculiar to remark ; the chief deviations from the common ſtructure appear to be with reſpect to the length and form of the cul-de-ſac ; this part is conical in the *perch of the Nile* (*perca nilotica*); it is deep in the *ſea-perch*. Blaſius gives a figure of the viſcera of the *perch*, in which the inteſtine appears continuous with the œſophagus, and the cæcal portion of the ſtomach is like a long bag, with a contracted neck.

In the *ſtickleback* (*gaſteroſteus pungitius*) the ſtomach is an oval figure, and without curvature.

The *red gurnard* (*trigla cuculus*) has the portion which ends in the inteſtine conſiderably enlarged.

The *piper* (*trigla lyra*) has the pylorus ſituated very near the œſophagus, which is ſtraight. The body of the ſtomach is nearly of an oval ſhape, and the bottom of it forms a very ſhort cul-de-ſac, leſs in diameter than the œſophagus.

In the *ſcomber ſanſun* the portion which ariſes from the body of the ſtomach to terminate in the inteſtine is an oval figure, and ſo large in proportion to the reſt of the cavity, that it ſeems like a ſecond ſtomach ; its muſcular coat is very ſtrong, and the internal one has ſome thick longitudinal folds.

The *abdominal* fiſhes exhibit ſome more remarkable varieties in the ſtructure of the ſtomach than the preceding orders.

In the *carps* (*cyprinus*) the ſtomach forms a continuous canal from the œſophagus to the inteſtine. In the *ſea pike* (*eſox belone*) alſo it cannot be diſtinguiſhed from the adjoining parts of the alimentary canal ; the ſtomach of the *common pike* (*eſox lucius*) forms no cul-de-ſac, the inteſtine going off at its bottom ; but the ſituation of the pylorus is plainly marked by an annular contraction externally, and by a circular fold of the internal membrane. The figure of the ſtomach is that of a very elongated bag, ſomewhat wider in the middle than the other parts ; its muſcular coat is ſtrong ; the internal membrane furniſhes at firſt ſome diſtinct longitudinal folds, which become numerous, and covered with papillæ in the lower part of the bag.

In the *herring* (*clupea harengus*) the ſtomach at firſt paſſes backwards, like the continuation of the œſophagus ; it is then reflected forwards, ſo as to form an acute angle with the firſt portion ; the outſide of this curvature produces a long, conical cul-de-ſac : theſe portions are diſtinguiſhable by their ſtructure, as well as their form : the firſt has thick parietes, and the internal ſurface plicated ; the ſecond has thin coats, and is ſmooth internally ; the pylorus, which is the termination of the reflected portion, is much contracted.

The ſtomach forms a cul-de-ſac in the genus *ſalmo*, which, however, varies much with reſpect to its depth. In the *ſmelt* (*ſalmo eperlanus*) it is long and pointed, as in the *herring*. In the common *ſalmon* and *trout* (*ſalmo fario*) the cæcal portion of the ſtomach is very inconſiderable. There is a kind of *trout*, found in the weſtern part of Ireland, which, from the great ſtrength and thickneſs of the muſcular coat of its ſtomach, is commonly called the *gillaroo* or *gizzard trout*. It is not generally ſuppoſed to be a diſtinct ſpecies, but a variety of the *ſalmo fario*. Hunter ſtated the parietes of its ſtomach to be two-thirds thicker than thoſe of the common *trout* ; he did not, however, conſider its ſtomach as ſerving the purpoſes, or as deſerving the name of a gizzard; the internal ſurface is ſoft and villous, and therefore not fit for grinding the food; the contractions of the ſtomach are however ſufficiently powerful to break the ſhell-fiſh on which this trout ſubſiſts, with the aſſiſtance of round, ſmooth ſtones, which are ſwallowed for the purpoſe. The common *trout* likewiſe takes ſtones into its ſtomach, with a ſimilar deſign.

The ſtomach of the *ſilurus bagre* is an oval, or rather the ſhape of a flaſk, with a very wide mouth; its parietes are hard, ſtrong, and thick; the portion which leads to the pylorus is ſhort, and ariſes from about the poſterior third, which occaſions a conſiderable cul-de ſac.

There is no cæcal portion of the ſtomach in the genus *anableps*; that of the *anableps tetropthalmus* is a canal curved upon itſelf, before it ends in the inteſtine, from which it is ſeparated by a ſlight contraction, and a circular valve; the left ſide of the internal ſurface of the ſtomach exhibits thick folds, which form a net-work, apparently of a glandular ſtructure; the other parts of the internal membrane are covered with fine villi.

Cuvier deſcribes the cæcal portion of the ſtomach, in the genus *mormyrus*, as being wide and ſhort; we ſhould rather ſay that the ſtomach is dilated into a bag, which lying tranſverſely acroſs the direction of the œſophagus, reſembles, in ſome degree, the form of this cavity in mammalia.

The moſt ſingularly conſtructed ſtomach in the whole claſs of fiſhes is met with in the *mullet* (*genus mugil*), of which Cuvier has given an imperfect deſcription, and bad figure. In the common ſpecies (*mugil cephalus*), the ſtomach may be divided into three parts; the firſt reſembles in form and direction the œſophagus, from which it commences; it leads to the back of a large muſcular maſs, into which it opens; the ſame canal is afterwards continued for a conſiderable way backwards, and is gradually contracted in capacity, until it finiſhes in a pointed blind extremity. The muſcular maſs has a figure not quite ſpherical, but ſuch as would be produced by the application of two diſks to each other; the largeſt diameter of it meaſures about an inch: the tubular part of the ſtomach opens into the centre of one diſk; the inteſtine commences exactly oppoſite, or at the centre of the other; a ſtraight canal leads directly through the muſcle, which therefore correſponds to the pyloric portion of the ſtomach. It has, however, been conſidered by ſome anatomiſts as an example of the true gizzard ſtomach in fiſhes, and not without foundation; the muſcular fibres which compoſe the interior part of it are ſhort, cloſely applied to each other, and interwoven ſo as to produce a maſs nearly of an homogeneous ſtructure; the fibres are more diſtinct on the external ſurface; they paſs from the centre to the circumference, where they ſeem to coaleſce with each other, and with a layer of muſcle, which paſſes round the maſs like a ring: this arrangement of the muſcular fibres bears ſome reſemblance to that of the gizzard in birds, and certainly ſhews that the apparatus in the *mullet* is capable of exerting an extraordinary degree of force. It ſhould further be added, that the internal part of the muſcular maſs is lined with a cuticular coat of ſome ſtrength: this is very eaſily detached by maceration, and is found to be confined, as in birds, merely to the grinding ſurface. As arguments againſt the ſuppoſition of the muſcular apparatus in the *mullet* performing the functions of a gizzard, it may be ſtated that the cavity it contains is too ſmall to ſerve as a reſervoir for any quantity of food; that the cuticle is too weak to ſuſtain the friction with hard bodies, and that the food muſt be in a great meaſure digeſted in the tubular portion of the ſtomach, before it paſſes into this. Theſe objections we are diſpoſed to allow to a certain extent; but that the aliment undergoes a further comminution and admixture, while moving through the muſcular portion of the *mullet*'s ſtomach, we cannot entertain a doubt, both from the contemplation of the ſtructure of the part, and of the inteſtines which ſucceed it, and from actual obſervation made upon its contents, immediately after the death of the animal.

Cuvier deſcribes the ſtomach of the *white mullet* (*mugil albula*) as differing only from that of the *mugil cephalus* with reſpect to the ſhape of the cul-de-ſac, and the muſcular portion; the firſt has the proper form of a bag, being wider at the lower part than above; the latter is the figure of a globe, inſtead of being compreſſed or levelled on the inferior and upper ſurfaces.

The figures which illuſtrate the form and ſtructure of the ſtomach are contained in *Plates* I. and II. of the *Anatomy of Fiſhes*. *Fig.* 5. of *Plate* I. exhibits a view of the ſtomach of the *baſking ſhark* (*ſqualus maximus*) laid open on one ſide; *c*, the portion of the ſtomach next the œſophagus, the inner ſurface of which is reticulated; *d, d*, the ſucceeding parts of the ſtomach, with longitudinal laminæ or folds, which are particularly prominent near the pylorus; *e*, the purſed, or contracted opening into the ſecond ſtomach; *f*, the ſecond ſtomach, partially ſeen behind the other; *g*, the commencement of the inteſtine; *h*, the biliary ducts, paſſing as a band to the inteſtine; *i i*, the ſpleen.

Fig. 6. of the ſame plate ſhews the globular cavity, or ſecond ſtomach, and its communication with the firſt ſtomach and inteſtine; *a*, the external ſurface of the pyloric portion of the ſtomach; *b*, the intermediate cavity laid open, to bring into view the contracted aperture leading into the principal ſtomach, and the one into the inteſtine; *c*, the cavity of the firſt part of the inteſtine expoſed; *d*, the commencement of the ſpiral valve; *e*, the projection into the inteſtine, upon which the ſmall aperture of the ſecond ſtomach is ſeen; *f*, the papilla, by which the biliary ducts terminate in the inteſtine; *g*, a portion of the ſpleen; *h*, twelve or thirteen biliary ducts, forming a ſingle faſciculus, which proceeds to the inteſtine.

Fig. 7. of the ſame plate repreſents a portion of the ſtomach and œſophagus of the *raja clavata*; *a*, the inner ſurface of the œſophagus; *b b*, the internal coat of the ſtomach, which is thick, ſoft, unequal, and, as it were, raiſed upon the ſurface of the other coats; the depreſſions ſeen upon it are produced by the deficiency of the internal coat itſelf; ſome ſmall foramina are ſcattered over the ſurface, which are the glands ſuppoſed to furniſh the gaſtric juice by Mr. Home, but which by others are commonly deſcribed as mucous glands.

In *Plate* II. of the *Anatomy of Fiſhes*, *fig.* 1. repreſents the ſtomach of the *tetraodon oblongus*; *a*, the œſophagus; *b*, the beginning of the inteſtine; *c*, the ſtomach, of a globular figure. *Fig.* 2. ſhews the ſtomach of the *eel* (*murena anguilla*); *a*, the œſophagus; *b*, the cul-de-ſac, or cæcal portion of the ſtomach of an elongated taper form; *c*, the inteſtine. *Fig.* 3. exhibits the ſtomach of the *ſole* (*pleuronectes ſolea*) which deſcribes an S like curve; *a*, the ſlight dilatation which correſponds to the cul-de-ſac. *Fig.* 4. repreſents the ſtomach of the *plaiſe* (*pleuronectes plateſſa*); *a*, the œſophagus; *b*, the inconſiderable dilatation which marks the ſituation of the ſtomach; *c*, the pylorus; *d. d*, the two ſhort pyloric cæca; *e*, the ſingle cæcum from the firſt portion of the inteſtine, as far as it is known, peculiar to this fiſh. *Fig.* 5. ſhews the ſtomach of the *chetodon zebra*; *a*, the œſophageal extremity; *b*, the pylorus; *c*, the portion of the ſtomach, correſponding to the cul-de-ſac, which, in this ſpecies, is turned forwards. *Fig.* 6. is the ſtomach of the *ſparus ſpinifer*; *a*, the œſophageal extremity; *b*, the inteſtine, of a ſmall ſize, ariſing near the œſophagus; *c*, the body of the ſtomach, which forms a perfect bag. *Fig.* 7. is the ſtomach of the *mullet* (*mugil cephalus*); *a* is the part continued from the œſophagus; *b*, the funnel, or cul-de-ſac; *c*, the muſcular portion, which has been compared to a gizzard, on which the arrangement of the muſcular fibres is ſeen; *d*, the inteſtine; *e e e*, pyloric cæca. *Fig.* 8. ſhews the ſame ſtomach, with the muſcular part cut through longitudinally; *a*, the œſophageal extremity; *b*, the funnel ſeen behind; *c*, the muſcular portion, in the centre of which appears the opening, through which the food paſſes to the inteſtine; *d*, the cuticle lining this paſſage, puckered or folded on itſelf.

Inteſtines.

There are, properly ſpeaking, but two inteſtines in fiſhes; the firſt correſponds to the *ſmall*, the ſecond to the *great*; theſe terms, however, are not applicable to the diviſions of the canal in this claſs of animals, unleſs they were reverſed, as that which would be called the *great* is often leſs capacious than the other. Cuvier has called the ſecond portion of the inteſtines in fiſhes *rectum*, to which part it is certainly more analogous than to the *colon*, or *cæcum*, although ſometimes it experiences a conſiderable and ſudden enlargement. The firſt and ſecond portions of the canal are commonly diſtinguiſhed from each other by an annular projection of the internal coat, which is generally thick and rounded on the edge, and appears to contain ſome circular muſcular fibres, which, by their contraction, will increaſe the valvular obſtruction to the paſſage of ſubſtances from one inteſtine into the other; theſe parts are further indicated by a difference of ſtructure in the internal membrane, and commonly, alſo, by a different arrangement of the fibres in the muſcular coat. The capacity of the ſecond inteſtine, as already mentioned, is almoſt always either ſmaller or larger than the preceding part of the canal; moſt commonly it is ſmaller. The internal ſtructure, characteriſtic of each inteſtine, is moſt ſtrongly marked in the one next the pylorus, and in the other towards the anus.

The variation with reſpect to the form, length, and ſtructure of the inteſtines of different fiſhes, do not accord with the natural diviſions of this claſs of animals; remarkable deviations being often found amongſt individuals of the ſame genus, and even ſometimes in varieties of the ſame ſpecies, as will appear by the following table, and in the deſcription of theſe parts in the principal genera.

Table of the proportional Lengths of the Inteſtinal Canal in Fiſhes, Extracted from Cuvier's Leçons d'Anatomie comparée, tom. 3.

Names.	Length of the body, from the end of the ſnout to the extremity of the tail, without including the caudal fin.	Length of inteſtinal canal, from the pylorus to the valve of the rectum.	Length of the rectum, or ſecond inteſtine.	Total length of the inteſtinal canal.	Relation of the length of the body to that of the inteſtinal canal.
Lamprey	0,148			0,080(*a*)	1,8 : 1
Ray	0,300(*b*)			0,200	1,5 : 1
Shark	2,759	0,351	0,189(*d*)	0,540	5 : 1
Sturgeon	2,273			1,200	1,8 : 8
Spatularia	0,114(*c*)			0,024	4,8 : 1
Baliſtes	0,130			0,270	1 : 2
Tetraodon mola	1,000			3,572	1 : 3,5
Tetraodon oblongus	0,140			0,090	1,5 : 1
Murena helena				0,230	
Common eel	0,720			0,254	2,6 : 1
Whiting	0,290			0,240	1,2 : 1
Cottus inſidiator	0,360	0,279	0,060	0,339	1 : 1
Pleuronectes limanda	0,150			0,200	3 : 4
Chetodon arcuatus	0,105	0,545	0,055	0,600	1 : 5 : 7
Perch	0,210			0,160	1 : 1,3
Perca labrax	0,923			0,703	1,3 : 1
Sparus	0,190			0,730	1 : 3,8
Barbel	0,390			0,015	1 : 2,6
Rud	0,210			1,366	1 : 1,8
Cyprinus dobula	0,290			0,400	1 : 1,4
Tench	0,280			0,340	1 : 1,2
Eſox braſilienſis	0,130			0,090	1,3 : 1
Common pike	0,840	0,608	0,140	0,820	1 : 1,4
Polypterus Niloticus	0,510			0,275	1 : 1
Mormyrus	0,260			0,160	1,6 : 1
Mullet	0,250			0,950	1 : 3,8
Silurus bagre	0,320	0,720	0,080	0,800	1 : 2,5

(*a*) Meaſure of the alimentary canal, from the poſterior parts of the mouth to the anus.

(*b*) Length, meaſured from the border of the lower jaw to the anus.

(*c*) Length taken from the end of the muzzle, but not including the leaf.

(*d*) Length meaſured from the end of the ſpiral valve to the anus.

In the *lampreys* (*petromyzon*) the alimentary canal paſſes to the anus without any ſenſible dilatation or convolution; the abdominal cavity is however of conſiderable extent. The inner ſurface of the inteſtine is covered with fine longitudinal plicæ; the reflection of peritoneum, which correſponds to the meſentery, completely encompaſſes the greateſt part of the inteſtine, by being coiled upon it, in conſequence of which it is allowed great latitude of motion in the abdomen.

The inteſtines of the *ray* and *ſhark* genus make no material convolutions, and appear remarkably ſhort for the fiſh; the length, however, loſt by this circumſtance, is amply ſupplied by the ſtructure of the firſt inteſtine; the internal membrane of which is converted into a ſpiral valve, which nearly fills up the canal from the pylorus to the commencement of the ſecond inteſtine; the food, therefore, inſtead of paſſing ſpeedily to the anus, traverſes a conſiderable circuit. The ſpiral membrane is tolerably ſmooth upon its ſurface, but is extremely vaſcular; an injection of the blood-veſſels will render this part of a vivid red, and ſcarcely ſhew any effect upon the other parts of the alimentary canal. The valvular portion of the inteſtine in the *ſqualus maximus* terminates at the rectum in a foliated appearance, reſembling a roſe, by which the paſſage of the food is obſtructed.

The ſecond inteſtine of theſe fiſhes uſually makes one or two ſlight curves; it has a ſmaller diameter and thinner coats than the preceding; the inner membrane is villous at the commencement. Cuvier has deſcribed a layer of a greyiſh, glandular ſubſtance, as being interpoſed between the muſcular and internal coats; this has not been obſerved by us.

There is a remarkable glandular body connected by a ſlender tubular foot-ſtalk with the rectum which is only met with in the *ray* and *ſhark* genera; in the former it is ſomewhat of the figure of the ſeed of a ſtone fruit, with the leſſer end towards the inteſtine. We have obſerved it in the *dog-fiſh* to be long, round, and pointed at the free extremity. Its ſubſtance is very denſe and unyielding, reſembling a good deal the texture of the human uterus; it contains a ſmall cavity, which appears to have a ſmooth ſurface, but, if accurately examined, exhibits ſome cells or depreſſions, which would ſeem to be the orifice of mucous glands. In the *ſqualus maximus*, Mr. Home found this gland deeply reticulated in the inner ſurface, and to contain a dark coloured glairy fluid. Doctor Monroe, in his Phyſiology of Fiſhes, called this body, from analogy of ſituation, *appendix vermiformis*, and ſuppoſed it to be deſigned to perform the ſame functions of that part in the human inteſtine. Cuvier, on the other hand, deſcribes it amongſt the anal glands of animals, to which claſs of organs he thinks it moſt analogous. It appears to us to be a gland deſtined to ſupply the rectum with mucus.

In the *ſturgeon* (*acipenſer*) all the parts of the inteſtine are extremely muſcular; the internal ſurface is reticulated throughout the greateſt portion of the canal; at the beginning the meſhes are ſo deep as to produce cells; at ſome diſtance from the pylorus there ariſes a ſpiral valve, which is loſt at nearly the ſame diſtance from the anus; its turns are much leſs frequent than thoſe of the valve in the *ray* and *dog-fiſh*. In the *ſturgeon* it is ſuſtained by a ſtrong pillar which runs in the centre of the tube of the inteſtine, and which ſeems to be compoſed of muſcle internally; the valve reſembles ſtairs placed around a pillar, except that it is not uninterruptedly attached to the centre, but rather coils upon it, leaving in ſome places the internal border at liberty; it does not ſeem, therefore, neceſſary for the alimentary ſubſtances to paſs around all the turns of the valve. In the *ſturgeon* there is interpoſed between the reticulated membrane and the muſcular coat a thick layer of a glandular ſubſtance, which is cloſe in its texture, a greyiſh colour, and in which may be ſeen ſome ſmall white branches. The laſt portion of the inteſtinal canal has neither valve, reticulation, nor glandular ſubſtance; its coats are thin, and its diameter diminiſhed.

Cuvier deſcribes the inteſtinal canal of the *ſpatularia* as being ſhort, but contrived to retard the paſſage of the alimentary ſubſtances through it. It is very wide for two-thirds of its length, and is then ſuddenly contracted into a ſmall canal; it next becomes dilated a ſecond time, and forms an oval pouch, the cavity of which is divided by ſix circular valves: the ſucceſſive enlargements and contractions produced by theſe are viſible on the external part of the inteſtine; the pouch opens into a ſhort and contracted canal, which is analogous to the *rectum*. The firſt portion of the inteſtine of this fiſh is moſt muſcular, and exhibits a network on the internal ſurface, ſimilar to that of the *ſturgeon*; the meſhes of which are, however, not ſtrongly marked, except in the firſt two thirds of the inteſtine. The parietes of the pouch, containing the valves, are thin, but the ſhort canal, immediately ſucceeding, has an evident muſcular coat, and the internal ſurface longitudinally plicated.

In the *ſygnathus pelagicus* the alimentary canal is without convolutions, as already mentioned, and preſerves nearly the ſame diameter throughout its whole length; the firſt or ſmall inteſtine has thin and tranſparent coats, and the inner ſurface is covered with longitudinal plicæ, waving and ramified together; it is ſeparated from the ſecond inteſtine, or rectum, by a circular valve; the latter canal has ſtrong parietes, and upon the internal ſurface thick rugæ running longitudinally, ſerrated upon their edge, undulating, and ſending branches to each other. The *ſygnathus acus* differs from the *pelagicus* in wanting the rugæ in the ſecond inteſtine, which is ſmooth and covered with fine cuticle.

The *oſtracion cubicus*, in which the inteſtine is without convolution, has the firſt portion ſlightly plicated internally; and in the ſecond more eminent rugæ diſperſed longitudinally and parallel to each other. This part of the inteſtine is likewiſe more muſcular, and ſeparated from the firſt by a circular valve.

In the *baliſtes* the firſt inteſtine is, for about two thirds of its length, thin, uniform in ſize, and ſmooth internally; at the commencement of the laſt third it exhibits ſome dilatations, and towards the end becomes much enlarged, at which place the internal coat acquires a beautiful villous appearance; a contraction of the parietes, and an annular projection internally, ſerve to diſtinguiſh the commencement of the ſecond inteſtine, which is ſhort and longitudinally plicated on the inſide.

In the genus *tetraodon* the inteſtines make two or three convolutions, but preſerve nearly the ſame diameter throughout; a fold of the inner membrane is placed at the beginning of the ſecond inteſtine, which has ſtronger coats than the firſt.

firſt, and deeper longitudinal folds of the internal ſurface.

The inteſtinal canal is longer in the *moon-fiſh* (*tetraodon mola*) than in the other ſpecies, and forms numerous convolutions. The firſt inteſtine is capacious, and has a ſtrong muſcular coat, which exhibits on the internal part of the gut very diſtinct longitudinal faſciculi; the inteſtine diminiſhes in wideneſs, and the thickneſs of its coats as it proceeds. There is alſo a thick white glandular layer between the internal and muſcular coats, which diſappears on approaching the ſecond inteſtine; in which, however, it is again formed. The internal ſurface of both inteſtines is covered with villous proceſſes, that are at firſt coarſe, but become fine towards the commencement of the ſecond inteſtine, in which they re-appear.

The inteſtinal canal of the *ſea devil* (*lophius piſcatorius*) has but little variation in its capacity from one end to the other; the folds of the internal membrane take a lozenge figure.

In the *lump fiſh* (*cyclopterus lumpus*) the firſt inteſtine is diſtinguiſhed from the ſecond by a circular valve, which projects into the latter; the muſcular coat of the firſt is alſo leſs thick and has the fibres circular, while in the ſecond they are conſiderable, and are arranged upon the external part of the inteſtine longitudinally; both inteſtines are plicated on the inner ſurface, but the ſecond has the folds larger and leſs regular.

In the *anarrhichas lupus* the ſecond portion of the inteſtinal canal has thick coats, and an external layer of longitudinal muſcular fibres; the two parts are indicated by the interpoſition of a circular valve, but the internal ſurface of both is covered by a number of fringed plicæ arranged in different directions.

The ſeveral parts of the inteſtinal canal in general have little variation with reſpect to their capacity. In the genus *murena*, the *conger* (*murena conger*) has the ſecond inteſtine wider than the firſt; it has alſo, particularly at the commencement of the canal, a glandular ſtructure of the internal coat, ſimilar to that already deſcribed in the *ſturgeon*. In all this genus the diſtinction of the two portions of the inteſtines are marked by a ſimilar valve.

In the *uranaſcopus ſcaber* the firſt and ſecond inteſtines are not diſtinguiſhed by any valvular projection of the internal ſurface, but by the ſtructure of their coats. They are at firſt thick and the canal ſmall, ſoon afterwards the inteſtines become much enlarged, thin, and tranſparent, which ſtructure is continued to near the anus; the internal membrane produces in the firſt diviſion of the canal fine longitudinal plicæ, touching each other in a zig-zag manner; theſe gradually decline, and in the part correſponding to the rectum become ſtrictly longitudinal and parallel, with ſmall rugæ ariſing alternately on the ſides. The canal experiences many convolutions.

The firſt inteſtine of the *weaver* (*trachinus draco*) is reticulated upon the inner ſurface; the ſecond portion is thin.

In the *genus gadus* the firſt and ſecond parts of the inteſtinal canal are diſtinguiſhed both by a difference of ſtructure and a valvular projection; the firſt inteſtine of the *hake* (*gadus merlucius*) has upon the inner ſurface fringed plicæ, which gradually diminiſh towards the rectum. In the *cod* (*gadus morrhua*) the canal is ſmooth internally, except at its firſt convolution. In the *ling* (*gadus molua*) the firſt inteſtine is plicated longitudinally; and in the *whiting* (*gadus merlangus*) the inteſtinal canal appears ſmooth on the inner ſurface; the rectum is very ſhort, and wider than the firſt inteſtine.

In the *remora* (*echeneis remora*) the firſt inteſtine is rugous, the ſecond ſmooth.

In the genus *cottus* there is a valve at the origin of the ſecond inteſtine. In the *cottus niloticus* there is a glandular ſubſtance ſituated behind the internal membrane, reaching for ſome way from the pylorus, that increaſes the bulk of that part of the gut, the diameter of which is alſo very wide; the canal, after proceeding for a conſiderable diſtance, becomes again dilated at the ſmall portion correſponding to the rectum. The whole extent of the ſmall inteſtine exhibits internally a net-work, which has very deep meſhes; in the rectum the ſame ſtructure is obſerved, but the meſhes are wide and ſhallower.

The inteſtinal canal forms three convolutions in the *ſcorpæna horrida*. The internal membrane is ſlightly plaited and villous, and the parietes thin in the firſt inteſtine; the rectum is ſomewhat larger, and has internally waving longitudinal folds.

In the *dory* (*zeus faber*) the two inteſtines are divided by a conical valve. The firſt is reticulated upon its inner ſurface; when viewed with a magnifying glaſs, we have obſerved each meſh to incloſe a finer net-work within it, and the projections of the membrane, which form the reticulation, to end in delicate villous laminæ; probably the ſame ſtructure would be found to exiſt in the inteſtines of many other fiſhes; the rectum in the *dory* is without reticulation, and thin in its parietes.

There is ſome variety with reſpect to the ſtructure of the inteſtines in the *flat fiſhes* (*pleuronectes*.) The *plaiſe* (*pleuronectes plateſſa*) has the canal wide for ſome way from the pylorus, after which it gradually diminiſhes to a moderate ſize, and continues of the ſame magnitude to the anus; the inner ſurface is covered with well marked plicæ arranged longitudinally, and others connecting them tranſverſely; in the wide part of the inteſtine the plicæ are ſo prominent that they float in the cavity, the border is plaited like the ruffle of a ſhirt, and altogether they produce one of the moſt beautiful ſurfaces we have obſerved in the inteſtines of fiſhes. This plicated ſtructure becomes gradually leſs evident in the courſe of the canal, and is nearly loſt on approaching the rectum. That portion of the inteſtine poſſeſſes alſo reticulated plicæ, but they are indiſtinct; the inteſtine becomes thick and fleſhy near the anus. Cuvier aſſerts, that its diameter is twice as great as that of the preceding part of the canal; but in thoſe inſtances we have examined, if any difference could be obſerved, the rectum was leſs than the adjoining part of the inteſtines. There is a circular valve at the commencement of the rectum.

In the *turbot* (*pleuronectes maximus*) the internal membrane of the firſt inteſtine produces fringed laminæ, which are cloſe together and reticulated; they gradually decline, and in the rectum, the origin of which is marked by a valve and a ſudden dilatation, the laminæ or plicæ become very remarkable, floating in the cavity of the inteſtine. The canal is moſt muſcular, from the firſt convolution to the pylorus, and in the rectum.

The firſt inteſtine of the *brill* (*pleuronectes rhombus*) is plicated internally, it is at firſt large and then becomes contracted. The rectum is ſmooth and conſiderably wider than the part of the canal immediately adjoining it.

In the *ſole* (*pleuronectes ſolea*) the diameter of the inteſtinal canal is nearly the ſame throughout, although Cuvier aſſerts the contrary. The internal ſurface of the firſt portion looks as if it were grooved, the folds projecting very little, and being cloſely applied to each other; they paſs in a waving manner in the longitudinal direction ; near the pylorus, however, the folds are more prominent and puckered or plaited upon the edges. The parietes of the rectum are thin ; the internal membrane forms in it ſlight, incompact, longitudinal folds. The two parts are diſtinguiſhed by an annular projection.

In the *pleuronectes limanda*, Cuvier ſtates the inteſtine to be very wide at the commencement, and after diminiſhing to be enlarged again a little in the rectum. The internal membrane has ſlight rugæ arranged in a lozenge figure near the pylorus, but farther on it becomes ſmooth.

In many of the genus *chetodon* the inteſtinal canal is very large ; in the *chetodon arcuatus* and *chetodon zebra* the parietes of the inteſtine are thin, delicate, and tranſparent, and dilated in ſome places for containing the excrements. The internal membrane of the firſt inteſtine has the plicæ diſpoſed in a zig-zag manner near the anus, their coats become thickened and rugous internally.

In the genera *labrus* and *ſparus* the ſtructure of the inteſtine varies in the different ſpecies ; in the *labrus melops* the rectum is ſo wide, according to Cuvier, as to reſemble a ſac, into which the firſt inteſtine is inſerted ; a valve is ſituated at this place. In other ſpecies the ſudden enlargement of the rectum alſo exiſts, but the valve is wanting in the *gibbous wraſſe* (*labrus tinca*); the firſt inteſtine is of the ſame diameter as the ſtomach, with which it appears to be continuous ; it is villous and reticulated on the inner ſurface ; the rectum is very ſhort, and twice the width of the firſt inteſtine ; its internal membrane exhibits a cellular appearance from the meſhes of the net-work being ſo deep.

The coats of the inteſtines in the *ſparus ſpinifer* are thin, and the internal ſurface is without villi or plicæ.

In the *perch* the firſt inteſtine is a little enlarged at the commencement, afterwards it diminiſhes, and again acquires bulk ; the ſecond portion or the rectum exceeds in ſize every part of the canal. The internal coat of the firſt inteſtine furniſhes numerous laminæ, forming many-ſided areolæ, which gradually become longitudinal and parallel to each other. There is a prominent funnel-ſhaped valve at the origin of the ſecond inteſtine ; as uſual, this part of the gut has longitudinal fibres in its muſcular coat. In this fiſh the ſtructure of the rectum is ſingular, its longitudinal folds are denticulated upon the edge, and are croſſed by other tranſverſe plicæ in a zig-zag manner ; the folds which compoſe the angles that are directed towards the anus are more prominent than the reſt and concave, ſo as to produce little cups or ſacs. The *baſs* (*perca labrax*) has looſe, plaited, longitudinal laminæ on the internal ſurface of the firſt inteſtine, exactly reſembling thoſe of the ſmall inteſtine of the *ſnake* ; the ſecond inteſtine has remarkable thick coats, and is perfectly ſmooth on the inner ſurface.

In the *ſtickleback* (*gaſteroſteus aculeatus*) the inteſtine is very wide at its origin, it ſoon, however, becomes ſmall, and continues ſo to the end of the canal.

In the *mackarel* (*ſcomber ſcombrus*) the internal membrane of the firſt inteſtine is nearly ſmooth, but that of the ſecond is plicated,

Cuvier deſcribes a very remarkable cæcal proceſs, or cul-de-ſac, which is ſituated at the origin of the rectum in the *piper* (*trigla lyra*), it paſſes for a ſhort diſtance on the ſide of the firſt inteſtine, from which it is ſeparated by a ſemi-lunar valve ; it reſembles, in form and poſition, a good deal the cæcum in mammalia, of which no other fiſh affords a ſimilar example.

In the *teuthis hepatus* the inner ſurface of the inteſtine is ſlightly villous ; the two portions are not diſtinguiſhed by a valve as uſual, but near the anus the canal becomes greatly enlarged, and again diminiſhed before its termination.

The inteſtinal canal in the genus *cyprinus* forms no dilatation or internal valvular projection, but uſually diminiſhes in its courſe from the œſophagus to the anus, both in diameter and the ſtrength of its coats.

In the *carp* (*cyprinus carpio*) the inteſtines make three convolutions and one-half ; the internal membrane at the beginning of the firſt portion of the canal produces a reticulation, of which the intervals are very deep, reſembling the cellular appearance of the inteſtine deſcribed in the *ſturgeon.* This net-work gradually diminiſhes in the *carp*, until near the anus, where it again increaſes.

In the *barbel* (*cyprinus barbus*) the internal membrane furniſhes plicæ which go longitudinally in a zig-zag manner, and are finely villous ; towards the end of the canal the villi are leſs thick, and the plicæ more compact and ſmaller, ſo as to give the appearance of a grooved ſurface.

In the *rud* (*cyprinus rutilus*) the inner coat furniſhes beautiful plicæ paſſing in zig-zag tranſverſely ; they are larger and cloſer at the commencement of the canal than in the ſucceeding parts ; near the anus the edges of the folds have a fringed appearance.

The inner ſurface of the inteſtine in the *cyprinus dobula* is villous in every part, but there are no zig-zag plicæ.

In the *tench* (*cyprinus tinca*) there are irregular zig-zag laminæ, with fringed edges.

In the genus *clupea* the diameter of the inteſtinal canal is nearly the ſame throughout ; the coats are thin and weak, the inteſtine are alſo uſually ſhort, they do not form any convolution in the *herring* (*clupea harengus*), and only two turns in the anchovy (*clupea incraſicolus.*)

In the *mullet* (*mugil cephalus*) the inteſtinal canal is ſingularly long, and forms convolutions one around the other, ſomewhat in the manner of the inteſtines of ſeveral water birds ; theſe coils are much more numerous than they are repreſented by Collins in his anatomy ; we have counted eleven turns of the inteſtine, which were all viſible on firſt opening the body ; the convolutions are preſſed together, and the interſpaces filled with fat, ſo that the whole forms one maſs which almoſt occupies the whole abdomen of this fiſh. The diameter of the canal varies but little throughout its whole extent ; the internal membrane is without folds, but furniſhed with villous proceſſes, which are thick, long, and diſtinct in the firſt convolutions, but as uſual gradually decline afterwards.

In the *gar fiſh* (*eſox belone*) the inteſtine extends from the mouth to the anus without any convolution : it ſhould be remarked, however, that the abdominal cavity is very long in this fiſh. Cuvier ſtates the ſtructure of the inteſtine to be the ſame throughout its whole length, and that the inner ſurface of it is ſmooth, and without villi ; but we find in our notes that the internal membrane is villous, and, if minutely examined, is likewiſe reticulated ; and that the villous ſtructure is extended in two ſtripes upon the inner ſurface of the ſecond inteſtine, and thus diſappears.

The parietes of the inteſtinal tube in the *common pike* (*eſox lucius*) are thick, and the origin of the rectum is marked by a valve, and alſo by an increaſe of volume ; the internal ſurface of the firſt inteſtine is villous, and appears grooved ; in the ſecond the villi are very long and fringed.

In the *ſalmon* (*ſalmo ſalar*) the internal membrane forms in the beginning of the inteſtinal canal very long villi, which float into the cavity ; theſe gradually diminiſh, and in the laſt part of the gut there are broad tranſverſe folds, which become larger and more diſtinct as they approach the anus. The inteſtine of the *trout* (*ſalmo fario*) wants the villi, but the tranſverſe plicæ are more regularly placed than in the ſalmon.

Cuvier deſcribes the inteſtinal canal of the *bichir* (*polypterus niloticus, Geoff.*) as being ſimilar to that of the *ſturgeon*. There is a ſpiral valve that commences immediately beyond the pylorus, and forms eight turns, which are approximated and prolonged poſteriorly; this valve does not extend to the anus, and the interval which wants it, Cuvier conſiders as the rectum; between the internal and muſcular coats there is, at the commencement of the canal, a glandular layer, which increaſes the parietes, for the diſtance of a decimetre to double their ſize, after which it is ſcarcely to be perceived in this part of the inteſtine. The internal coat forms a net-work, as in the *ſturgeon*, of which the meſhes become ſhallower as they recede from the pylorus, and are almoſt entirely effaced beyond the gland. The parietes of the rectum are very thin, and its inner coat ſhews ſome ſlight longitudinal folds.

In the *anableps tetropthalmus* the internal membrane of the firſt inteſtine produces a fine and apparently glandular reticulation, and the parietes of the ſecond inteſtine are very thick, and the inner ſurface plicated longitudinally.

Cuvier deſcribes a curious ſtructure in the inteſtine of the *ſilurus bagre;* the beginning of the canal is wide, it then contracts and continues for ſome way of the ſame ſize; about the middle, the inteſtine is ſuddenly enlarged, and its coats become thin, and there is a kind of inſertion of the firſt half of the canal, which opens into the ſecond by a ſmall orifice, bordered by a circular valve; at ſome diſtance beyond this place the parietes acquire thickneſs, and the diameter of the tube becomes ſmall as before; and finally, this inteſtine terminates in the rectum, which is large and diſtended at this place. The valve of the rectum is very prominent, its parietes are remarkably ſtrong and muſcular, the inner membrane has longitudinal folds; a ſimilar appearance exiſts on the inner ſurface towards the end of the firſt inteſtine, but they are ramified nearer the pylorus.

The inteſtinal tube in the genus *mormyrus* has an uniform diameter, is ſmooth internally, and unprovided with a valve at the commencement of the rectum.

From the preceding deſcription it will be perceived that the inteſtines of fiſhes poſſeſs a more complicated and beautiful ſtructure of the internal membrane than exiſts in any other claſs of animals; the alimentary canal of fiſhes, for this reaſon, as well as the nature of their food, is generally found to be ſhort; the laſt diviſion of it, which in mammalia very properly receives the name of the *great* or *large* inteſtines, is, as before obſerved, often the ſhorteſt and moſt contracted part of the canal in fiſhes. The rectum in this claſs rarely ſerves as a reſervoir for fæces; its internal ſurface is often as well fitted for forming and abſorbing the chyle as the firſt portion of the gut, and ſometimes even more ſo: it may, therefore, be ſaid of fiſhes that the whole tract of their alimentary canal performs, in a greater or leſs degree, the functions of the ſmall inteſtines in other animals.

In *Plate* II. of the *Anatomy of Fiſhes, fig.* 9. ſhews the valvular portion of the inteſtine of the *ſkate* (*raja batis*) which is dried in order to render the turns of the valve more diſtinct. *Fig.* 10. exhibits a piece of the valvular part of the inteſtine of the *ſturgeon* (*acipenſer ſturio*); *a*, the central portion; *b*, the coiled part; *c c*, the internal ſurface of the parietes of the canal. *Fig.* 10. of *Plate* III. of the *Anatomy of Fiſhes*, gives a view of the internal ſurface of the firſt inteſtine of the *ſturgeon*, where the cæca are connected with it; *a*, the ſurface of the gut deeply reticulated or cellular. *Fig.* 11. of *Plate* II. is a portion of the firſt inteſtine of the *dory* (*zeus faber*) on which the meſh-work and intermediate reticulation of the internal membrane are repreſented. In *fig.* 12. of the ſame plate, the internal ſurface of the inteſtine next the pylorus is diſplayed in the *turbot* (*pleuronectes maximus*); *a*, the laminated appearances of the internal membrane of the inteſtine in this fiſh. *Fig.* 13. exhibits a portion of the firſt inteſtine in the *plaiſe* (*pleuronectes plateſſa*) laid open to expoſe the puckered plicæ of the internal membrane. *Fig.* 14. of the ſame plate repreſents the abdominal viſcera of the *mullet* (*mugil cephalus*) as they appear on opening the body; *a*, the œſophagus; *b*, the liver, concealing the ſtomach; *c*, the numerous coils formed by the inteſtinal canal in this fiſh; *d*, ſome of the pyloric cæca, nearly of the ſame ſize of the inteſtine. *Fig.* 15. is a piece of the inteſtine of the *mullet* laid open, by which the villi of the internal ſurface are ſeen.

In *Plate* III. of the *Anatomy of Fiſhes*, *fig* 1. exhibits a part of the inteſtinal canal, with the gland attached to the rectum in the *dog-fiſh* (*ſqualus catulus*); *a*, the rectum; *b*, the glandular body, of an elongated figure in this ſpecies; *c*, a portion of the valvular part of the inteſtine left. *Fig.* 2. ſhews this gland in the *ſkate* (*raja batis*) magnified and laid open; *a*, the fundus; *b*, the neck of the gland; ſeveral irregular depreſſions are ſeen upon the inner ſurface. *Fig.* 3. repreſents the roſe-formed termination of the valvular inteſtine of the *ſqualus maximus* in the rectum, deſcribed by Mr. Home. *Fig.* 4. exhibits the inner ſurface of the rectum in the *turbot* (*pleuronectes maximus*); *a*, a portion of the firſt inteſtine, with ſlight, waving, longitudinal folds; *b*, the commencement of the rectum, marked by a valve; *c*, the internal ſurface of the rectum, forming very prominent, floating laminæ; *d*, the anus. *Fig.* 5. ſhews the form of the rectum, and its connection with the firſt inteſtine, in the *pimelodus bagre*; *a*, the origin of the rectum, which is enlarged, and receives the firſt inteſtine in the way of inſertion; *b*, the rectum becoming again enlarged. *Fig.* 6. exhibits the cæcal proceſs in the *piper* (*trigla lyra*); *a*, the firſt inteſtine; *b*, the part analogous to a cæcum; *c*, the rectum.

Liver.

The ſituation of this viſcus is generally the ſame in fiſhes as in the preceding claſſes; *i. e.* it immediately precedes the ſtomach, which it covers more or leſs by its lobes. In the genus *pleuronectes*, however, and ſome other fiſhes which have the abdominal cavity ſhort and round, the liver lies between the ſide of the ſtomach and firſt convolution of the inteſtine; to the former of which it is more immediately connected.

The liver is retained in its poſition by means of reflections of its peritoneal covering, which are attached to the ſeptum that ſuſtains the pericardium, and to the œſophagus, and likewiſe by the large veins that come from the liver to the junction of the ſubclavian veins.

The magnitude of the liver is in general very conſiderable in proportion to the ſize of the fiſh.

The colour of the liver varies; it is generally paler than in other animals; often an aſh-colour, and ſometimes milk-white.

Its form is ſubject to continual variety; it is generally not divided into many lobes; moſt frequently, perhaps, only into two. As Cuvier has conſidered the diviſions of the liver more in detail than we have done, we ſhall chiefly follow his deſcription, given in the Leçons d'Anatomie comparée.

In the genus *lamprey* (*petromyzon*) there is but a ſingle lobe ; the liver is much elongated, and has a good deal the figure of a tongue.

In the *rays* the liver is divided into three long lobes, which extend throughout the whole length of the abdominal cavity. Cuvier deſcribes but two long and very diſtinct lobes in the genus *ſqualus*, but, beſides theſe, we have noticed in the *leſſer dog-fiſh* (*ſqualus catulus*) two very ſmall, thin lobes, ſituated upon the ſide of the ſtomach next the ſpine.

The *ſpatularia* and *ſturgeon* have two large lobes to the liver, which are ſub-divided in the latter into a great number of lobules.

There are three diviſions made by ſhallow fiſſures in the *frog-fiſh* (*lophius piſcatorius*), and one lobe only in the *ſygnathus pelagicus*, the *tetraodons*, and the *lump fiſh* (*cyclopterus lumpus*).

Amongſt the *apodal* order of fiſhes, the *eels* (*murena*), and the *ammodytes tobianus*, the liver is not divided, but merely a little notched in ſome ſpecies of the firſt ; but there are two lobes in the liver of the *anarrhichas lupus*, the *electrical eel* (*gymnotus electricus*), and the *ſtromateus paru*.

Of the *jugulares*, the genera *gadus* and *blennius* have two or three long lobes.

In the *whiting* (*gadus merlangus*) the left lobe extends almoſt the whole length of the abdominal cavity, between the inteſtines and air bag.

The *weaver* (*trachinus draco*) has the liver compoſed of one lobe.

The liver is triangular, and without diviſion in the *cottus niloticus*, but the *cottus ſcorpæna* has two lobes. There are alſo two lobes in the liver of the *ſcorpæna volitans*, although that of the *ſcorpæna horrida* conſiſts of a ſingle lobe. There are two lobes in the liver of the *trigla cuculus*, of the *mullus barbatus*, of the *echeneis remora*, of the *pleuronectes fleſſus*, and of the *turbot* (*pleuronectes maximus*). The liver is without lobes in the following ſpecies of *pleuronectes* ; the *plaiſe*, the *pleuronectes lineatus*, and *limandoides* ; there is a ſmall lobe placed behind the principal one in the *ſole*, of a ſingular ſhape, with two points like horns, which has not been noticed by Cuvier. The liver has three lobes in the *ſcomber thynnus* ; that of the *ſcad* (*ſcomber trachurus*), and of the *pilot* (*ſcomber ductor*), have two lobes. There are three lobes in the little *ſtickleback* (*gaſteroſteus pungitius*) the common *ſtickleback* (*gaſteroſteus aculeatus*), and four in the *gaſteroſteus ſpinachia*. The diviſions of the liver are equally various in the *perch* and *ſciena* genera; the liver is without lobes, and of the ſhape of an arrow ; in the *river perch* it is likewiſe undivided ; and triangular in the *ſciena labrax* ; although Bloch ſays, there are two unequal lobes in the liver of this fiſh. In many other *ſcienas* and *perches* there are three lobes deeply ſeparated. In the *dory* (*zeus faber*) there are two lobes, one of which very much exceeds the other in ſize, and forms a kind of third lobe at its external corner. There are two lobes in the liver of the *chetodon ciliaris*, and only two ſlight notches in the *chetodon zebra*. The *holocentrus ſogo* has three unequal lobes. The liver of the *ſparus ſalpa* has three lobes ; there are two in that of the *ſparus pagrus*, the *ſparus erythrinus*, and likewiſe in the *labrus melops* ; but it is a ſingle lobe in the other ſpecies of *labrus*.

In the genera *cyprinus* the liver is very deeply divided into lobes, of which the number varies according to the ſpecies ; in the *carp* (*cyprinus carpio*) the lobes are ſo diſpoſed amongſt the different convolutions of the inteſtines, that it is difficult to aſcertain their number ; the liver in this ſpecies exceeds in proportional bulk that of every other animal. The liver does not divide into lobes in the *pike* (*eſox lucius*), in the *exocœtus exiliens*, in the *ſalmon* (*ſalmo ſalar*), in the *anableps tetropthalmus*, and in the *white mullet* (*mugil albula*). There are two lobes in many of the genus *clupea*, in the *ſilurus glanis*, and in the *loricaria maculata*. There are three lobes in the liver of the *ſilurus bagre*.

It ſhould be obſerved, that in the above inſtances there are uſually ſeveral ſlight notches and fiſſures upon the ſurface of the liver, which ſome anatomiſts would, perhaps, conſider as diviſions of this viſcus, although Cuvier has not done ſo.

The diviſions of the liver, as well as its figure, are but of little importance in all animals : ſometimes they are deſigned to accommodate the neighbouring viſcera, and at others look like accident ; but in no caſe can the form materially affect the functions of this organ.

The texture of the liver in fiſhes is remarkably ſoft ; unleſs in a very recent ſtate, it immediately gives way under the preſſure of the fingers. From all the obſervations we have been able to make, however, it appears to poſſeſs the ſame ſtructure as the liver in the three preceding claſſes ; the vena portæ terminates in penicillous branches, even more evidently in many fiſhes than in birds or reptiles.

The liver contains a great quantity of liquid oil in thoſe fiſhes that have not the fat diſperſed over the different parts of the body ; of theſe the *ſhark*, *ray*, *cod*, &c. are examples. The *gadus virens* has the liver ſo rich with oil, that the inhabitants of Norway catch it for the purpoſe of obtaining its oil to burn. Mr. Home ſtates, that the liver of the *ſqualus maximus* yielded about three hogſheads of oil. The oil of fiſhes appears as if it were diffuſed in thoſe parts which contain it, as it readily flows from them, but it is more probably depoſited in large cells, which freely communicate, than in the common interſticial ſubſtance.

The *biliary ducts* of the liver in fiſhes, except in a very few inſtances, do not conjoin to form a common hepatic duct, as in other animals ; they proceed directly as they leave the different lobes of the liver, to open either into the gall-bag or its excretory canal, or into both ; in conſequence of which the hepatic ducts are in general numerous and very ſmall in fiſhes.

In the *ſqualus maximus* a faſciculus of twelve ducts, like a navel ſtring, paſſes from the liver to the inteſtine, from which it is preſumed there is no gall-bag in this ſpecies.

In the *ray* genus there are ſeveral very ſlender ducts, which terminate in the gall-bag, and one large branch, which is furniſhed by the middle lobe of the liver, and communicates with the cyſtic duct.

In the *ſygnathus pelagicus* the different hepatic ducts produce a trunk, which, however, does not go on to the inteſtine, but terminates in the cyſtic duct.

In the genus *tetraodon* there are three principal hepatic ducts, of which the firſt opens into the gall bag, near the neck, and the other two enter the cyſtic duct at different diſtances.

In the *lophius piſcatorius* there are two hepatic ducts, which end in the cyſtic ; the one at its origin, and the other at ſome diſtance.

The *lump* (*cyclopterus lumpus*) forms an exception to the general rule, with reſpect to the termination of the hepatic ducts ; in this fiſh there is no gall-bladder, and the different branches from the liver ſoon unite, to form a ſingle duct, which proceeds directly to end in the inteſtine. The few fiſhes which do not poſſeſs a gall-bag have probably a ſimilar ſtructure, although it has not been examined.

In the *anarrhichas lupus* the hepatic ducts are extremely numerous : the right lobe of the liver furniſhes three faſciculi, of five or ſix branches, which enter diſtinctly into the gall-bag ; the left lobe gives origin to three faſciculi ; the firſt has three branches which open into the neck of the gall-bag; the others are compoſed each of two branches, and end in the cyſtic duct.

There are three or four principal hepatic ducts in the *eel*, which terminate in the ductus cyſticus near its origin.

In the *cod* (*gadus morrhua*) there are ſeveral ſmall hepatic ducts, which form four branches; theſe, after paſſing ſome way, enter an enlargement of the cyſtic duct, which takes place near its entrance into the inteſtine. In the *hake* (*gadus merlucius*) there are many ſmall hepatic ducts, which terminate in ſucceſſion upon the cyſtic duct.

The hepatic ducts of the *ſcorpæna horrida* penetrate the cyſtic duct.

In the *ſole* (*pleuronectes ſolea*) the ducts from the liver go chiefly to a dilated part of the ductus cyſticus. In the *brill* (*pleuronectes rhombus*) the cyſtic duct receives two from the liver before its dilatation; and one trunk, which is compoſed of ſeveral branches, enters the dilated part of the cyſtic duct. In the *turbot* (*pleuronectes maximus*) ſome of the hepatic lobes open into the gall-bladder, and others into the dilated part of the cyſtic duct.

In the *dory* (*zeus faber*) there are two or three minute canals which paſs from the ſmall lobe of the liver into the neck of the gall-bladder, and four conſiderable ducts that go from the large lobe to the cyſtic duct, which they enter at different diſtances.

In the *river perch* (*perca fluviatilis*) the hepatic duct opens into the neck of the gall-bag, and in the *ſea perch* (*ſciena labrax*) there are three principal branches from the liver which end in the cyſtic duct, at different diſtances.

The *barbel* (*cyprinus barbus*) has the hepatic ducts ending in the cyſtic.

The *ſalmon* ſends hepatic ducts into the neck of the gall-bladder.

In the *bichir* (*polypterus niloticus*) the trunk of the hepatic ducts is joined to the cyſtic.

In the *ſilurus bagre* there are eight or ten little ducts from the liver to the cyſtic duct.

In all the inſtances we have examined, the entrance of the hepatic ducts into the cyſtic, or the gall bag, is not accompanied by any valve or projection of the coats; the ſtructure of the hepatic ducts alſo appears to be ſimple, and the internal ſurface without any valve or reticulation.

The *gall-bag* is not univerſally met with in fiſhes; it has not been found in the *lamprey* (*petromyzon marinus*); in the *pride* (*petromyzon branchialis*) in the *lump* (*cyclopterus lumpus*); the *piper* (*trigla lyra*); the *pleuronectes radiatus*, the *perch* of the *Nile*, and in many *ſcienas*; we have not obſerved a gall-bag alſo in the *weaver* (*trachinus draco*).

Theſe inſtances of the abſence of the gall-bladder are fewer than thoſe noticed in mammalia, and in birds; a reſervoir in which the bile may be concentrated, it may be concluded, is therefore more neceſſary to fiſhes than to the hot blooded animals; the circumſtance of the bile all paſſing through either the gall-bag or its duct, when thoſe parts exiſt, is a ſtrong proof of this opinion.

Cuvier deſcribes the gall-bag as being more variable with reſpect to poſition in fiſhes than in the other claſſes; it is ſituated horizontally or obliquely, in regard to the whole fiſh, and in thoſe two caſes its fundus may be either turned forwards or backwards; at other times it is placed tranſverſely under the ſtomach, of which the *ſilurus bagre* affords an example; it is ſometimes in a degree imbedded or concealed by the ſubſtance of the liver.

The form of the bag is alſo ſubject to variety; it is moſt commonly either egg ſhaped or pyriform; ſometimes it is globular; ſometimes it is ovular, with the end next the duct very obtuſe or flattened; this we have obſerved in ſome of the *flat fiſhes* (*pleuronectes*). In the *leſſer dog-fiſh* (*ſqualus catulus*) we have found it of the ſhape of a tube, nearly two inches long; the duct ariſes from the end the fartheſt from the inteſtine, and is ſeen like a ſmaller canal, accompanying the other which compoſed the gall-bladder.

The bulk of the gall-bag is alſo variable; perhaps it might be ſtated that it is large in proportion to the rapidity of the digeſtion in the fiſh. The bag is large in the *anarrhichas lupus*, the *pike*, the *ſpatularia*, and *moon-fiſh*, (*diodon mola*); it is ſmall in the *ſygnathus pelagicus*, *ſcorpæna horrida*, the *river perch*; ſeveral of the genus *chetodon*, the *ſole*, *brill*, and ſome others of the *pleuronectes*, alſo have a ſmall gall bag, but in thoſe the dilatation of the cyſtic duct makes amends for it.

The ſtructure of the gall-bag would ſeem to be ſimply membranous, the parietes are thin and ſmooth on the inner ſurface, which do not exhibit any glandular appearance or reticulation.

The *cyſtic duct* in general paſſes off directly from one end of the gall-bag, without forming any contortion, as in mammalia; it is alſo, as far as we have obſerved, a ſimple membranous tube, with a ſmooth ſurface internally, and the orifice by which it communicates with the gall-bag is unprovided with any valvular ſtructure, by which means the bile flows through it without interruption.

The cyſtic duct tranſmits all the bile which paſſes to the inteſtines, with a few exceptions of thoſe fiſhes which are unprovided with a gall-bladder; it therefore correſponds to the ductus communis choledocus of other animals. In ſeveral fiſhes, as the *cod* (*gadus morrhua*), ſome of the *pleuronectes*, as the *ſole*, *brill*, *turbot*, and others, the cyſtic canal forms a remarkable dilatation previous to its termination in the inteſtine; this dilated part receives ſome or all the ducts from the liver; it is ſo large in the *turbot*, that Cuvier deſcribes it as a ſecond gall-bag, to which it certainly correſponds in its office, by accumulating and detaining the bile on its way to the inteſtine.

The cyſtic, or rather common biliary duct, uſually diſcharges its fluid into the inteſtine, along with the pyloric cæca, by an opening in the midſt of theirs; ſometimes it ends in one of the cæca. This happens in the *plaiſe* (*pleuronectes plateſſa*), the *river perch*, and the *dory* (*zeus faber*). The duct enters the inteſtine at ſome diſtance from the pylorus in the *pike* (*eſox lucius*).

In the *ſqualus maximus*, the orifice through which the bile is poured into the inteſtine is placed upon a proceſs like a nipple.

The magnitude of the liver, and the formation of the biliary ducts in fiſhes, plainly indicate two circumſtances in their phyſiology, namely, that a large quantity of bile is ſecreted, and that this fluid paſſes in a concentrated ſtate into the inteſtinal canal. It is remarkable that the bile is ſcarcely to be detected in the tract of the firſt inteſtine, and that even the fæces in the laſt portion of the canal are leſs coloured by this ſecretion than in other animals; this fact ſtrongly ſupports the opinion of the bile being deſtined to aſſiſt in the converſion of the alimentary ſubſtance into chyle, in performing which it is itſelf decompoſed and diſpoſed of.

The *bile* of fiſhes, as far as we are acquainted, has not yet been ſubmitted to any exact analyſis; it does not however appear to differ materially in its properties from the ſame fluid in other animals. It is uſually of a deep green colour, although the liver is often in fiſhes of a pale yellow colour, which probably ariſes from the bile ſojourning for ſome time in the gall bag, before it is carried into the inteſtine. It is alſo more fluid than in mammalia and birds, as might be expected in conſequence of the gall-bag not being conſtructed to furniſh a mucous ſecretion as in theſe animals.

In *figs.* 5 and 6, of *Plate* I. of the *Anatomy of Fiſhes*, the letter *h* indicates the faſciculi of twelve biliary ducts, which are found to paſs from the liver to the firſt inteſtines in the *ſqualus maximus*.

In *Plate* III. of the *Anatomy of Fiſhes*, *fig.* 7. ſhews the manner in which the hepatic ducts proceed to the gall-bag and cyſtic duct; *a*, the portion of the liver next the gall-bag; *b*, the gall-bag; *c*, the dilated part of the cyſtic duct; *d*, the hepatic ducts paſſing to the gall-bag; *e*, the ducts from the liver to the dilatation of the cyſtic duct. *Fig.* 8. of the ſame plate, exhibits the termination of the biliary ducts in the *wolf-fiſh* (*anarrhichas lupus*); *a* is the liver; *b*, the gall-bag; *c*, the cyſtic duct; *d*, a portion of the inteſtine, into which the cyſtic duct opens; *e*, faſciculus of ſeveral hepatic ducts from the right lobe, going to terminate diſtinctly in the gall bag; *f*, faſciculus from the left lobe ending in the neck of the gall-bag; *g*, *g*, two other faſciculi from the left lobe, which open into the cyſtic duct. *Fig.* 9. of this plate, repreſents the hepatic ducts going to the inteſtine in the *lump fiſh* (*cyclopterus lumpus*); *a* is a part of the liver; *b*, the hepatic duct, coming from the liver, and uniting into a common duct, which is indicated by *c*; *d* is the portion of the inteſtine into which the common biliary duct opens.

In *fig.* 6. of *Plate* I. of the *Anatomy of Fiſhes*, the letter *f* points out the nipple-ſhaped proceſs, on which is ſeen the orifice of the hepatic ducts within the inteſtine of the *ſqualus maximus*.

Cæca, or pyloric Appendices.

Cuvier has, with ſome propriety, conſidered theſe parts as proceſſes of the inteſtinal canal, and has combined his deſcription of them with that of the inteſtines; in ſome fiſhes they are ſo wide, that the alimentary ſubſtances muſt neceſſarily paſs into them, but in general they are very ſmall worm-like proceſſes, with a cavity ſcarcely wide enough to admit a probe; but whatever their bulk may be, they are always continuous with the tube of the inteſtine.

The internal ſurface of the cæca is extremely vaſcular, even more ſo frequently than that of the adjoining inteſtine. When the internal membrane of the inteſtine is plicated or laminated, that of the cæca is ſometimes reticulated; but in general the ſtructure of the inner ſurface of the cæca correſponds with that of the neighbouring ſurface of the inteſtine, although it may not be ſo ſtriking.

The cavity of the cæca always contains a quantity of tenacious mucus, which may be more abundantly obtained by preſſing the parietes of the cæca between the fingers.

The cæca poſſeſs a muſcular and a membranous coat, like the other parts of the inteſtinal canal.

The cæca in general bear conſiderable reſemblance, both in ſize and figure, to a cluſter of worms attached to the canal of the inteſtine by one extremity; in ſome inſtances they are conjoined to form trunks, which open into the inteſtine. In the *ſpatularia* they are united two and two, and produce ſeven principal branches, which at laſt join in one trunk. In the *ſturgeon* they are ſhort and wide, and collected together into one maſs, into the centre of which they all open by very large mouths; the inner ſurface is deeply reticulated, ſo as to give the whole maſs, when cut into, rather the appearance of a congeries of cells, than a collection of ramified tubes, which has led many authors to deſcribe this part in the *ſturgeon* as a ſingle gland analogous to the pancreas; the muſcular coat is ſtrong; and has the fibres diſtributed in different directions, and the opening of the conjoined cæca into the inteſtine is ſingle, and would be as wide as that canal if it were not for an annular fold which contracts the orifice a little. There is a greyiſh glandular ſubſtance very diſcernible behind the cells, ſimilar to the glandular layer already noticed in the firſt inteſtine of this fiſh.

There is great variety with reſpect to the number of the pyloric cæca, and in ſeveral fiſhes they are altogether wanting; neither their preſence, however, nor their number, ſeems to have much relation to the habits or general ſtructure of the fiſh, except in the *ray* and *ſhark* genera, in which the cæca are wanting, and their places ſupplied by a real pancreas.

Beſides, in the *chondropterygii* the cæca are not found in the genera *ſygnathus*, *oſtracion*, *baliſtes*, *tetraodon*, and *diodon*, amongſt the branchioſtegi; in any of the *apodal* fiſhes: in the *uranoſcopus* and *blennius* genera, in ſome ſpecies of *pleuronectes*; in the *ſparus ſpinifer*, and the *labrus tinca*: in the *anableps tetropthalmus*, many ſpecies of *eſox*, the genera *cyprinus* and *ſilurus*, and probably others which have not been examined.

Cuvier has taken the pains to reckon the number of pyloric cæca which exiſt in many fiſhes; we ſhall therefore follow his account.

The *lophius piſcatorius* has but two, which are ſmall and ſomewhat pyriform in their ſhape.

In the *cyclopterus lumpus* the cæca are ſmall, form about ſix ramified rays, and as they approach the inteſtine they unite and open into each other.

In the genus *gadus*, the number of the appendices varies; they are alſo often ramified, or united into trunks, which open into the inteſtine; there are four orifices of theſe in the *whiting* (*gadus merlangus*), and ſix in the *cod* (*gadus morrhua*). In the *hake* (*gadus merlucius*) there is, in place of the cæca, one large cul-de-ſac, of which the bottom is turned forwards, and which opens by a large aperture into the commencement of the inteſtinal canal; there are eight cæca in the *gadus muſtela*, thirty-two in the *barbel* (*gadus lota*), and thirty-four in the *ling* (*gadus molva*).

There are eight long and ſlender appendices in the *weaver* (*trachinus draco*).

In the genus *cottus* the number of the cæca varies from four to nine.

There are ſix in the *remora* (*echeneis remora*). Twenty-ſix cæca are found in the *ſurmullet* (*mullus ſurmuletus*), and ſix only in the *mullus barbatus*.

The *ſcorpæna horrida* has four cæca; the number varies much in the genus *trigla*; the *piper* (*trigla lyra*) has from eight to ten; the *trigla cataphracta* ſix.

In moſt of the *pleuronectes* there are but two cæca, as in the *turbot*, the *brill*, the *pleuronectes limanda*, the *flounder*, the *dab*. Cuvier alſo reckons two in the *plaiſe*, and only one in the *hollibut*: as far as our recollection ſerves, there are two very large cæca in the *hollibut*, and in the *plaiſe*, beſides the two ſmall conical dilatations at each ſide of the origin of the inteſtinal canal. We have lately diſcovered, about an inch beyond theſe, a third cæcum, from the ſide of the inteſtine, exactly reſembling in ſhape and ſtructure the two already deſcribed by authors. This is the more worthy of remark, as it is the only inſtance we know in which the firſt inteſtine of fiſhes furniſhes any ſuch proceſs except at the pylorus.

In the *mackarel* (*ſcomber ſcombrus*) the cæca are very numerous; but there are only three in the *ſcomber ſanſun*, in the *ſcomber thynnus* there are two, which divide each into three branches. In the *pilot* (*ſcomber ductor*) there are twenty-five; and in the *ſcad* (*ſcomber trachurus*) twelve or thirteen cæca.

There are but two little appendices ſituated at each ſide of the pylorus in the *ſtickleback* (*gaſteroſteus aculeatus*).

The cæca are fine and ſmall in moſt of the *perches* and *ſcienas* In the common *perch* (*perca fluviatilis*), and the *perca zingel*, there are but three. In the *perca nilotica* there are four; ſix cæca are found in the *perca lucio-perca*. There are ſeven or eight in the *ſciena nigra*; five in the *ſciena labrax*, and ſix in the *ſciena cirroſa*, and a much greater number in the other individuals of this genus.

There are four cæca in the *teuthis hepatus*. The *chetodon arcuatus* has about thirty long, ſlender cæca; the *chetodon zebra* only five.

In the genus *ſparus* there are uſually from three to five cæca; the *ſparus ſalpa* has four; the *ſparus auratus*, and *ſparus ſargus*, have three; the *ſparus pagrus*, *ſparus mæna*, and *ſparus brama*, have each four, and there are five in the *ſparus annularis*.

The cæcal appendages are numerous in the genus *clupea*. There are eighteen long, ſlender cæca in the *anchovy* (*clupea encraſicolus*); twenty-four in the *herring* (*clupea harengus*), which open into the inteſtine by twelve orifices, ranged in a line; there are as many as eighty in the *clupea aloſa*.

The genus *ſalmo* exhibits great variety in this reſpect; there are but ſix in the *ſmelt* (*ſalmo eperlanus*), although in the *ſalmo muræna* there exiſt one hundred and fifty; in the common *ſalmon* (*ſalmo ſalar*) there are about ſeventy, placed in ſeveral rows, along the ſide of the inteſtine.

There are two cæca in the *mormyrus labiatus*. Geoffroy.

The common *mullet* (*mugil cephalus*) has ſix cæca; the *mugil albula* but one.

The only point of view in which we can conſider the pyloric cæca is, as prolongations, or proceſſes of the alimentary canal, deſigned to furniſh an additional quantity of the inteſtinal mucus; this office is reconcileable to all the varieties of form and number, and the occaſional abſence of theſe parts, which could only affect the mucous ſecretion of the cæca with reſpect to quantity, and any deficiency of that fluid might be ſupplied by a more copious ſecretion from the inteſtine itſelf. This opinion ſeems ſupported by the relative magnitude of the cæca, and of the parts of the alimentary canal from which they ariſe. We have obſerved that the capacity of the ſtomach, or of the firſt part of the inteſtine, is greateſt in proportion to the bulk of the fiſh, in thoſe ſpecies where the cæca are either wanting or few, and that theſe parts are commonly ſmall when the cæca are numerous or large.

In *Plate* II. of the *Anatomy of Fiſhes*, *fig.* 4. exhibits the three cæca in the *plaiſe* (*pleuronectes plateſſa*): *c* is the pylorus; *d*, *d*, the two pyloric cæca; *e*, the third cæcum peculiar to this fiſh, ariſing from the inteſtine, at a ſhort diſtance from the pylorus. *Fig.* 12. of the ſame plate gives a view of the internal ſurface of the cæca, and the adjoining parts of the inteſtine in the *turbot* (*pleuronectes maximus*): *a* is the laminated ſurface of the inteſtine; *b b*, the internal membrane of the two cæca, in which the laminated ſtructure is leſs apparent. The letters *e*, *e*, *e*, of *fig.* 7. and the letter *d*, in *fig.* 14. of this plate, refer to ſome of the cæca in the *mullet* (*mugil cephalus*).

In *Plate* III. of the *Anatomy of Fiſhes*, *fig.* 10. ſhews the internal ſtructure of the cæca, and their connection with the inteſtine in the *ſturgeon* (*acipenſer ſturio*); *a*, the cavity of the inteſtine; *b*, the valve of the pylorus; *c*, the cavities of the cæca expoſed by a ſection. The larger orifices belong to branches of the cæca, the ſmaller to the cells produced by the reticulation of their internal membrane; *d*, the large common opening of the cæca into the gut; *e e*, the muſcular coat which ſurrounds the cæca, and gives them the appearance of a ſingle gland. *Fig.* 11. of the ſame plate repreſents the numerous cæca in the *ſalmon* (*ſalmo ſalar*); *a* is a portion of the inteſtine at the pylorus; *b b*, the cæca in great numbers arranged along the inteſtine.

Pancreas.

This gland only exiſts in two genera of fiſhes, the *ray* and *ſhark*; the glandular apparatus which has been deſcribed by ſome anatomiſts as a pancreas, in the *ſturgeon*, is really, as we have before obſerved, only an aſſemblage of ſhort cæca, having many communications with each other.

The pancreas is ſituated immediately beyond the pylorus, upon the firſt inteſtine; its form is ſomewhat triangular, but very irregularly ſo; it is divided into lobes. In the *ſmaller dog-fiſh* (*ſqualus catulus*), we have obſerved the pancreas to be double, or of two portions, of which one is placed on each ſide of the inteſtine.

The texture of the gland is ſoft, compact, and uniform; its minute ſtructure is, therefore, obſcure; its colour is a rich reddiſh white; it has a much ſmaller proportional volume, than the pyloric cæca uſually have, to thoſe fiſhes in which they exiſt.

The fluid which this gland ſecretes, appears to reſemble the pancreatic juice of the three preceding claſſes of animals, and not the mucus of the pyloric cæca; which circumſtance, as has been before mentioned, affords a ſtrong preſumption that the offices of theſe two ſecretions are different.

Spleen.

This organ is ſuppoſed to exiſt in all fiſhes; we have, however, failed to detect it in two diſſections of the *lamprey* (*petromyzon marinus*); but, until aſſured by further obſervation, we are unwilling to aſſert poſitively, that ſo extraordinary a departure from the common ſtructure of the claſs does occur in this ſpecies; it may be preſumed, however, that if this fiſh poſſeſs a ſpleen, it is ſo inſignificant as to readily eſcape notice.

The ſituation of the ſpleen, with reſpect to the adjacent viſcera, is by no means uniform in fiſhes; it is perhaps moſt commonly placed on the upper ſide of the cæcal portion of the ſtomach, that is to ſay, between its fundus and the ſwimming bladder, which lies along the back.

In the *ſhark* and *ray* genera it projects from this ſituation, ſo that one half of it lies on the left ſide of the ſtomach.

In the *angel-fiſh* (*ſqualus ſquatina*) Monroe obſerved two ſpleens, one of which was attached to the large, the other to the ſmaller curvature of the ſtomach. In the *leſſer dog-fiſh* (*ſqualus catulus*) the ſpleen is divided by a deep fiſſure, which is what we preſume doctor Monroe meant by two ſpleens; one portion is on the left ſide of the fundus of the ſtomach, and the other paſſes above it. Mr. Home repreſents the ſpleen of the *ſqualus maximus* as a chain paſſing round the ſtomach. Cuvier deſcribes two branches of the ſpleen in the *ſturgeon* (*acipenſer ſturio*), which are attached to the curvature that the ſtomach makes in this fiſh poſteriorly. Doctor Monroe reckoned ſeven ſpleens in the *ſturgeon*, but all very ſmall; the largeſt, he ſays, did not exceed the ſize of a dried horſe-bean, and the other ſix were none of them larger than a dried garden pea.

The ſpleen is enveloped by the meſentery, near the commencement of the inteſtinal canal in the *lump fiſh* (*cyclopterus lumpus*). It is fixed on the right ſide of the beginning of the firſt inteſtine in the *ſpatularia*. In the *eel* it is placed between the ſtomach and the next portion of the inteſtinal canal. In the *ſcorpæna* it is found interpoſed between the pyloric extremity of the ſtomach, and one of the cæca. The *remora* has it ſituated between the liver and the ſtomach; its poſition is likewiſe ſimilar in ſeveral ſpecies of *pleuronectes*, as the *plaiſe*, *ſole*, *brill*, &c.

In the *dory* (*zeus faber*) it is connected to the left ſide of the cæcal portion of the ſtomach. It is extended upon the funnel-ſhaped cul-de-ſac of the ſtomach in the *mullet* (*mugil cephalus*); and the *pike* (*eſox lucius*) has the ſpleen ſuſpended in the curve which is produced poſteriorly by the ſtomach and the firſt inteſtine.

The ſhape of the ſpleen is in general irregularly triangular. Cuvier, as before mentioned, deſcribes the ſpleen of the *ſturgeon* as forming two branches anteriorly. The ſpleen is much elongated in the *ſpatularia*, the *viviparous blenny*, &c.; it is ſmall and ſpherical in the *plaiſe* (*pleuronectes plateſſa*), the *echeneis remora*, and others; of a very irregular ſhape in the *barbel* (*cyprinus barbus*). Collins has ſtated the ſpleen to be double in ſome of the *pleuronectes*, as the *turbot*, *plaiſe*, and *flounder*; likewiſe in the *eel*, the *mullet*, and others, in which he appears to have been incorrect, or to have reckoned the fiſſures of the ſpleen as complete diviſions of the viſcus.

The internal organization of the ſpleen appears to agree with that deſcribed in the other claſſes of animals. The arteries divide like the branches of a broom, and terminate in very minute ramuſcules; the veins originate from cells, which, although not large, are ſometimes very viſible in conſequence of their containing a dark coloured ſubſtance: when the texture of a ſpleen is unravelled, which is very eaſy from the looſeneſs of its texture, the cells, if filled with this ſubſtance, appear like ſmall grains of coffee adhering to the extremities of the veſſels; this dark appearance of the cells is not general, nor do we believe conſtant in the ſame individual; it ſeems to be rather an accidental condition of the organ: after it has once been perceived, there is no difficulty in recognizing the ſame ſort of granular appearance, of a pale browniſh colour, in the ſpleens of other fiſhes. What is the ſubſtances which give the granular appearance in the ſpleen of fiſhes? Is it the ſplenic blood changed in its properties while paſſing through the cells? More obſervation is required to anſwer theſe queſtions.

Abſorbents.

The honour of diſcovering the lymphatic ſyſtem in fiſhes has been claimed both by Dr. Monroe and Mr. Hewſon; but it ſhould probably be ſhared between theſe two anatomiſts, who were both engaged in the purſuit of it about the ſame period. The reaſon for its remaining ſo long unknown, ſeems to have been the greater magnitude of the abſorbent veſſels in this claſs than in mammalia, or birds. Anatomiſts, in ſearching for the minute branches, overlooked thoſe palpable plexuſes, cells, and trunks, which, when once diſcovered, rendered the developement of the whole ſyſtem perfectly eaſy; thus we find Mr. Hewſon made many unſucceſsful attempts with different fiſhes, both recently dead and while ſtill alive, before he was able to detect any veſſels of this nature. Another circumſtance which ſtood in the way of the diſcovery of this ſyſtem of veſſels was, that it does not poſſeſs any lymphatic glands, as in mammalia.

We ſhall firſt give a deſcription of the abſorbents in the *chondropterygii* and afterwards in the *oſſeous* fiſhes.

In the *ſkate* (*raja batis*) the lacteals may be ſeen to ariſe numerouſly from the ſtomach and inteſtines; they accompany the blood-veſſels of theſe organs; they communicate with a ſingular cellular body, which lies along the great curvature or external ſide of the ſtomach. The internal ſtructure of this part, when prepared by inflation and drying, reſembles ſomewhat the cancelli of the bones, being compoſed of a great many cells of very irregular ſhapes, and all communicating the one with another. The principal abſorbent veſſels paſs through it.

This cellular receptacle of the chyle may probably perform the ſame offices of the abſorbent glands in other animals.

The lymphatics of the liver, gall-bag, pancreas, and ſpleen, alſo accompany the blood-veſſels of theſe parts; they freely communicate with each other, and, uniting with the abſorbents of the ſtomach and inteſtines, they form a plexus on each ſide of the ſtomach, which proceeds along the ſides and the back part of the œſophagus to the ſide of the ſpine, and near to the large veins analogous to the ſubclavian; at theſe parts all the abſorbents of the different parts of the body are aſſembled.

The lymphatics of the kidnies and organs of generation, with thoſe of the tail and poſterior parts of the body, proceed along the ſpine.

The lymph of the head and lateral fins is conveyed into the common reſervoir, principally by means of a large trunk, which paſſes on each ſide of the head, and which receives large lateral branches from the adjacent parts.

The different abſorbents of each ſide of the body, after communicating with each other in the ſubclavian plexus, furniſh two ſhort trunks which go to terminate, the one on the right, the other on the left ſubclavian vein, near the junction of thoſe veſſels with the internal jugular veins. Theſe two trunks correſpond in their office to the thoracic ducts of other animals, but do not ſerve as reſervoirs, as they have leſs capacity than the plexus from which they take their origin.

At the orifices of the trunks into the ſubclavian veins, there are placed two ſemilunar valves, to prevent the blood eſcaping into them. There is no other inſtance of valves throughout the abſorbent ſyſtem of fiſhes; although the veſſels have a flattened, jointed appearance, as if their canal was interrupted by valvular contractions.

In the *oſſeous fiſhes*, of which the *cod* and *haddock* are taken as examples, the lacteals are of a ſmaller ſize than in the *ſkate*; they run on each ſide of the meſenteric artery, and form numerous tranverſe communications over this veſſel; they enter a large receptaculum, which lies on the right ſide of the anterior, or œſophageal portion of the ſtomach.

This receptacle is compoſed at its back part, according to Hewſon, of two branches; the one lies between the commencement of the inteſtinal canal and the ſtomach, and runs a little way upon the cæca, receiving the lymphatics of the liver, cæca, and thoſe of the poſterior part of the ſtomach, and part of the lacteals. The other branch of the receptaculum receives the lacteals of the remainder of the inteſtinal canal; the receptaculum alſo derives ſome lymphatics from the ſwimming bladder, from the gall-bag, and the poſterior part of the œſophagus.

Mr. Hewſon has deſcribed the thoracic duct as ariſing from this receptaculum, paſſing for about half an inch in the *haddock*, on the right ſide of the œſophagus, where it divides into two branches, one of which paſſes behind the œſophagus to the left ſide, the other goes ſtraight on, on the right ſide, runs paſt the upper part of the kidney, from which it receives ſome ſmall branches, and ſoon after is joined by a branch from the large lymphatic that lies upon the clavicular bone. It likewiſe, near this part, ſends a branch to join the duct of the oppoſite ſide, and then a little farther on is joined by thoſe large lymphatics which make a net-work behind the heart. Theſe laſt-mentioned veſſels receive the lymphatics from the anterior gills and fauces. The thoracic duct, after being joined by theſe veſſels, communicates with the net-work near the orbit; where its lymph is mixed with that of the lymphatics from the poſterior part of the gills, from the anterior fins, the belly, &c. and then from this net-work a veſſel goes into the jugular vein, juſt below the orbit.

The lymphatics of the left ſide agree exactly with thoſe of the right. Hewſon's Account of the Lymphatic Syſtem in Fiſh. Phil. Tranſ. for 1769.

Neither Hewſon nor Cuvier, (who ſeems to have copied his deſcription) have repreſented the common receptacles of the lymph in *oſſeous* fiſhes accurately. Theſe parts do not deſerve to be called net-works, but, as Dr. Monroe has named them, large *cellular* receptacles; they are particularly large in the *haddock* (*gadus æglefinus*), and *cod* (*gadus morrhua*), and are moſt eaſily demonſtrated by injecting with a fluid, or inflating any of the large abſorbents in the neighbourhood of them. Theſe receptacles are ſituated immediately behind the gills, and may be diſplayed by cutting through the integuments at that place; the receptacles have leſs magnitude in the *ſalmon* (*ſalmo ſalar*), but are ſtill too much dilated to merit the name of a plexus of veſſels.

The receptacles communicate by large canals, which croſs from one to the other, behind or above the heart and œſophagus.

Independently of the abſorbents of the viſcera already deſcribed, the lymphatics of the head and muſcular parts of the body give origin to four principal trunks, and a plexus which terminate in the large receptacles, or common reſervoir of the ſyſtem.

The firſt of theſe carries the lymph of the under ſurface of the body and tail; it is a conſiderable veſſel, extending along the medial line of fiſh; from the tail towards the head it becomes a little enlarged under the thorax, and communicates with the large receptacles, by means of ſome foramina which lead into a canal on each ſide, between the two ventral fins.

The next two trunks are alſo ſuperficial; they run along the ſides of the fiſh near the lineæ laterales. From each ſide of theſe trunks a number of branches go off immediately under the ſkin, which produce a beautiful penniform appearance; theſe trunks open directly on each ſide into the common receptacles that are placed behind the gills. Beſide theſe veſſels, Hewſon deſcribes a deep-ſeated ſet of abſorbents, which accompany the ribs.

The fourth trunk is deeply ſituated and large, it commences near the tail, and lies between the roots of the ſpinous proceſſes of the vertebræ; as it proceeds towards the head it collects the lymph, from the dorſal fins and adjacent parts of the body; having arrived near the head it ſends a branch to each thoracic duct, near the part where they come off from their common trunks.

The lymphatics of the brain and organs of ſenſe, and thoſe from the mouth, jaws, and gills, form a complex anaſtomoſis or plexus near the orbits, and ſend a veſſel into each of the common reſervoirs.

In the *ſalmon* each of the receptacles terminates the ſyſtem, by ſending a canal into the upper end of the correſponding inferior vena cava, contiguous to and on the fore and outer ſide of the internal jugular vein.

The entrances into the venous ſyſtem are guarded in *oſſeous* fiſhes, as in the *ſkate*, by ſemilunar valves.

As the abſorbent veſſels are unprovided with valves, the moſt effectual way of expoſing them, is to inject the ſyſtem from ſome of the principal trunks; the beſt for this purpoſe is the one which runs under the ſkin of the belly. By this means the moſt minute branches may be filled and exhibited. Dr. Monroe ſucceeded in injecting from the trunk, the abſorbents of the brain, of the membranes of the eye, and the ear in the *ſkate* (*raja batis*), by which he diſcovered that the lymphatics of the brain form an intricate plexus; he alſo filled the ultimate branches of the abſorbents of the ſkin. Theſe are moſt beautifully reticulated, and are particularly large and numerous upon the upper or dorſal ſurface of the *ſkate*, on which they terminate by foramina capable of being demonſtrated. Dr. Monroe ſays, that not only water, but air, milk, quickſilver, and even oil of turpentine, coloured with the powder of vermilion, were diſcharged upon the ſurface of the ſkin, by a vaſt number of diſtinct orifices, placed at regular diſtances from each other; yet the force with which theſe liquors were injected was very ſmall, and there was no extravaſation into the cellular ſubſtance any where under the ſkin, or in the interſtices of the muſcles. It is remarkable that the effuſion of theſe liquors upon the ſkin takes place only on the upper ſurface of the fiſh, where the ſkin is tough and ſcabrous: it however proves that it does not happen in conſequence of extravaſation, or rupture of the veſſels, for in that caſe the effuſion would be ſolely or principally ſeen on the under ſurface of the fiſh on which the ſkin is much more weak and thin. Monroe concludes that the cutaneous lymphatics, ſituated on the back of the *ſkate*, are deſigned to abſorb a portion of ſea water for the purpoſes of furniſhing the ſalt liquor found in ſuch conſiderable quantity within the cranium of that fiſh. See Monroe's Phyſiology of Fiſhes, p. 34.

The facility of injecting the abſorbents from their trunks enabled Mr. Hewſon alſo to fill a ſeries of very minute veſſels, between the internal and muſcular coats of the inteſtines; and upon the plicæ, (or, as he terms them, villi) in theſe ſituations the abſorbents anaſtomoſe and run together, ſo as to produce a very cloſe and beautiful reticulation. If mercury be injected into this net-work at one part, it ſpreads over the inteſtine; and if the inteſtine be inverted, and the mercury ſqueezed, it is eaſily forced into the ſmall veſſels on the internal coat.

In one injection Mr. Hewſon made of the ſtomach of the *cod*, the abſorbents were ſeen to paſs through the external coats, dividing into ſmaller and ſmaller branches, without any appearance of a net-work between the muſcular and villous coats, although conſiderable force was employed in the injection; from which he concludes that the abſorbent veſſels of the ſtomach do not poſſeſs the ſame arrangement as thoſe of the inteſtines. See Hewſon's Account of the Lymphatic Syſtem in Fiſhes. Phil. Tranſ. vol. lix.

In *Plate* IV. of the *Anatomy of Fiſhes*, *fig.* 1. repreſents the curvature of the ſtomach of a *ſkate*, (*raja batis*) with the cellular receptacle of the chyle in ſitu and of the natural ſize; *a*, the portion of ſtomach; *b*, the cellular receptacle attached to it. *Fig.* 2. of the ſame plate, exhibits the receptacle magnified, and cut open, after having been previouſly inflated and dried, in order to expoſe its internal ſtructure; *a*, indicates the cellular part; *b*, *b*, the abſorbent veſſels paſſing longitudinally through the receptacle and communicating with its cells. *Fig.* 3. of *Plate* IV. diſplays the common receptacle of the chyle and lymph in the *haddock*, (*gadus æglefinus*) with ſome of the lymphatic trunks which enter it; *a* is the receptacle diſtended by injection, it appears like a large ſac, ſituated immediately behind the gills; in order to expoſe it the gill-cover is cut away; *b*, the branchiæ; *c* is the abſorbent which runs along the middle line of the belly, and communicates with the receptacle by branches ſent in between the abdominal fins; *d*, the lateral abſorbent trunk, which enters the receptacle directly; *e*, the lateral ſubcutaneous duct obſcurely ſeen, running parallel with the lateral abſorbent veſſel.

Heart.

Fiſhes have not, properly ſpeaking, a thoracic cavity, although their heart and gills are very diſtinctly ſeparated from the abdominal viſcera, by means of a ſeptum, which croſſes the body immediately before the liver. This diaphragm is not muſcular, as far as we have obſerved, but receives a ſlender muſcle on each ſide from the ſcapula. It is uſually thick and firm, and is apparently compoſed of tendinous fibres, interwoven together like the muſcular faſciculi of the internal ſurface of the human auricle, and the web thus formed is further ſtrengthened by the peritoneum on one ſide, and the pericardium on the other.

The heart is ſituated in the middle line of the body, between the branchiæ of each ſide, and farther forward, that is, nearer the head than in other animals; the ſpace between the mouth and the belly being generally very inconſiderable in fiſhes.

The *pericardium* is larger, and of a rounder figure than the heart; this is neceſſary on account of the irregular form of that viſcus.

The external reflection of the pericardium is in general a ſtronger membrane than the peritoneum; it appears to be tendinous in ſtructure, although commonly very thin.

We have not obſerved any material deviations from the common ſtructure of the pericardium, except in the *lamprey* (*petromyzon marinus*), in which we have lately diſcovered a moſt ſingular conformation of the part. The pericardium in this fiſh is compoſed of firm cartilage, of a rounded figure, and ſo far imbedded in the anterior portion of the liver, that a great part of it is concealed from view until the ſubſtance of the latter be cut aſunder; there are ſeveral fræna, or tendinous proceſſes ſent off from the internal ſurface of this cartilaginous ſac, which are attached to the ſurface of the heart, and ſerve to ſuſtain it in its proper poſition in the bag.

The above ſtructure in the *lamprey* is a confirmation of an opinion we have held, that the pericardium does not alter its figure with the contraction and dilatation of the different parts of the heart; from which ariſes the neceſſity of a greater quantity of aqueous fluid in this cavity, than is found in thoſe containing the other viſcera.

The pericardium of the *ſkate* (*raja batis*), as has been mentioned in ſpeaking of the abdominal cavity, was diſcovered by Doctor Monroe to produce a funnel-ſhaped elongation towards the abdomen, which is divided into two branches or canals, terminating by open mouths in the latter cavity; as far as our obſervation goes, this ſtructure is peculiar to the *ray* genus.

The heart in fiſhes is compoſed of two cavities only, an auricle for receiving the blood from the veins of the body, and a ventricle for propelling it to the branchiæ. The diſtinction of theſe parts is very evident, by which the figure of the heart is rendered peculiar, appearing like two bodies connected to each other.

The poſition of the auricle, with reſpect to the ventricle, is ſubject to vary; it is uſually placed anterior to it; it covers, and even paſſes beyond the ventricle in the genus *gadus*, the *rays*. *ſmooth hound* (*ſqualus muſtelus*), and the *dog-fiſh* (*ſqualus canicula*), &c.

The auricle is generally much more capacious than the ventricle. Its figure is not eaſily aſſigned; it is a ſac, of which the lateral parts are dilated, and at the place where it becomes connected to the ventricle it is in a degree contracted, or forms a ſort of neck. The parietes of the auricle are generally thin; its muſcular faſciculi form no remarkable projections, and are diſtributed over the internal ſurface, rather in the manner of a meſhwork or irregular ramification. The opening into the ventricle is uſually furniſhed with two ſemilunar valves.

In the *moon fiſh* (*tetraodon mola*) there are four valves of a ſquare ſhape in this ſituation, and in other inſtances, as amongſt the *ſharks* (*ſqualus*), the aperture into the ventricle is guarded by a ſingle delicate valve, the border of which is attached by many points to the parietes of this cavity. The opening of the venæ cavæ into the auricle is ſituated rather ſuperiorly, that is, ſomewhat on the ſide of the auricle next the ſpine; it is near the neck, or part which is united to the ventricle, conſequently the auricle appears, on opening a fiſh, like an entire bag, depending from the ventricle, the communication with the cavæ not being viſible in that view of the parts.

The *ventricle* has, according to Cuvier, moſt commonly four ſides; we ſhould ſay, the moſt uſual figure is that of a ſhort pyramid, with three ſides, the baſe of which correſponds to the fourth. The ventricle is, however, globular in the *ſmooth hound* (*ſqualus muſtelus*), and triangular in the *dog-fiſh* (*ſqualus canicula*), and exhibits ſome other variations of form in different ſpecies. The parietes of the ventricle are ſtrong and fleſhy, and furniſh many faſciculi on the internal part of the cavity, ſimilar to thoſe obſerved in the ventricles of other animals.

At the anterior part of the ventricle, and near the aperture into the auricle, there ariſes a ſhort tube, from which the branchial artery is afterwards continued. Cuvier has called this part the *footſtalk* or *bulb* of the branchial artery. Its figure is various; in the *ſturgeon* (*acipenſer ſturio*) it is oval; in the *ray* and *ſhark* genera it is cylindric, and in other fiſhes it is moſt commonly pyriform; the bulb is leſs muſcular than the ventricle, but much more ſo than the artery; there is often a conſiderable layer of muſcular fibres around it, which are continued upon the branchial artery. The internal part of the bulb is commonly made irregular by a number of ſtrong longitudinal faſciculi. The membrane which lines the bulb produces ſome folds of a ſemilunar, or a parabolic form; theſe have their free edge turned towards the branchial artery, conſequently perform the office of valves, in obſtructing the return of the blood upon the ventricle. In the *ſharks* there are two rows, of three valves each, the one at the origin, the other at the termination of the bulb; there are alſo two rows in the *ſturgeon*, the firſt compoſed of four valves, the ſecond of five. In the *ray* genus, Cuvier reckons four rows, compoſed of the ſame number of valves, and in the genus *gadus*, the *carps* (*cyprinus*), and *ſalmons* (*ſalmo*), &c. but two valves, placed at the entrance of the footſtalk, and none at any other part.

Arteries.

We have already ſaid that the heart of fiſhes is ſingle, or conſiſts only of an auricle and a ventricle, it conſequently furniſhes but one artery; this veſſel is analogous to the pulmonary, as it conveys all the blood to the organs of reſpiration; it being entirely ſubſervient to the functions of the gills or branchiæ, it has been with great propriety termed the *branchial artery*.

This veſſel ariſes from the bulb connected with the ventricle, of which it is in reality but the continuation, and from which, in ſome fiſhes, it is not very diſtinguiſhable.

In the *ſkate* (*raja batis*) the artery proceeds under the cartilage which joins the inferior extremities of the branchial arches ; it firſt ſends off, nearly at right angles, two large branches, one on each ſide, by which the trunk is conſiderably diminiſhed ; theſe two branches ſoon divide each into three others, which go to the three poſterior branchial arches, along the convex edge of which they paſs, and are loſt in fine ramifications upon the laminæ of the gills. The branchial artery then continues its courſe until it arrives oppoſite to the firſt gill, when it terminates in two branches, which make a ſlight curve backwards, and each divides again into two branches, which ſupply the two anterior gills in the ſame manner as already deſcribed.

In *oſſeous fiſhes* the diſtribution of the branchial artery does not materially differ from that in the *ſkate* ; the veſſel gains the bone to which the inferior extremities of the branchial arches are articulated, along which it divides and ſends its branches between the ſhort muſcles of the branchiæ ſituated at this place ; the ultimate number of theſe branches are but four, correſponding to the uſual number of the gills in theſe fiſhes ; the laſt branch proceeds almoſt directly backwards.

The branches of the bronchial artery having conveyed all the blood to the gills, and diſtributed it there in a manner to be hereafter deſcribed, it is returned by another ſet of veſſels, which many anatomiſts have conſidered as veins, but which would with much more propriety be called the *returning arteries of the gills*, both on account of their ſtructure and office. Theſe veſſels do not carry back the blood to the heart, but, after uniting together, diſtribute it to every part of the fiſh's body ; there is therefore but one circulation in this claſs of animals, in the courſe of which the organs of reſpiration are interpoſed.

The *arteries* which receive the blood from the gills, and convey it to every part of the body, have been ſo fully deſcribed by Monroe and Cuvier, that we have ſcarcely any thing to add to their account of them. The *ſkate* (*raja batis*) forms their chief example.

In this fiſh each gill furniſhes an artery, which makes a circuit round the ſuperior extremity of its cartilaginous arch, from below backwards. Monroe deſcribes the arteries produced by the gills as being double upon all except the firſt, and beſides being united together at their extremities ſo as to form arterial circuits, are conjoined with each other by means of large tranſverſe canals.

The artery of the anterior gill, after anaſtomoſing with the next, by the tranſverſe veſſel, turns forwards to be diſtributed to the head ; it ſupplies the parts of the upper jaw, the eye, the ear, the noſe ; gives ſmall branches to the fore-part of the brain. There are likewiſe ſome veſſels ſent off from the anterior ſide of the trunk of the arteries of the firſt and ſecond gills, which are diſtributed to the muſcles and external parts of the head. Theſe firſt branches, derived from the arteries of the gills, may be conſidered analogous to the *carotid*.

After ſending off the preceding arteries, the veſſels furniſhed by the gills produce, by their junction at the ſuperior part, or upon the cartilages of the vertebræ of the neck, *three principal trunks* ; at the place, where the moſt anterior is formed, it ſends off a veſſel which penetrates the cranium, at the inferior part, near to where it is joined with the vertebral column ; this artery divides, on entering the cavity of the cranium, into three branches : the 1ſt runs backwards upon the inferior ſurface of the ſpinal marrow, and unites with the correſponding artery of the other ſide, and with a middle veſſel, which forms a communication between the different arteries of the brain. Theſe three branches compoſe a ſingle artery, which paſſes upon the ſpinal marrow, and may be called with great propriety the *ſpinal artery*. The 2d branch of the artery of the brain goes forwards and inwards, and again forms a junction with its fellow, and the one which runs along the middle line of the lower ſurface of the brain and ſpinal marrow. The 3d branch paſſes to the origin of the medulla ſpinalis, and there gives off two branches which extend to a vaſcular ring, produced from the ſides of the middle artery; the branch ſtill advances as far as the eighth pair of nerves, where it ſends off two other branches, which unite to give origin to the middle artery already mentioned. After producing this veſſel the anterior branch goes on diſtributing ſmall arteries to the brain ; it paſſes under the root of the fifth pair of nerves, to the tubercles of the olfactory nerves, where it is expanded on branches that ſpread in radii, or like the pes anſerinus of the portio dura. The intricate anaſtomoſes produced by this artery with its fellow, and with the middle veſſel of the lower ſurface of the brain, have been compared by Cuvier to the Greek capital letter *phi*, accompanied with two ſemicircles affixed to it, in oppoſite directions, thus ↄΦc. This arrangement of the veſſels of the brain may be conſidered as analogous to the rete mirabile of the carotid in quadrupeds, and the circle of Willis in man. The artery which is diſtributed to the brain in fiſhes appears, from its origin and courſe, to ſupply the place of the *vertebral artery*.

The three trunks produced by the blood veſſels of the gills proceed inwards and backwards upon the inferior ſmooth ſurface of the cartilage, correſponding to the cervical vertebræ, and ſoon unite into one large veſſel which is analogous to the *aorta*.

At the place where theſe veſſels are aſſembled to form the aorta, there is given off a large branch, which correſponds to the *ſubclavian artery*, both in its ſituation, and on account of the parts it ſupplies ; it paſſes directly acroſs the cartilages which compoſe the pectoral member, or great fin of the *ſkate*, into which it enters, and immediately divides into two great branches, which take the courſe of the broad cartilage that ſuſtains the rays and muſcles of the fin, the one paſſing anteriorly, the other backwards, and each diſtributing branches in the direction of the muſcles of the fin.

The ſubclavian, according to Cuvier, furniſhes poſteriorly a ſmall artery, which goes to the ovary in the female, and to the teſticle in the male, and is analogous to the *ſpermatic*.

Before the ſubclavian penetrates the fin it gives off a remarkable branch anteriorly, which paſſes along the fore part of the gills ; it there ſends communicating branches to the veſſels that are immediately produced from the gills, and likewiſe ſome which are diſtributed upon the gills themſelves for their nouriſhment, which are conſequently analogous to the *bronchial* arteries of thoſe animals which have lungs. It detaches alſo, inwards, ſome arteries to the heart and trunk of the branchial artery, which ſupply the place of the *coronary* arteries ; and, laſtly, it is loſt in branches which go to the muſcles and parts about the upper jaw.

The *aorta* proceeds in a ſtraight line upon the under ſurface of the cartilages compoſing the dorſal vertebræ, on which there is a groove for its reception, and when it arrives at the tail it becomes completely encloſed in a canal, which is made by the inferior ſpinous proceſſes of the caudal vertebræ.

Soon after entering the abdomen the aorta ſends off the *cæliac artery* ; this veſſel paſſes backwards, and is diſtributed in particular to the ſpiral valve of the inteſtines, to the liver, and to the ſtomach. The firſt branch accompanies the cyſtic duct to the commencement of the inteſtines, which it penetrates very near the pylorus, in order to ramify to infinity upon the ſpiral valve : ſome of its ſmall branches alſo go to the pancreas, and to the poſterior part of the ſtomach. The ſecond branch, or the *hepatic artery*, is a ſmall veſſel; it goes with the hepatic duct to the baſe of the liver, at which place it enters that viſcus. When the cœliac artery has arrived at the internal edge of the ſtomach, it divides into two branches, the one inferior, of which the ramifications are detached at right angles, from right to left, under the inferior ſurface of the ſtomach; the other is ſuperior, and is diſtributed to the correſponding ſurface of the ſame organ, and gives likewiſe ſome ſmall arteries to the left ſide of the ſpleen.

The next branch of the aorta is the *meſenteric artery*. It paſſes to the right of the ſpleen, to which it gives two large branches that enter it at one ſide, and furniſh at the other ſide arteries to the pancreas; it afterwards follows the right ſide of the inteſtinal canal, to which it is diſtributed. Its chief branches, to the number of nine or ten, detach themſelves at right angles at nearly equal diſtances from each other, and croſs and ſurround the inteſtine. The ſucceeding branches of the aorta are much ſmaller than the preceding.

The two firſt go to the commencement of the oviduct, which they furniſh with many branches, particularly at the ſuperior part; but before arriving there each of them ſends an artery to the muſcles of the ſpine analogous to the dorſal branch of the intercoſtals, or of the lumbars in mammalia.

A third branch furniſhes ſome arteries to the ſpinal column and to the commencement of the kidney, and goes particularly to the oviduct.

A fourth artery ariſes from the aorta, and is ſent excluſively to the kidney, at the ſide of which it detaches a ſmall lumbar artery, which is diſtributed to the parietes of the belly, to the muſcles of the ſpine, and to the vertebral column.

Three other arteries, having a ſimilar deſtination, ariſe more poſteriorly from each ſide of the aorta.

Finally, there proceeds from the aorta a large branch on each ſide; it ſoon ſends off a *renal* artery, which advances the length of the kidney, diſtributing its branches to it, after which it continues its courſe outwards in the moſt poſterior part of the abdomen, and produces an artery analogous to the *epigaſtric*, and then eſcapes from the cavity, and is expended upon the anal fin.

The arterial ſyſtem of fiſhes in general does not differ materially from that deſcribed in the *ſkate*; the gills being four, they conſequently furniſh one branch leſs than in the genus *ray*, or the *ſhark*. The aorta in ſome of the cartilaginous fiſhes, inſtead of paſſing in a groove as is uſual, is contained in a canal formed in the bodies of the vertebræ: this is remarkably the caſe in the *ſturgeon* (*acipenſer ſturio*), and the *lamprey* (*petromyzon marinus*). The coats of the aorta adhere firmly to the ſides of the canal, ſo that it would appear in theſe fiſhes the blood flows through the aorta as through a paſſive tube.

In thoſe fiſhes which have ribs, the aorta gives off a number of branches to the intercoſtal ſpaces, which correſpond to the *intercoſtal arteries*. Theſe veſſels, however, diſtribute branches to the kidnies before they paſs to the parietes of the belly.

The ſplenic artery is not generally as it is in the *ſkate*, a branch of the meſenteric, but of the cœliac, or that artery which ſupplies the firſt portion of the alimentary canal, the liver, and ſpleen.

Cuvier ſtates that there are generally in fiſhes two *meſenteric arteries*, and deſcribes them in the *trout* (*ſalmo fario*). The *firſt*, or *anterior meſenteric*, he ſays, is detached from the aorta very near the middle of the body, and at a diſtance from the trunk of the cœliac; it advances for a little way in the ſubſtance of the meſentery, and divides into two branches, of which the one goes forwards and the other backwards, parallel to the inteſtinal canal, and ſupplies it with branches which form right angles with the artery that furniſhes them, and which having arrived at the inteſtine, wind round it in a ſerpentine manner, and give off branches that extend forwards and backwards along it.

The *poſterior meſenteric* artery ariſes from the trunk of the aorta at ſome diſtance from the firſt; it paſſes backward parallel to the inteſtine, and diſtributes its branches to the poſterior portion of it: theſe go off at acute angles, and are not ſerpentine, as thoſe of the anterior meſenteric artery. This veſſel likewiſe ſends branches to the bladder, which alſo receives others from the poſterior intercoſtals.

Although the arteries of fiſhes have ſo peculiar an origin, and are ſent to parts differently conſtructed than thoſe in mammalia, they bear conſiderable reſemblance to the arteries of that claſs. From the preceding deſcription it will be ſeen that almoſt all the arteries of fiſhes admit of the ſame names that are applied to the veſſels of mammiferous animals.

The mode in which the aorta is formed in fiſhes, makes it impoſſible for the heart to communicate its impulſe to the arterial ſyſtem: the circulation of the blood in theſe animals is therefore carried on ſlowly, and unaccompanied by the pulſe, or that ſaltatory motion that is obſerved in the principal arteries of the hot-blooded animals: conſiſtently alſo with the offices of theſe veſſels, their parietes are thin, and appear to be deprived of the middle or contractile coat. The arteries of fiſhes very much reſemble in their ſtructure the veins of other animals; they further agree with veins in the circumſtance of having the branches of large capacity, and often as large as the principal trunks of the body.

In *Plate* IV. of the *Anatomy of Fiſhes*, *fig*. 4. exhibits a view of the heart and branchial artery of the *ſkate* (*raja batis*); *a*, the ventricle of the heart; *b*, the auricle; *c*, the bulb of the branchial artery; *d*, *d*, the places at which the ſemilunar valves are found; *e*, *e*, the two firſt branches of the branchial artery; *f*, *g*, *h*, their diviſion into three branches deſtined for the three poſterior gills; *i*, the continuation of the trunk of the branchial artery; *k*, *k*, the two branches in which the artery terminates; *l*, *m*, the two branches which go to ſupply the two anterior gills: the numbers 1, 2, 3, 4, 5, indicate portions of the five gills which are left on one ſide, in order to ſhew a little of the courſe of the branches of the branchial artery along their convex edges.

Fig. 5. of the ſame plate, ſhews the formation of the aorta and ſome of its principal branches in the *ſkate*; the parts on the lower ſide of the body are cut away to bring into view the objects of the figure: *a* is the trunk of the returning artery (or vein, as it is often, though improperly, termed) of the anterior gill; *b*, the continuation of this veſſel diſtributed to the ſnout and external parts of the head; *c*, a communication between the returning artery of the firſt gill with that of the ſecond, pointed out by *d*; *e*, the trunk formed between thoſe proceeding to form the aorta; *f*, *f*, *f*, ſmall arteries ſent from this trunk to the muſcles and other external parts of the head; *g*, the anaſtomoſes between the two returning arteries of the ſecond gill; *h*, the ſecond artery of the ſecond gill; *i*, *k*, the returning arteries of the third gill; *l*, their communication; *m*, *n*, the arteries of the fourth gill; *o*, their anaſtomoſis; *p*, the branch of the firſt trunk ſent to the brain; *q*, the ſecond arterial trunk which forms the aorta; *ſ*, *t*, the arteries from the fifth gill united as the others by a croſs branch; *u*, the third arterial trunk which produces the aorta; *v*, the commencement of the aorta formed by the congreſs of the three arterial trunks on each ſide; *x*, the branch of the aorta which correſponds to the ſubclavian artery; *y*, the branch of this artery which goes forward, communicates with the external ends of the returning arteries of the gills, and ſends off the branches analogous to the bronchial and coronary arteries, and others to the muſcles of the jaws; *z*, the diviſion of the ſubclavian artery in order to ſupply the great pectoral fins or wings of this fiſh; 1, the cœliac artery, 2, the meſenteric: ſeveral ſmall arteries are ſeen to ariſe from the ſucceeding parts of the aorta which go to the organs of generation, the kidnies, &c.

Veins.

The aperture by which the venous ſyſtem of fiſhes terminates in the auricle of the heart is very ſmall, in proportion to the ſize of that cavity, and to that of the adjoining trunks. The contracted opening into the auricle muſt, in a certain degree, perform the office of valves, or at leaſt diminiſh the current of the blood upon the heart.

The common venous ſinus with which the auricle immediately communicates, paſſes on each ſide tranſverſely and backwards; it is formed, according to Cuvier, by the concourſe of five principal trunks: 1, the poſterior vena cava; 2, the trunk of the venæ cavæ hepaticæ; 3, and 4, the two inferior venæ cavæ; 5, a trunk which conveys the blood from the parts in the neighbourhood of the gills.

The *poſterior vena cava* receives the deep-ſeated venous branches in the neighbourhood of the ſpine; the trunk itſelf accompanies the aorta, and, like that veſſel, it is incloſed between the inferior ſpinous proceſſes of the caudal vertebræ; and in thoſe fiſh which have the aorta lodged in a canal in the bodies of the dorſal vertebræ, as in the *lamprey* (*petromyzon*), and the *ſturgeon* (*acipenſer*), the poſterior vena cava is accommodated in a ſimilar manner; the poſterior cava is in general an inconſiderable trunk with reſpect to capacity, it is however very long, and is without dilatation, being nearly of the ſame ſize throughout: this veſſel is not deſcribed by Doctor Monroe, and appears to have entirely eſcaped his obſervation, although, from the number of ſpecies in which we have ſeen it, we believe that it is conſtantly to be found in this claſs.

The *venæ cavæ hepaticæ* of the ſeveral lobes of the liver unite immediately before their termination in the common ſinus under the heart, they are always conſiderably dilated; Monroe ſtates that in the *ſkate* (*raja batis*) they form between the liver and the heart ſinuſes, the diameter of which is ten times greater than that of their openings.

The *two anterior cavæ* are the moſt important veins in the body; they receive the blood from a great part of the muſcular ſubſtance of the fiſh, the organs of generation, &c. They lie contiguous to each other in the abdomen, and are greatly dilated. They form large receptacles of blood, according to Monroe, above the ovaries in the female, and the teſticles in the male fiſh, at which place theſe veins communicate freely with each other.

The blood of the anterior and lateral parts of the body, eſpecially in the *flat chondropterygii*, and the fiſhes with large pectoral fins, is conveyed by trunks of ſome ſize, which correſpond to the *jugular* and *ſubclavian* veins of other animals.

The latter trunk appears to be the continuation of the common ſinus, into which the other trunks open by orifices ſmaller than the veſſels themſelves, the edges of which are prominent and looſe, or floating, ſo as to perform, in ſome degree, the offices of valves. Dr. Monroe ſays, that he obſerved within the external jugular veins, and at the termination of the internal jugulars, a pair of valves, ſimilar to thoſe in the veins of the human ſubject. At the termination of the renal veins, and large branches of the hepatic veins, he found ſingle membranes fixed by threads from their edges, reſembling the coronary vein of our heart; and at the termination of the other large veins, eſpecially near the heart, he ſays, there are not only contracted orifices, but doublings at their edges, which have ſo far the effect of valves, even in the dead body, that we cannot fill completely all the veins, by throwing an injection in at one of their branches. Page 18. Monroe's Phyſiology of Fiſhes.

It ſhould however be obſerved, that the veins of fiſhes are not valvular in their courſe, like thoſe of mammalia.

It is unneceſſary to give a particular deſcription of the venous branches, which produce the trunks above-mentioned; theſe, as far as we have obſerved, accompany the ramifications of the arteries, and are ſingle veſſels of a ſomewhat greater diameter than the artery.

The coats of the veins of fiſhes are extremely fine and thin; ſo much ſo, that they would ſeem to be incapable of ſuffering much diſtenſion without being ruptured.

We have frequently obſerved that the veins of fiſhes appeared as if they were in a great meaſure emptied of their blood, particularly in the dilated parts of the anterior cavæ, which veſſels would ſeem to have a capacity beyond their uſual contents: the great ſize of the principal venous trunks of fiſhes is therefore, probably, not ſo much the conſequence of long continued diſtenſion, as original organization. It appears to be a circumſtance in the ſtructure of theſe animals, adapted to the ſlow motion of their blood, and not as Dr. Monroe ſuppoſed, dependent upon the preſſure of the water on the ſurface of their gills, cauſing an accumulation of the blood in the interior parts of their bodies. The exiſtence of ſeveral venous trunks for collecting the blood from the ſmaller branches appears alſo to be a proviſion to obviate the fulneſs which would ariſe, if all the blood was ſlowly accumulated in one or two trunks.

Fig. 4. *Plate* IV. of the *Anatomy of Fiſhes*, preſents a view of the principal venous trunks in the *ſkate*, (*raja batis*); *n* is the common ſinus, in which all the veins meet, ſeen paſſing from each ſide behind the auricle into which it opens; *o o o*, part of the venæ cavæ hepaticæ taken out of the liver; they pour their blood into the ſinus, oppoſite to the auricle; *p*, *p*, the two anterior venæ cavæ; *q*, the place at which they communicate with each other; *r* and *s* the veins analogous to the internal and external jugulars; *t*, the trunk, which correſponds to the ſubclavian vein; *u*, *v*, two branches of the ſubclavian, which collect the blood from the great pectoral fins; *x*, a large vein from the muſcles, and other parts behind the abdomen, which opens into the ſubclavian.

Vital Temperature.

All the hot-blooded animals poſſeſs a degree of temperature ſuited to the functions they naturally perform; which cannot be materially altered without inconvenience to them; and any conſiderable deviation from which is reſiſted by an effort of their vaſcular ſyſtem: this we have termed their *ſtandard heat*. The temperature of fiſhes, both from their organization, and the element they inhabit, is in general low: one of their claſſific characters is being cold blooded. There is however a good deal of variety in the natural temperature of different ſpecies: thoſe that live in the ſea are ſome degrees colder than the freſh-water fiſhes; and thoſe that are active, and frequent the ſurface of the water, as many of the genera *cyprinus*, *ſalmo*, &c. have a higher temperature than the more ſluggiſh ſpecies. We may ſtate the ſtandard heat of the one kind of fiſhes to be about 60° of Fahrenheit's ſcale, and that of the other about 50°.

As the vital heat is leſs independent of the external temperature, in proportion to the lowneſs of the ſtandard, or, in other words, as the heat of the animal is more inconſtant when it is not naturally high, we find that the temperature of fiſhes, commonly, is nearly the ſame with that of the water in which they reſide. In ſome experiments we made upon *carps* and *eels*, we could not diſcover any material difference between their heat, and that of the water in which they were placed, until the latter was heated, or cooled, many degrees beyond its ordinary temperature.

Mr. Hunter's experiments on this ſubject were attended with a ſimilar reſult, although they appear ſomewhat inconſiſtent with each other, as he has ſtated them.

Upon one occaſion he put an *eel*, its heat being 44°, which was nearly that of the atmoſphere, into water heated to 65°, for fifteen minutes: and upon examination it was of the ſame degree of heat with the water. In another experiment, he ſays, he put a *tench*, whoſe heat was 41°, into water at 65°, and after remaining there ten minutes, the ball of the thermometer being introduced both into the ſtomach and rectum, the quickſilver roſe to 55°.

Having removed a *carp* out of a pond, the water of which he had aſcertained to be 65° and a half, he introduced the thermometer into its ſtomach; the quickſilver roſe to 69°; ſo that the difference between the water and the fiſh was 3° and a half.

Theſe two laſt experiments do not quite accord with the two following. Having put an *eel*, the heat of whoſe ſtomach was 37°, into a freezing mixture, its temperature ſunk to 31°. The animal, he ſays, at that time appeared dead, but was alive the next day. He took a living and dead *tench*, and a living and dead *eel*, and put them into warm water; they all received heat equally faſt: and when they were expoſed to cold, both the living and the dead admitted the cold likewiſe with equal quickneſs.

It is beyond all doubt that fiſhes readily ſuffer great alterations in their natural temperature, and that this is not attended in them with any ſerious injury. It has been aſſerted that they can even be entirely frozen, and afterwards reſtored to life; and if we may credit Sonnerat, he ſaw in the Philippine iſlands fiſhes ſwim in water at the heat of 187° of Fahrenheit.

Mr. Hunter aſſerts that he never ſucceeded in freezing whole fiſhes, and afterwards recovering them; although his experiment of freezing the *eel*, as above-mentioned, would lead us to make a different concluſion. He froze, he ſays, the tail of a *tench* (as high as the anus), which became as hard as a board; when it thawed, that part was whiter than common, and when it moved, the whole tail moved as one piece, and the termination of the frozen part appeared like the joint on which it moved.

He alſo froze the tails of two *gold fiſhes* until they became as ſolid as a piece of wood. They were put into cold water to thaw, and appeared for ſome days to be very well; but that part of the tails which had been frozen had not the natural colour, and the fins of the tails became ragged. About three weeks afterwards a fur came all over the frozen parts; their tails became lighter, ſo that the fiſhes were ſuſpended in the water perpendicularly, and they had almoſt loſt the power of motion; at laſt they died. The water in which they were kept was New River water, changed every day, and about ten gallons in quantity. See Hunter's Animal Œconomy.

From theſe experiments it would be inferred, that even parts of fiſhes will not admit of being frozen without diſorganization.

Organs of Reſpiration.

All truly aquatic animals poſſeſs certain parts of a laminated or tufted ſtructure for minutely dividing the water, and extracting from it the air with which it is intermixed. The gills of fiſhes are peculiarly well contrived for this mode of reſpiration, both from their poſition and organization.

The gills of fiſhes are ſituated on each ſide of the neck; they have always a very free communication with the cavity of the mouth, of which they may be generally conſidered as conſtituting the poſterior parietes. They are covered externally in the *chondropterygii* by the common integuments, and in the other fiſhes uſually by a bony or cartilaginous operculum, which is, in moſt inſtances, increaſed by the addition of ſome radiated bones that are covered by a proceſs of the ſkin.

In the *chondropterygii* the gills are fixed by being connected externally to the integuments that encloſe them, which are perforated by a number of foramina, varying according to the genus; but in the other orders of fiſhes the gills are unattached at the external ſide, and the branchial aperture is ſingle and capable of being much enlarged and diminiſhed by the elevation and depreſſion of the operculum, which is moved by certain muſcles in the manner of the lid of a box.

The branchiæ are ſuſtained upon ſome cartilaginous or oſſeous arches, which are placed ſo that their concavity is turned obliquely forwards towards the mouth, and their convex ſides are directed backwards and outwards. Theſe arches are conſtructed to admit of their baſes being contracted and dilated, and of being approximated one with reſpect to another; for which purpoſes they are provided with numerous and complicated muſcles. The motions of the branchial arches are alſo connected with thoſe of other parts in their neighbourhood; the pharyngeal bones, hyoides, &c. although chiefly intended for deglutition, enter into the mechaniſm of the reſpiratory organs; and the branchial arches on the other hand are employed in deglutition; ſo that all the parts ſituated about the origin of the œſophagus have complicated functions, as will appear when they are more fully deſcribed along with the other organs of motion. It is ſufficient at preſent to ſtate, that by the motions of the different parts with which the branchiæ are connected, their vaſcular ſurfaces are expanded, contracted, and preſſed againſt the water, which runs over them.

The real organs of reſpiration in fiſhes are the great number of laminæ which are fixed upon the convex ſides of the branchial arches. Theſe laminæ in the *branchioſtegi* and *oſſeous* fiſhes are arranged in two rows upon each branchial arch, of which there are generally four on each ſide. The laminæ are very narrow, elongated, and pointed at their free extremity, and are uſually united to each other by their internal edge for about two-thirds of their extent from the baſe; they are commonly ſet cloſe to each other, producing the appearance, in a great degree, of the teeth of a comb, or the barbs of a feather. Each of the laminæ contains a very delicate plate of a cartilaginous ſtructure, by which they preſerve their form and poſition againſt the force of the water. Their ſuperficies is ſmooth along the edges, but we have lately diſcovered that the intermediate ſurface is covered with extremely fine thin villous proceſſes, by which means the reſpiratory ſurface is infinitely extended.

We have already ſtated that the ſingle artery which ariſes from the heart of fiſhes is entirely expanded on the gills. The branches of this veſſel paſs along the convex ſides of the branchial arches under the baſes of the laminæ. They furniſh in this route a branch to each pair of laminæ, which aſcends between them as far as they are united, and then divides into two branches that go along the internal edge of the laminæ to their extremity; theſe produce an immenſe number of minute veſſels, which are expanded in fine ramifications upon both ſurfaces of the pair of laminæ. The extreme terminations of theſe veſſels form the roots, or give birth to the artery of the body, or aorta. Theſe are collected upon each lamina by a branch which runs along its external edge, and the veſſels, thus produced, terminate in one which runs like the branch of the branchial artery under the roots of the laminæ, upon the convex ſide of the arch. Theſe branches receive the blood from each of the gills, and concur to form the aorta, in the manner formerly deſcribed.

The ſtructure of the organs of reſpiration in the *chondropterygii* differs in ſome reſpects from that above deſcribed. In the *lampreys* (*petromyzon*), there are ſeven gills on each ſide, and in the *rays* and *ſharks* (*raja* and *ſqualus*) there are five on each ſide. The *lampreys* have only, however, a ſingle row of laminæ to the firſt and the laſt gill, and the two laſt genera have but one row of laminæ to the anterior gill. In theſe fiſhes the branchial arches ſuſtain upon their convex edges a number of cartilaginous proceſſes or radii, upon which there is a muſcle of ſome thickneſs placed, that has the effect of approximating them to each other. The real laminæ of the gills ariſe from the ſides of theſe parts, and are compoſed, in fact, of reflections of the membrane which covers them. Theſe laminæ are broader and ſet farther aſunder than thoſe of other fiſhes; they are unattached at one edge, and at part of the other. They have upon each ſide a number of ſub-diviſions or ſmall folds, which vary in their figure and extent in the different ſpecies; theſe ſub-laminæ conſtitute the true reſpiratory ſurfaces.

The branch of the branchial artery, which proceeds along the convexity of the arches, furniſhes to each pair of laminæ two veſſels; the larger of which is ſent to the internal edge of the laminæ, and the other runs upon the external edge along with the branch which collects the blood from the laminæ for the aorta. The artery of the internal edges anaſtomoſes at ſome diſtance from the extremity of the laminæ, with a branch which paſſes tranſverſely from one lamina to another, and thus eſtabliſhes a communication between all the internal branches of the branchial artery. The minute or ultimate ramifications of the branchial artery are expanded upon the ſmall or ſubordinate laminæ, which ariſe from the ſides of the others.

Cuvier deſcribes the branchiæ of the *hippocampus* as being differently organized from thoſe of other fiſhes. They are compoſed of eight rows of tufts united by pairs in ſuch a manner as to correſpond with the four ordinary gills. The external rows have only five tufts; thoſe which ſucceed have ſix; there are ſeven in the third; and in the middle rows there are eight tufts. The conſequence of there being a different number of tufts in the ſeveral rows is, that the entire gills appear of a round figure. Each of theſe tufts, of which the extremity is round, is formed of a cartilaginous lamina, which is fixed upon the branchial arch, and ſuſtains, as in the *ray* genus, ſome other little membrano-vaſcular laminæ, very diſtinct from each other, and arranged upon the cartilaginous lamina, in the direction of the branchial arches.

The *ſilurus anguillaris* has been diſcovered by M. Geoffroy to poſſeſs ſome ſupernumerary organs of reſpiration, of a very ſingular ſtructure. In this fiſh the ordinary gills exiſt, but with ſhorter laminæ than are uſually found; in addition to which there are two organs on each ſide, conſiſting of a hollow trunk and numerous branches, the parietes of which reſemble the coats of an artery. The external ſurface of theſe vaſcular trees is covered by the ramifications of the branchial artery, which become more fine and numerous as they extend upon their branches. The extremities of the ramifications open into the branches of the arboreſcent organs, and diſtil into them their blood, through a multitude of villi that cover the interior ſurface of theſe branches. The trunks of the organs themſelves terminate in the roots of the aorta, where they come from under the gills.

Cuvier conſiders theſe parts as not only ſerving the purpoſes of reſpiratory organs, but alſo as acting as hearts, by giving an impulſe to the blood which flows through the aorta.

The numerous ſurfaces furniſhed by the gills of fiſhes qualify them for dividing, in an eminent degree, the water which paſſes over them, and for ſeparating from it all the air with which it may be mechanically combined. The quantity of air conſumed by the reſpiration of a fiſh is greater than would be at firſt expected. If one be encloſed in a veſſel of water which is completely excluded from the atmoſphere, it very ſoon extracts all the air mixed with the water, and expires. Such a reſult will, however, excite no ſurpriſe if we contemplate the extent of ſurface upon which the blood is expoſed to the ſurrounding element.

Monroe has calculated that the ſurfaces of the gills in a large *ſkate* (*raja batis*) are nearly equal to the whole external ſurface of the human body. There are eighteen ſides on the branchiæ; each of theſe ſides has about fifty diviſions or doublings of the membrane; each of theſe diviſions, he ſays, poſſeſſes one hundred and ſixty ſubdiviſions, doublings, or folds of its membrane, the length of each of which, in a very large *ſkate*, he takes as about one-eighth of an inch, and its breadth about the one-ſixteenth of an inch; ſo that in the whole gills there are one hundred and forty-four thouſand ſubdiviſions or folds, the two ſides of each of which are equal to the ſixty-fourth part of a ſquare inch; or the ſurface of the whole gills in a large *ſkate* is equal to two thouſand two hundred and fifty ſquare inches, that is, to more than fifteen ſquare feet.

It appears to us that Dr. Monroe has very much overrated the dimenſions of the laminæ of the gills in his calculation; ſtill, however, it muſt be admitted, that the reſpiratory ſurface of the branchiæ in the *ſkate* is prodigiouſly extenſive, and vaſtly ſurpaſſes what would be ſuppoſed before being thus viewed in detail; and if the aggregate of all the ſurfaces of the villi we have diſcovered in the laminæ of the gills in *oſſeous* fiſhes could be aſcertained, it would probably be found to exceed very far the ſuperficies of the gills in the *ray* geuns.

Some fiſhes, as the genus *cyprinus*, &c. come to the ſurface of the water to obtain a ſupply of air from the atmoſphere; the ſpecies that require this are particularly vivacious; many of theſe will reſpire air alone for ſeveral days after they are caught, during which the operculum of the gills may be obſerved to riſe and fall alternately, like the motions of the thorax in thoſe animals which reſide conſtantly in air.

In *Plate* IV. of the *Anatomy of Fiſhes*, *fig.* 6. repreſents a portion of the gills of the *cod* (*gadus morrhua*) of the natural ſize. *a* is a piece of the branchial arch, on which the laminæ are ſuſtained; *b*, *b*, the laminæ of one row; *c*, *c*, thoſe of the other row appearing partially behind them. *Fig.* 7. of the ſame plate, exhibits the manner in which the two rows of laminæ are placed with reſpect to each other in the *cod*; *a* is the branchial arch cut tranſverſely ; *b b* the ſection of the branches of arteries which tranſmit the blood to the gills, and return it afterwards to form the aorta ; *c c*, a lamina of each row croſſing each other, which is the poſition they have in this fiſh, in which they are not united to each other. *Fig.* 8. of the ſame plate, preſents a ſingle lamina of the *cod*, conſiderably magnified, in order to ſhew the villous proceſſes we have diſcovered to exiſt upon its ſurface. *Fig.* 9. is a lateral view of a portion of the gill of the *ſkate* (*raja batis*) ; *a*, the baſis of the gill or branchial arch ; *b*, the ſurface from which the laminæ proceed, and to which they are connected by the greateſt part of one of their edges ; *c*, *c*, the fine edges of the laminæ. *Fig.* 10. of this plate, ſhews one of the laminæ of the firſt order of the *ſkate*, magnified ; *a* the border which is attached ; *b*, the edge which floats, is ſeen furniſhed with villous proceſſes ; *c*, the intermediate ſurface, covered with fine ſubordinate laminæ.

Kidnies and urinary Bladder.

Theſe glands uſually bear a greater proportion to the ſize of the body in fiſhes, than in any other claſs of animals. They not only extend the whole length of the abdominal cavity, but often paſs as far forwards as the ſides of the œſophagus, and back of the cranium, and ſometimes go backwards along the ſpine, conſiderably beyond all the abdominal viſcera. They are proportionably ſmall in the *ray* and *ſhark* genera.

The kidnies are always cloſely applied to the ſurface of the vertebral column, from which it is difficult to remove them ; the ſurface, which is next to the ſpine, is conſequently very irregular, particularly in *oſſeous fiſhes.* The greateſt part of the kidnies is covered, on the lower ſurface, by the air-bladder, when this organ exiſts.

The form of theſe glands is ſomewhat various; ſometimes, as in the *carp*, &c. there is a tranſverſe lobule on the external ſide of each kidney, at the anterior part, which gives them an uniform figure. This lobule projects chiefly from the internal ſide in the *dory* (*zeus faber*). The kidnies are ſometimes of nearly the ſame breadth at every part ; in other inſtances they are conſiderably ſmaller anteriorly. They are in general but imperfectly divided into lobules, which gives an obſcure notched appearance along their external edge ; there are two poſterior lobes which project backwards for a greater or leſs diſtance.

The proper coat of the kidnies is extremely thin. On the under ſurface they are covered by the peritoneum, which cloſely adheres to them.

The uſual colour of the kidnies is a dark reddiſh brown.

Their texture is ſoft and fragile, and yields equally in all directions to the preſſure of the fingers. In the *ray* and *ſhark* genera their ſubſtance is formed of a lighter red colour than in oſſeous fiſhes. In every inſtance the kidnies have an uniform ſtructure. They are very vaſcular, being ſupplied by numerous arteries from the adjacent trunks.

The uriniferous ducts are numerous, and diſtributed throughout the whole ſubſtance of theſe glands. They are, at their commencement, fine and tranſparent; but as they become larger their coats appear opake, and of a ſilvery hue. There are no cells or reſervoirs in the interior of the kidney, into which the uriniferous canals pour out their fluid, as in mammalia; theſe veſſels coaleſce to form the *ureters*, as in birds and reptiles.

Theſe ducts run generally along the under ſurface of the kidnies, imbedded in their ſubſtance, and acquire magnitude as they proceed. In the *ſqualus maximus*, according to Mr. Home, they run along the inner edge of the kidnies.

An *urinary bladder*, ſuch as exiſts in other animals, is wanting in a great number of fiſhes; but in its place we generally find a dilated canal into which the ureters open. This canal is ſometimes ſo wide as to approach the appearance of a ſac or bladder ; it is generally capable of containing a certain quantity of urine. Its coats are ſtronger than thoſe of the proper urinary bladder, and it is often plicated or laminated upon the inner ſurface.

When the urinary bladder exiſts, it is a thin pellucid bag. It is found in many *cartilaginous* fiſhes, as the *frog-fiſh* (*lophius piſcatorius*) ; the *lump fiſh* (*cyclopterus lumpus*) ; *moon fiſh* (*tetraodon mola*), &c. &c. and the number of oſſeous fiſhes in which it has been obſerved to exiſt is much greater. In the *carp* (*cyprinus carpio*) the bladder is of a ſpherical ſhape; in the *father-laſher* (*cottus ſcorpius*) it is more elongated in its form, and of conſiderable ſize in proportion to that of the fiſh to which it belongs.

The urinary bladder diſcharges its contents uſually by an opening diſtinct from the anus, and placed a little farther back than that aperture.

There is no proper urinary bladder in the *ray* and *ſhark* genera. The ureters terminate in a cloaca, as in birds. Mr. Home has, however, obſerved in the *baſking ſhark* (*ſqualus maximus*) that "the ureters terminate in an oval cavity juſt within the verge of the anus, which has an imperfect ſeptum ſeparating it into two parts, the ureters opening on the oppoſite ſides of this ſeptum ; this cavity muſt, therefore, he ſays, be conſidered as the urinary bladder. This cavity opens externally in the male, by an infundibular proceſs which correſponds to the penis. Doctor Monroe has likewiſe called the part which conveys the urine into the cloaca in the *common ſkate* the urinary bladder.

It is impoſſible to aſſign the uſe of the bladder or any reſervoir for the urine in fiſhes ; theſe animals continually reſiding in the water, one ſhould have ſuppoſed that no inconvenience could have ariſen from the expulſion of their urine as faſt as it was ſecreted ; perhaps part of their urine is abſorbed, as in other animals, and carried back into the ſyſtem, for which purpoſe it is neceſſary to detain it for ſome time before it is ejected.

No accurate examination has been made of the chemical properties of the urine of fiſhes, as far as we are acquainted. Although exceedingly tranſparent, it poſſeſſes more of the urinous flavour than the contents of the bladder in reptiles ; it may, however, be queſtioned, how far the fluid found in the bladder of reptiles is really urine : this will be conſidered in its proper place.

Anatomiſts have agreed in denying *renal glands* or *capſules* to the whole claſs of fiſhes ; there are in the *dory* (*zeus faber*) two aſh-coloured glandular bodies, about the ſize of ſmall peas, placed upon the poſterior extremity of the kidnies ; theſe glands are of a firm, tough texture throughout ; they are attached to the kidnies, and alſo to the poſterior end of the air-bag, by ſome ligamentous-looking cords. We have not yet examined other fiſhes with the view of obſerving ſimilar bodies in them; we are, therefore, not prepared to ſay how far theſe glands may correſpond with the renal capſules of other animals, or whether they may not be connected with the offices of the air-bag in this particular fiſh.

Fig. 11. of *Plate* IV. in the *Anatomy of Fiſhes*, repreſents the dilated canal, which takes the place of the urinary bladder in the *dory* (*zeus faber*) ; *a*, *a*, are portions of the two ureters which end in the fundus of the ſac ; *b*, the wide part of the canal; *c*, the contracted part, which goes on to terminate behind the anus; the canal is laid open to ſhew that it is plicated on the inner ſurface.

Organs ſubſervient to the generative Functions.

Male parts of generation.—If we except the *holders*, or *organs of prehenſion*, in the genera *raja* and *ſqualus*, there are no *external* parts of generation in the claſs of fiſhes. From the manner in which theſe animals in general accompliſh the act of generation, a *penis* would be perfectly uſeleſs to them, and the organs for preparing the male ſemen would be expoſed continually to injury, if placed on the outſide of their bodies.

The parts reputed to be the organs of prehenſion in the *ray* and *ſhark* kind, are ſituated at the ſides of the anus, between the two ventral fins. They conſiſt of three parts, articulated with the pelvis, reſembling additional abdominal members. They are compoſed of thirteen cartilaginous joints, of different ſizes and figures, which are moved by certain muſcles covered by the common integuments, and connected with a ſingular gland.

The firſt part is formed by three ſhort cartilaginous pieces, articulated one to the other. The ſecond part is likewiſe compoſed of three cartilages, which are long, and not moveable upon each other. The two external pieces interrupt a canal which proceeds to open in a hollow formed in the third part. This laſt is made up of ſeven cartilages, all moveable on each other; it receives likewiſe one of the pieces of the ſecond part, which goes on as far as its extremity.

The firſt part admits of flexion outwards upon the ſecond, and of extenſion, and the whole member is moveable from without inwards. Theſe motions are performed by the means of two muſcles. One of theſe ariſes from the pelvis and terminates at the commencement of the ſecond part. It is confounded with the flexor of the ventral fin. The other muſcle is ſmaller, and placed upon the firſt; it ariſes from the firſt part, and is inſerted at the commencement of the ſecond.

There is a third muſcle which takes its origin from the third part, and envelopes the ſecond, except a ſmall portion of its external ſide, and is inſerted by a ſlender tendon upon the inferior and external ſide of the laſt piece, and is affixed at the ſuperior ſide to an extended border that is preſented before the piece, which has the figure of a blade. The uſe of this muſcle is to open the canal already mentioned, which is cloſed by the elaſticity of the parts compoſing it.

The gland is ſituated at the exterior of the middle part of this apparatus. It is an oval figure, and ſurrounded by a thick muſcle; it furniſhes a very viſcid fluid, and its excretory duct opens into the groove that is formed by the two cartilaginous pieces of the ſecond part, and is loſt in the hollow of the third.

Naturaliſts are not agreed with reſpect to the uſe of theſe ſingular members. Cuvier thinks that they are only employed in ſwimming, as the largeſt of their muſcles is alſo the depreſſor of the ventral fin, and as their parts are not provided with muſcles, to be approximated with ſufficient force to act as organs of prehenſion. Bloch, and many others, ſuppoſed that they were deſigned to hold the female during coition. Geoffroy believes that they are introduced into the cloaca of the female, and perform the office in ſome degree of a penis. We are moſt inclined to adopt the laſt opinion. If this apparatus was intended for ſwimming alone, why ſhould it be peculiar to the male? and if for prehenſion, a gland to ſecrete a ſlimy fluid would be not only unneceſſary, but inconvenient. The *ray* and *ſhark* genera ſhould therefore, perhaps, be conſidered as exceptions to the general obſervation, that fiſhes do not poſſeſs a penis.

The *teſtes* of the genera *raja* and *ſqualus* differ very much from thoſe of other fiſhes; they bear a greater reſemblance to the ſame organs in ſome reptiles than to thoſe of their own claſs. Each teſticle conſiſts of two parts united together. The one is an uniform glandular maſs, ſomewhat like the texture of the teſtes of other fiſhes; it is flattened and imperfectly divided into lobes. The other portion is made up of a great number of ſmall ſpherical bodies, on the external ſurface of each of which there is a ſlight depreſſion, like an impreſſion made by the head of a pin; theſe bodies are united to each other by ſome ſtrong filaments, and are incloſed in a fine membrane. This tubercular ſubſtance forms the principal portion of the gland, and is divided into ſeveral lobes or maſſes of different ſizes. When examined with a magnifying glaſs it appears to conſiſt of very minute round grains.

The teſticles in theſe fiſhes give origin to a real *epididymis*, which is evidently compoſed of a convoluted tube. It is thin, where it is connected with the gland, with which it appears to be continuous; it forms a large maſs of an oblong ſhape.

From the lower part of the epididymis the *vas deferens* comes forth; it is a canal of conſiderable ſize, and as it proceeds along the ſpine, towards the anus, forms a great number of ſigmoid flexures or coils upon itſelf. Theſe become leſs ſtriking, and the duct enlarges as it approaches a *ſac* near the cloaca, in which it terminates in ſuch a manner, that although they form a common receptacle, there is not a free communication between them.

Monroe ſtates that theſe ſacs contain a green coloured fluid, and he conſiders them analogous to the *proſtate gland*; they appear to us to correſpond much more with the *veſiculæ ſeminales*, if they be looked upon as any thing more than a dilatation of the vas deferens. Monroe deſcribes the dilated part of the vas deferens, before its communication with the ſac, as a *veſicula ſeminalis*; in which he is evidently wrong. He was led into this error from conſidering the veſiculæ ſeminales of mammalia as mere reſervoirs of the ſemen.

The vas deferens and ſac of each ſide open into a cylindric papilla, which is viſible in the cloaca.

The teſtes of the *other orders* of fiſhes are two elongated bodies, ſometimes cylindric or conic in their form, but moſt commonly notched or divided into imperfect lobules; they are of a pale grey or aſh colour, ſoft, pulpy, and homogeneous in their texture, reſembling very much medullary ſubſtance; their ſoftneſs renders their intimate ſtructure very obſcure, but they appear to be compoſed of an intertexture of fine membrane and pultaceous matter. They do not furniſh any epididymis, nor, properly ſpeaking, vaſa deferentia; but open at their poſterior extremity almoſt immediately at the foramen, behind the anus, which is a common opening for tranſmitting the urine and ſemen. The teſtes of fiſhes are popularly known under the name of the *milt* or *ſoft row*.

Theſe glands increaſe remarkably in ſize during the ſeaſon that the females expel their ova; they are then full of a white thick fluid, like milk, which is no doubt the male ſemen. At this period they make ſo material an addition to the bulk of the body of fiſhes, that theſe animals are then only ſought after as articles of food.

In *Plate* V. *of the Anatomy of Fiſhes*, *fig.* 1. exhibits a view of the genital organs in the *male ſkate* (*raja batis*); *a* is the white medullary portion of the teſticle; *b*, the tubercular portion; theſe parts are cut away on the oppoſite

ſite ſide to abridge the ſize of the figure and expoſe other parts; *c c*, the epididymus of each ſide; *d, d*, the vaſa deferentia; *e, e*, the ſacs in which the vaſa deferentia terminate; the one on the right ſide is laid open to expoſe its cavity and connection with the vas deferens; *f* is the cylindric papilla upon which the conduits of the ſemen terminate.

Female organs.

In the genera *raja* and *ſqualus* theſe parts are more peculiarly formed than even the male organs of theſe fiſhes. They reſemble in a very great degree the female organs of birds.

The *ovaries* of theſe genera conſiſt of cluſters of round eggs of various ſizes and different ſtages of growth. The membrane which envelopes the ovaries nearly ſurrounds each of the ova, which therefore, eſpecially when mature, appear diſtinct and have ſome liberty of motion. Theſe ova conſiſt only of the yolks, and are of a pale yellow colour. In their mode of growth, connection with the ovary, and manner of excluſion from it, they very much reſemble the *racemus vitellorum* of birds.

Although in theſe genera there are two *oviducts*, they are conjoined at their extremities to form a ſingle aperture, which is placed immediately behind the ſeptum that divides the branchial and abdominal cavities. This part of the oviducts may be conſidered as analogous to the *infundibulum* in birds. The ovarian tube of each ſide at firſt proceeds for ſome way outwards and backwards, at which place its canal is ſmall, and its parietes thin and plicated longitudinally upon the inner ſurface. It then ſuddenly enlarges, and incloſes in its coats a large glandular maſs, ſomething between a ſquare and kidney ſhape; this body is compoſed of a number of white tubes, which are ſo diſpoſed that their ends are turned towards the cavity or internal part of the gland; at one ſide of this maſs there is the appearance of a ſtripe of tubes or fibres, which croſſes the other ſtructure, and is probably a muſcle for contracting the cavity. The internal membrane of this part is ſmooth, and ſo thin and tranſparent that the tubes are very viſible through it.

The interpoſition of ſo large a gland in the courſe of the ovarian duct is unqueſtionably for the ſecretion of that remarkable *horny covering* or *ſhell* which is found on the ova of theſe fiſhes, and yet it ſhould be obſerved, that we have not been able to diſcover the orifices of the tubes upon the internal membrane of the oviduct, nor have we ſucceeded in expreſſing the ſmalleſt quantity of fluid from the tubes into the cavity of the gland.

The portion of the oviduct which ſucceeds the gland is greatly dilated, its parietes are thin, and the internal ſurface (in the *ſkate* at leaſt) is covered with fine tranſverſe folds, or rather linear impreſſions, not reſembling the plicæ of an inteſtine, which are thin productions of the internal coat.

The oviducts terminate by a corrugated or puckered opening on each ſide of a conſiderable cavity, within the anus, which ſome authors have deſcribed as a *uterus*, and others as the *cloaca*. The latter name appears to be the moſt correct, as this cavity receives the urine, and communicates with the rectum. The orifices by which the oviducts terminate in the cloaca are ſurrounded by mucous glands.

In the genus *chimera* there are firſt ſome ſmall ducts, of which the extremity attached to the ovaries is open and ſpread out. After a ſhort ſpace they ſuddenly enlarge, and form a conſiderable glandular maſs, of which the faſciculi of tubes that compoſe it are perpendicular to its parietes. From theſe glands to their termination the oviducts are membranous, and of great capacity; where they terminate they are conjoined and open externally by one common aperture.

In the *oſſeous*, and in the *cartilaginous* fiſhes, *except* thoſe already deſcribed, the *ovaries* conſiſt of two membranous ſacs or bags, the cavity of which is occupied by numerous leaves, formed by reflections of the membrane; the folds are uſually placed tranſverſely; they contain the ova within their duplicatures; they are copiouſly ſupplied with blood-veſſels, and exhibit (eſpecially after injection, with a coloured fluid) a very beautiful and variegated foliated appearance.

The ovaries of different oſſeous fiſhes are of various forms; they are uſually elongated and pointed at either end. In the *dory* (*zeus faber*) they are flat, and approach a ſquare figure; in many fiſhes they have four corners, which are elongated forwards and backwards. In ſome of the *pleuronectes*, and in ſome other fiſhes, a part of the ovaries is extended backwards in that proceſs of the abdominal cavity which is continued along the external parts of the ſpines of the caudal vertebræ.

We have obſerved but one ovary, of a pear ſhape, in the *perch* (*perca fluviatilis*); perhaps ſome other fiſhes may be found to have ſingle ovaries.

The ovaries of oſſeous fiſhes increaſe prodigiouſly during the ſeaſons for depoſiting their ova. At this period they exceed in ſize all the reſt of the viſcera; although after the ſeaſon of ſpawning they are the ſmalleſt viſcera in the body: the variations in their bulk depend upon the number of ova they contain, for their parietes are at all times nearly of the ſame thickneſs.

Fiſhes in general ſurpaſs all other animals in fecundity M. Rouſſeau, a laborious French anatomiſt, has taken the pains to reckon the number of ova contained in the ovaries of ſeveral ſpecies. He found in the *ſturgeon* (*acipenſer ſturio*) 1,467,856 eggs; in the *mackarel* (*ſcomber ſcombrus*) 129,200; in the *perch* (*perca fluviatilis*) 69,216; in the *carp* (*cyprinus carpio*) 167,400; and in the *pike* (*eſox lucius*) 166,400 eggs.

The ova of thoſe fiſhes which are not viviparous are all ſmall, and of the ſame ſize; they are generally about the bulk of pin heads. They are not expelled from the ovary in ſucceſſion, as in the *chondropterygii*, but in large quantities, like the ſpawn of *frogs*; which they further reſemble in being impregnated, and undergoing their changes outſide the body of the parent.

Except in the viviparous fiſhes alſo there are no oviducts; the ovaries terminate immediately at a particular aperture placed behind the anus.

From the preceding deſcription it will be perceived, that the mode of generation in the genera *raja, ſqualus, and chimeræ* is eſſentially different from that of fiſhes in general. In thoſe genera the eggs do not leave the ovary until they acquire a conſiderable magnitude; their ſtructure is completed in their paſſage through the oviducts, in which alſo they are moſt probably impregnated. During the reſidence of the egg in the oviduct its contents are changed in their organization, and the fœtus is formed in the ſame manner as during the incubation of the egg of birds; and when the ovum is diſcharged from the body of the fiſh, the ſhell ſplits, and admits the water in which the fœtus floats, ſtill nouriſhed by the yolk which remains attached to its inteſtine.

At this period we have diſcovered that the fœtal fiſh is provided with external branchial appendages exactly ſimilar to thoſe met with in the *tadpoles* of ſome reptiles. It is when theſe fall off, and the yolk is conſumed, that the young fiſh ſeeks its own ſubſiſtence.

The ſhells of the eggs of the *raja* and *ſqualus* genera, after being evacuated by their inhabitants, are commonly from their lightneſs caſt on ſhore, and are known in ſome places under the name of *ſea bats*. For a further account of the hiſtory of the ovum, and the changes it undergoes in fiſhes, ſee the articles Ovum and Incubation.

The ſecond figure of *Plate* V. of the *Anatomy of Fiſhes*, gives a view of the female organs of the *ſkate* (*raja batis*); *a a*, the firſt portion of the ovarian tubes; *b*, their junction and aperture by which they communicate with the cavity of the abdomen; *c, c*, the glandular bodies; the one on the right ſide is laid open to ſhew its compoſition to be of tubes; *d, d*, the ſucceeding portions of the oviduct, which are very capacious, and perform in ſome reſpects the offices of uteri; *e*, a mature egg ſeen in the enlarged part of the oviduct; *f, f*, the ovaries containing eggs of various ſizes; *g g*, the termination of the oviducts in the cloaca; *h*, the cloaca; the opening by which it receives the urine; *k*, the anus.

Organs employed in the Exerciſe of the animal Functions.

Brain.

The *dura mater* in fiſhes reſembles very nearly the common perioſteum; the diſtinction of two layers is not evident; and thoſe broad reflections of the internal layer which exiſt in mammalia for ſeparating the different diviſions of the cerebral maſs are wanting. The dura mater approaches, in the large fiſhes, nearly to a cartilaginous nature.

As the cavity of the cranium is much larger than the brain, there is a conſiderable ſpace left between them, which contains a quantity of gelatinous matter in the *cartilaginous fiſhes*, and commonly an oily fluid in the *oſſeous fiſhes*. There is alſo a conſiderable quantity of ſalt water found in the cavity of the cranium, which has been ſuppoſed by doctor Monroe to be ſea water carried thither by abſorption, as we have mentioned in ſpeaking of the ſalt liquor met with in the cavities of the abdomen and pericardium of fiſhes.

The fluid of the cavity of the cranium is very frequently ſtained by admixture with blood, which appears to be extravaſated in it in ſmall quantity.

Theſe fluids are contained in a very looſe cellular texture, which correſponds to the *tunica arachnoidea* of other animals. Monroe found the ſurface of the brain covered with a number of ſmall ſpheroidal bodies; theſe are probably contained in the tunica arachnoidea.

The *pia mater* cloſely inveſts the ſurface of the brain as uſual; it likewiſe lines the ventricles, and produces a plexus analogous to the *choroid plexus*; which however does not float in the cavity of the ventricles. Cuvier deſcribes alſo two other productions of the pia mater, ſituated in the fourth ventricle, which appear to be at liberty.

The *brain* of fiſhes poſſeſſes the characters deſcribed in that of *birds* and *reptiles* in a ſtill more remarkable degree than this organ in either of thoſe claſſes. It is very ſmall in proportion to the ſize of the whole body, and bears even a greater diſproportion to the bulk of the nerves which ariſe from it. Cuvier ſtates the proportion of the brain to the reſt of the body to be as 1 to 2496 in the *white ſhark* (*ſqualus carcharias*), 1 to 1344 in the *great dog-fiſh* (*ſqualus canicula*), 1 to 37440 in the *tunny* (*ſcomber thynnus*), 1 to 1305 in the *pike* (*eſox lucius*), 1 to 560 in the *carp* (*cyprinus carpio*), 1 to 1817 in the *ſilurus glanis*. The greater ſize of the brain in the *carp* accords with the well known docility and intelligence of that ſpecies; and the ſmall proportion which the brain of fiſhes generally bears to the ſize of the body, is what might naturally be expected from the dulneſs and incapacity of this claſs of animals in general. On looking at the brain of a fiſh one is ſtruck with its diſſimilarity to the cerebral maſs of man or quadrupeds; it appears like a ſucceſſion of tubercles ſcarcely conjoined together: the eminences which nearly correſpond to the cerebrum and cerebellum are not diſtinguiſhed from the others, which give origin to the nerves, and in ſome caſes might be overlooked from their being ſmaller.

The *cerebrum* is always compoſed of two hemiſpheres, as in other animals; it is ſmooth and without convolutions: thoſe parts called *corpus calloſum, fornix*, &c. cannot be diſtinguiſhed at the junction of the hemiſpheres.

There is a cavity in each hemiſphere which correſponds to the *lateral ventricle*; it is not, however, prolonged and reflected ſo as to form thoſe parts termed *horns* in *mammalia*.

The floor of the ventricles is plain in the *ray* and *ſhark* genera, but in moſt other fiſhes there is an elevation, uſually of a ſemicircular figure, from the external or convex ſide of which a number of medullary ſtriæ go off in a radiated manner upon the internal parietes of the ventricle: this eminence correſponds to the *corpus ſtriatum*; it varies with reſpect to ſize in different ſpecies, and alſo ſometimes in its figure: according to Cuvier it forms in the *whiting* (*gadus merlangus*), an elevated oval body.

Between the corpora ſtriata there is a ſmall chink, which opens into the third ventricle.

The *anterior commiſſure* of the brain is ſituated a little below theſe eminences.

There are ſome tubercles within the hemiſpheres, which Cuvier conſiders analogous to the *tubercula quadrigemina*, although their ſituation is not the ſame. They are placed, as in birds, before and above the thalami nervorum opticorum. In the genus *cyprinus* there are four of theſe tubercles, two anterior and two poſterior; the former are extremely long, cylindric in their ſhape, and bent outwards and backwards, taking the curvature of the lateral ventricles, the cavity of which they fill: they are marked poſteriorly by a longitudinal furrow; the poſterior tubercles are round, and much ſmaller than the anterior.

The *eel* (*murena anguilla*), *haddock* (*gadus æglefinus*), and *herring* (*clupea harengus*), have but one pair of thoſe tubercles, which produce a ſemioval eminence before the cerebellum, between the poſterior extremities of the corpora ſtriata. The *pike* (*eſox lucius*), *trout* (*ſalmo fario*), *ſalmon* (*ſalmo ſalar*), and *perch* (*perca fluviatilis*), have four tubercles which are diſtinct, round, and ſmall; the poſterior pair is larger than the anterior. Theſe tubercles are not found in the *ray* and *ſhark* genera.

The *thalami nervorum opticorum* are two diſtinct tubercles ſituated below the hemiſpheres, as in birds; each of them likewiſe contains a ventricle.

The *cerebellum* is generally large in proportion to the cerebrum, and in ſome inſtances even exceeds it in ſize: it is ſometimes rugous on the ſurface; it is always a ſingle tubercle without lobes, and uſually of a heart ſhape, the apex of which is turned backwards; ſometimes the ſuperior part is the moſt prominent. When the cerebellum is cut into, the ſection of it expoſes ſome indiſtinct pale coloured lines; but that arboreſcent arrangement of medullary ſubſtance, called *arbor vitæ*, does not exiſt.

The *fourth ventricle* is generally large; with reſpect to the other cavities of the brain, it not only paſſes under the cerebellum as uſual, but aſcends for ſome way in its ſubſtance.

We have next to conſider thoſe additional tubercles of the brain of fiſhes upon which its character depends, and which conſtitute in general the greateſt part of its bulk; they are placed before the cerebrum and behind the cerebellum.

The anterior tubercles give origin to the nerves, which go to the organ of ſmelling; they are therefore commonly named the *olfactory* tubercles. They are uſually a ſingle pair. In the *ray* and *ſhark* genera they are united and form one maſs, which exceeds in ſize all the reſt of the brain: the figure of this maſs is a little various, and is difficult to deſcribe. In the *thornback* (*raja clavata*), it is ſomewhat of a triangular figure, one of the ſides or the baſe being turned forwards; in the *leſſer dog fiſh* (*ſqualus catulus*) the fore part is circular, and the back a little concave in the centre. The olfactory tubercle in theſe fiſhes has been deſcribed by ſome authors as the cerebrum, and by others as its anterior lobes.

The olfactory tubercles are long and narrow in the *ſturgeon* (*acipenſer ſturio*); they are oval maſſes, ſmaller than the hemiſpheres in the *lump-fiſh* (*cyclopterus lumpus*), and in the *moon-fiſh* (*tetraodon mola*). In the genus *gadus* they are round, and in the *cod* (*gadus morhua*) they are nearly as large as the hemiſpheres: according to Cuvier they are alſo round and notched on one ſide in the *wraſſes* (*labrus*), and in the *carp* (*cyprinus*); but Ebel and Scarpa have delineated them in the common *carp* (*cyprinus carpio*), of an egg-ſhape; they are oval in the *ſilurus glanis*.

There are four olfactory tubercles arranged in pairs in the *flat fiſhes* (*pleuronectes*), the *herrings* (*clupea*), the *pikes* (*eſox*), the *perches* (*perca*), and in the genus *ſalmo*: the anterior pair is in the common *pike* (*eſox lucius*) ſo ſmall, that they might readily eſcape obſervation: the poſterior pair, although larger, are not equal in ſize to the hemiſpheres.

In the *eels* (*genus murena*), there are three pair of olfactory tubercles; the firſt pair are the ſmalleſt; the ſecond ſomewhat larger; and the third, or poſterior, conſiderably the largeſt, being about the magnitude of the hemiſpheres.

The olfactory tubercles do not in any ſpecies contain a cavity or ventricle.

The *tubercles ſituated behind the cerebellum* are peculiar to the claſs of fiſhes: they are in general a ſingle pair, but in ſome ſpecies there is a third ſingle tubercle placed in the middle immediately before the other two, and behind the cerebellum.

Some anatomiſts ſuppoſe that the lateral tubercles are analogous to the *corpora olivaria* of mammalia, and the middle tubercle has been deſcribed as a ſecond cerebellum: the latter is evidently erroneous; but the former appears to be perfectly well founded: the corpora olivaria and theſe tubercles correſpond both with reſpect to ſituation and in giving origin to the poſterior nerves of the brain: it would be more correct, however, to ſay that the corpora olivaria are theſe tubercles on an abridged ſcale.

The poſterior lateral tubercles are large and irregularly furrowed in the *ray* genus. In the *whiting* (*gadus merlangus*), and the *cod* (*gadus morhua*), the tubercles are oval, and placed above the medulla oblongata. They are ſimilar in the *common* and *conger eels* (*murena anguilla* and *m. conger*); they are inconſiderable in the *pike* (*eſox lucius*), the *ſalmon* (*ſalmo ſalar*), the *trout* (*ſalmo fario*), and the *perch* (*perca fluviatilis*)

In the *carp* (*cyprinus carpio*) the poſterior lateral tubercles are extremely large; they equal in ſize the hemiſphere of the cerebrum; they have ſomewhat the figure of kidnies. This fiſh likewiſe poſſeſſes the middle tubercle, which is large, and of a round figure.

There are no cavities in the poſterior tubercles of fiſhes.

There is nothing very peculiar to remark with reſpect to the *origin of the nerves* in fiſhes.

The *olfactory nerves* are produced from the tubercles placed before the cerebrum, as already mentioned: they generally appear as the continuation of theſe tubercles; this is particularly evident in the *ray* and *ſhark*.

In the *carp* and *ſilurus glanis*, &c. the olfactory nerves ariſe by two or three filaments from the tubercles.

The *optic nerves* take their riſe, as uſual, from the thalami nervorum opticorum; immediately after their origin they decuſſate, or croſs each other. In oſſeous fiſhes this is moſt obvious; in which the optic nerves may be ſeen lying one acroſs the other, and only connected by cellular ſubſtances. The right nerve goes to the left eye, and the left nerve to the right eye. Many anatomiſts have ſuppoſed, in conſequence of the decuſſation of the nerves being ſo palpable in fiſhes, that ſomething of the ſame kind takes place in other animals, by which they have explained the ſympathy that is well known to exiſt between one eye and the other, in the ſuperior animals; there is, however, ſufficient connection between the two ſides of the brain, to account for the ſympathies of the organs of viſion, without aſcribing it to the decuſſation of the optic nerves.

Euſtachius and Malpighi have ſtated, that in ſome fiſhes the optic nerves have an inveſtment of pia mater, containing very elegant longitudinal folds.

The *third* and *fourth*, and *ſixth pair of nerves*, ariſe as near as may be from the ſame parts of the brain which furniſh them in mammalia.

The *fifth pair* are produced by a common trunk with the *portia mollis*, or *auditory nerve*; this trunk ariſes from the tubercles behind the cerebellum in the *rays* and *ſharks*, and from the beginning of the medulla oblongata, in the *oſſeous* fiſhes.

The *facial* nerve, or that analogous to the *portia dura* of the *ſeventh pair*, is quite diſtinct from the auditory; and ariſes in common with the *par vagum*, or the *eighth pair*, of which it might, with equal propriety, be conſidered a branch.

The nerves analogous to the *eighth pair* ariſe from the ſide of the medulla oblongata, and the back part of the poſterior lateral tubercles of the cerebellum, when theſe exiſt.

There is no nerve analogous to the *ninth pair*, or *hypogloſſal* nerves in fiſhes; although Ebel has figured a large faſciculus in the *carp*, (*cyprinus carpio*), which he deſcribes as the ninth pair. Much confuſion exiſts amongſt authors on this ſubject; thus Ebel confounds the eighth with the ninth pair; Monroe calls the olfactory tubercles the anterior protuberances of the brain; and deſcribes the ſixth for the fifth pair of nerves; Scarpa delineates the hemiſpheres of the cerebrum under the name of the *olive ſhaped protuberances* of the brain. See Monroe's Phyſiology of Fiſhes. Anatomicæ Diſquiſitiones de Auditu & Olfactu, by Scarpa; and Obſervationes Neurologicæ ex Anatom. comparata, by Jo. Godof. Ebel.

The brain of fiſhes has been hitherto but little ſtudied in a phyſiological point of view. Its ſtructure in this claſs of animals, however, promiſes to illuſtrate the functions of the different parts of the organ, as they are ſo diſtinct, that their proportional magnitude and importance may be fairly appreciated. The great relative ſize of the eminences which furniſh the nerves of ſenſe, and the ſmall quantity of cerebral ſubſtance employed to unite them into one maſs, would lead us to conclude, that fiſhes receive vivid impreſſions upon their organ of ſenſe, under the immediate impulſe of which their actions are directed; and that they have little capacity for combining or aſſociating their ſenſations: a concluſion which exactly accords with what has been obſerved reſpecting the habits and manners of this claſs of animals. We believe if the ſame rule for judging of the mental faculties be extended to other animals, that it will anſwer equally well; and that the *ſenſitive* powers will be found proportioned to the relative magnitude, and the diſtinctneſs of the parts of the brain which give origin to the nerves; and that the *intellectual* faculties will keep pace with the developement of thoſe parts which ſerve to unite the preceding. It is poſſible that this rule may be employed, to calculate the comparative excellence of the ſenſitive, and intellectual faculties of individuals in the ſame ſpecies. Perhaps even by theſe means ſome ſteps may be made towards aſcertaining the ſhades and varieties in the mental character of men.

The ſympathetic connection of the different parts of the ſyſtem, doubtleſs depends upon the union of the nerves in the common ſenſorium, which being imperfect in fiſhes, it became neceſſary that their optic nerves ſhould be diſtributed to the ſides oppoſite to their origin, on account of the organs of viſion acting conſentaneouſly, or in harmony, with each other.

In *Plate* VI. of the *Anatomy of Fiſhes. fig.* 1. exhibits the upper ſurface of the brain of the *carp* (*cyprinus carpio*); *a, a,* the two olfactory tubercles; *b, b,* the two hemiſpheres of the brain; *c,* the cerebellum; *d, d,* the two lateral tubercles placed behind the cerebellum, analogous to the corpora olivaria; *e,* the ſimple tubercle behind the cerebellum; *f* the medulla oblongata.

Fig. 2. ſhews the brain of the *carp* alſo, in which the hemiſpheres of the brain are cut, and turned to each ſide, in order to bring into view the anterior tubercles which fill the lateral ventricles, and which are ſuppoſed analogous to the *nates*; *g.g,* indicate the tubercles in queſtion, the other letters indicate the ſame parts as in the preceding figure.

Fig. 3. is the ſame brain, with the nates ſeparated at their poſterior part, in order to expoſe the poſterior tubercles, or thoſe correſponding to the *teſtes*; *h, h,* are theſe parts; the references of the other figures are the ſame as in the firſt figure.

Fig. 4. is another view of the ſame brain; the nates and teſtes, or tubercula quadrigemina, are raiſed to ſhew the corpora ſtriata, and the opening into the other ventricle, &c. *i, i,* exhibitsthe ſtriated bodies; *j,* the fiſſure which leads into the inferior ventricle; *k, k,* the thalami nervorum opticorum, which are ſcarcely viſible. The other letters have the ſame ſignification as in the preceding figures.

Fig. 5. is ſtill the ſame brain, with the hemiſpheres removed, in order to expoſe completely the thalami nervorum opticorum, which are deſignated by the letters *l, l.*

Fig. 6. ſhews the brain of the *carp,* with the cerebellum divided and turned towards each ſide, to expoſe the fourth ventricle; the references are continued the ſame.

Fig. 7. is the brain of the *carp,* viewed upon its under ſurface. The parts ſeen in that poſition, which have been already repreſented in the other figures, are indicated by the ſame letters. The nerves are numbered according to the names they uſually bear, as the 1ſt pair, or olfactory; the 2d, or optic, and ſo on; the decuſſation of the optic nerves is pointed out by the letter *m.*

Fig. 8. is a repreſentation of the upper ſurface of the brain in the *eel* (*murena anguilla*). The letters *a, a, a, a, a, a,* deſignate the ſix olfactory tubercles; *b, b,* the two hemiſpheres of the brain, which are not larger than the poſterior olfactory tubercles; *c,* the cerebellum; *d,* the medulla oblongata.

Fig. 9. exhibits the inferior ſurface of the brain of the *eel*; *e, e,* are the thalami nervorum opticorum: the other letters correſpond with thoſe of *fig.* 8. In both theſe figures the nerves are indicated by their numbers.

In *Plate* VII. of the *Anatomy of Fiſhes, fig.* 1. is a view of the head of the *thornback* (*raja clavata*), diſſected to expoſe the brain and organs of ſenſe: *a* is the large medullary maſs formed by the olfactory tubercles; *b, b,* the two hemiſpheres of the cerebrum, called by Scarpa *olive-ſhaped protuberances* of the brain; *c,* the cerebellum depreſſed along the middle, but not divided into two lobes; *d,* a portion of the brain, which muſt be conſidered either as a diviſion of the cerebellum, or the middle poſterior tubercle; *e, e,* the lateral poſterior tubercles; *f,* medulla ſpinalis. Where the nerves are ſeen in this figure, they are expreſſed by their number.

In the diſſected head of the *pike* (*eſox lucius*), ſhewn by *fig.* 1. in *Plate* VIII of the *Anatomy of Fiſhes, a. a,* indicate the two principal olfactory tubercles; *b, b,* two inconſiderable enlargements of the root of the olfactory nerves, which might be conſidered as leſſer tubercles; *c, c,* the two hemiſpheres of the cerebrum; *d,* the cerebellum. In this figure, likewiſe, ſuch nerves as are ſeen to ariſe from the brain are expreſſed by their numbers.

In *fig.* 4. of *Plate* VIII. of the *Anatomy of Fiſhes,* the olfactory tubercles of the *carp* (*cyprinus carpio*) are ſhewn: *a,* the cerebrum; *b, b,* the olfactory tubercles; *c, c,* the origin of the olfactory nerves by filaments; *d, d,* the trunks of the olfactory nerves. The other nerves that appear are indicated by correſponding numbers.

Nerves.

The courſe and diſtribution of the *firſt* or *olfactory pair of nerves* are pointed out in the deſcription of the organ of ſmelling.

The termination of the *optic nerve* is deſcribed in that part of the article which treats of the eye of fiſhes. The component filaments of the optic nerve are particularly evident in this claſs of animals, and may be demonſtrated without any preparation. They are commonly flat; and Cuvier deſcribes them as being ſometimes formed of a very thin medullary lamina, folded on itſelf, and contracted into the figure of a cord. This is particularly obſervable in the *cod* (*gadus morhua*), and the *ſword-fiſh* (*xiphias*).

The *third, fourth,* and *ſixth* pairs of nerves in fiſhes differ ſo little, with reſpect to their diſtribution, from the ſame nerves in other animals, that they do not require to be deſcribed.

The *fifth pair of nerves,* as before-mentioned, ariſe by a common trunk with the auditory nerve. In the *ſkate* (*raja batis*) they form two trunks in the cranium, and appear to coaleſce in paſſing out. On the outſide of the cranium there are again two nerves produced: the one is the *ophthalmic*; the other paſſes under the cartilage behind the orbit, and immediately divides into three branches: one of theſe is a nerve which has not been hitherto accurately deſcribed; the other branches correſpond to the *ſuperior* and *inferior maxillary nerves.*

The *ophthalmic* branch of the *fifth pair* paſſes out of the cranium into the ſuperior part of the orbit, and then divides into two branches; of which one proceeds acroſs the orbit, under the rectus ſuperior and externus, and the external oblique muſcles of the eye; the other croſſes above all the parts in the orbit. Theſe two branches, on arriving at the naſal cavities, re-unite to form a ſingle nerve. Previous to this re-union, the ſuperior branch of the ophthalmic gives off a branch to the organ of ſmelling. This forms an anaſtomoſis with another branch, which is ſent off from the conjoined nerves of the ophthalmic.

After paſſing beyond the naſal cavity, the ophthalmic breaks into a long faſciculus, from the ſides of which a great number of ſhort branches ariſe, which are loſt in the gelatinous ſubſtance that is on each ſide of the middle cartilage of the ſnout, and upon the edge of that cartilage.

The remarkable anaſtomoſis of the ophthalmic nerve, and its diſtribution in the ſnout, is repreſented in *Plate* VII. of the *Anatomy of Fiſhes*. and *fig*. 1. *r*, ſhews the origin of the ophthalmic from the fifth pair; *s*, the ſuperior branch paſſing over the muſcles of the eye; *t*, the inferior branch going between the muſcles of the eye; *u*, the coalition of theſe two; *v*, the firſt branch ſent to the organ of ſmelling; *w*, the ſecond branch given off from the united nerve; *x*, the anaſtomoſis of theſe branches; *y*, the diſtribution of the ophthalmic nerve in the ſnout. This plate exhibits the parts as they appear in the *thornback* (*raja clavata*), in which they do not differ materially from the deſcription we have given of them in the *ſkate* (*raja batis*).

The *branch* of the *fifth pair* of nerves, which we mentioned as not being accurately deſcribed by other anatomiſts, proceeds in a ſtraight line from its origin, under all the parts of the orbit, to reach the tranſverſe cartilage, ſituated on the external ſide of the organ of ſmelling. Having penetrated this cartilage, one part of the nerve forms a ſort of bulb or ganglion, from which a number of fine filaments depart like rays: theſe are abruptly, and almoſt immediately, loſt in the membranous ſtructure which forms the centres of the albumino-gelatinous ducts, to be hereafter deſcribed. The other portion of the nerve is diſtributed in long branches to the ſame gelatinous ſubſtance of the ſnout. This branch of the fifth pair is the moſt remarkable in the fiſh's body, on account of its giving the only example of a gangliform enlargement of a nerve, (thoſe of the organs of ſenſe excepted,) and from the peculiar mode of its termination. It is difficult to determine whether the ſingular conformation of this nerve be deſigned to beſtow a nicer ſenſe of touch on the ſnout, or to produce, with the albumino-gelatinous ducts, an electric apparatus ſimilar to what exiſts in the *torpedo*, &c. The latter, from analogy of ſtructure, is very probable; although the electric property, if it exiſt in the *ray* kind generally, has not yet been detected by its effects.

The *ſuperior maxillary nerve* of the *ſkate* paſſes forwards under the external ſide of the cranium, to gain the outer edge of the middle cartilage of the ſnout. In this courſe it diſtributes ſome ſmall branches to the neighbouring parts, and afterwards runs in a groove in the ſide of the cartilage, as far as the point of the ſnout, ſending off ſmall branches to the gelatinous ſubſtance, in the ſame manner as the ophthalmic nerve.

The *inferior maxillary* nerve in the *ſkate* (*raja batis*) goes forwards under the orbit, and ſends off ſeveral ſmall branches, which penetrate and are loſt in the operculum of the naſal cavity, and the integuments before the upper jaw: it then turns round the external part of the upper jaw, concealed by the large muſcles which ſurround the ends of the jaws, and divides into ſeveral branches, which are diſtributed to theſe muſcles. One of theſe branches goes on to be expended upon the integuments of the lower jaw.

The *facial nerve*, or that which correſponds to the *portio dura* of the ſeventh pair, is much larger in the *cartilaginous* than the *oſſeous* fiſhes. It forms two branches ſoon after its origin: one of theſe aſcends in the cranium, through which it paſſes, and is loſt upon the integuments.

The other branch goes through a particular foramen, into the cavity of the ear, paſſes beneath the principal cretaceous body, and there forms the remarkable anaſtomoſis with the auditory nerve, from which the ampulla of the poſterior ſemicircular canal is ſupplied. The trunk afterwards penetrates the cranium, and re-appears upon the external part, where it is loſt in a number of branches in the ſoft parts and integuments of the head.

The *auditory nerve* of the *fifth pair* in fiſhes is analogous to the *portio mollis* of the ſeventh pair in other animals; and, like it, is diſtributed excluſively to the interior of the organ of hearing. It is deſcribed and figured in that part of the article where the ear is treated of.

The *eighth pair of nerves* in fiſhes differ materially from the ſame nerves in other animals, with reſpect to their courſe and ramification. This depends upon the ſituation and ſtructure of the parts they ſupply, in order to preſerve an analogy with the nerves of this name in the other claſſes of animals. The firſt and moſt important branches are ſent to the branchiæ: theſe may be conſidered as ſupplying the place of the *par vagum* of mammalia. They are ſituated moſt anteriorly, and are uſually four on each ſide: they ſeparate from each other immediately upon leaving the cranium, and proceed to the branchiæ. When they approach theſe, each branch divides into two; one of which runs in the groove ſituated on the convex edge of the cartilages or bones that bear the branchiæ, and ſends off numerous filaments to the laminæ of the gills; the other branch paſſes in the correſponding groove or gutter of the concave edge of the branchial cartilages or bones, and is diſtributed in a ſimilar manner. The anterior branch of the firſt branchial nerve, however, returns into the cranium, in order to be diſtributed to the ear.

The ſecond branches of the eighth pair moſt commonly come out of the cranium as two or three diſtinct nerves, but ſometimes they are furniſhed from the ſame trunk, as the laſt branchial. One of theſe nerves is loſt upon the branchial muſcles. The ſecond, which is larger, is diſtributed to the ſide of the œſophagus, as far as the ſtomach. The third branch is conjoined with the cervical nerves that go to ſupply the pectoral fin.

The laſt branch of the eighth pair has a very remarkable diſtribution; it is ſituated poſteriorly to the others, at its origin; it proceeds almoſt directly outwards, and backwards towards the integuments of the ſide of the body, immediately under which it runs as far as the tail, when it terminates in fine filaments, upon the rays of the caudal fin. This ſingular nerve is nearly of the ſame ſize throughout its whole length; it has no palpable communication with the inter-vertebral or other nerves; and its courſe correſponds to the lateral line on the ſide of the body. It bears a greater analogy, perhaps, to the *nervus acceſſorius* than to any other, although its termination is much more remote.

According to Cuvier the eighth pair of nerves in the *chondropterygii* conſiſts of a ſingle trunk, which does not divide until it reaches the parts to which it is diſtributed. In theſe fiſhes the long lateral nerves are ſituated nearer to each other, and more towards the back.

The *gloſſo-phangeal nerve* is not a diſtinct trunk in fiſhes, but ariſes from the anterior part of the firſt branchial nerve; it furniſhes a great number of filaments, which are expended upon the tongue and ſurrounding parts. The trunk is loſt in the inferior part of the throat, before and between the gills.

The *hypogloſſal nerves*, as before mentioned, do not exiſt in fiſhes.

The cervical vertebræ cannot always be diſtinguiſhed from the dorſal. Cuvier aſſerts that there are never more than four ſpinal nerves, which deſerve to be called *cervical;* and frequently there are none to which this name can be applied. The firſt nerves of the ſpine, however, furniſh thoſe of the pectoral member in oſſeous fiſhes, as will be hereafter deſcribed, and likewiſe a nerve which is diſtributed to the ſeptum that divides the branchial from the abdominal cavity; and which, therefore, may be conſidered analogous to the *phrenic* nerve of other animals.

The *dorſal, lumbar, ſacral,* and *caudal,* nerves of fiſhes reſemble each other in their courſe and diſtribution, with the exception of thoſe which ſupply the pectoral fins of the *ray* kind, and thoſe that are ſent to the abdominal fins of fiſhes; generally all the ſpinal nerves paſs out of the vertebral canal, and are immediately diſtributed to the muſcles and integuments adjoining. The nerves of the ſpine anaſtomoſe with the great ſympathetic, but do not produce a ſeries of ganglia, as in other animals.

The *intercoſtal,* or great ſympathetic nerve, comes out of the cranium, by the canal of the firſt vertebræ; it is but a ſmall filament extended along each ſide of the ſpine, without any ſenſible enlargements or ganglia. It diſtributes branches round the principal arteries of the viſcera, which ſupply the place of the different plexuſes of the *ſplanchnic* nerve of mammalia.

The *brachial* nerves, or thoſe which ſupply the pectoral fins of *oſſeous* fiſhes, are furniſhed by the two firſt vertebral nerves. The anterior of theſe is ſituated ſo near the eighth pair in ſome fiſhes, that it might be miſtaken for a branch of the latter; it paſſes out, however, through a foramen peculiar to itſelf. The ſecond vertebral nerve lies more behind the œſophagus, and more towards the middle line of the body. Theſe two nerves proceed directly to the internal lamina of the ſcapulæ, where they are conjoined without being intermixed. The firſt vertebral then forms two branches, which ſend off filaments that anaſtomoſe with each other, and are diſtributed to the adductor muſcles of the fin. One of the branches of the firſt vertebral nerve is ſent to the ſeptum of the branchial and abdominal cavities. This filament is conſidered by Cuvier as analogous to the *phrenic* nerve.

The two cords, formed by the vertebral nerves, paſs through the hole ſituated before, and on the outer ſide of the articulation of the fin with the ſhoulder, where they unite and produce an irradication of nervous filaments, ſeveral of which are loſt in the external ſurface of the ſhoulder, and in the oblong articular capſule which receives the ſmall carpal bones. One of theſe filaments runs under the ſkin that covers the rays of the fin.

The *brachial* nerves are remarkably large, and are formed of a great number of nerves, from the ſpinal marrow in the *flat cartilaginous* fiſhes (genus *raja*). There is firſt a thick cord produced by the union of twenty vertebral nerves. This cord paſſes through the middle of the cartilaginous bar upon which the rays of the wing or great pectoral fin of theſe fiſhes are articulated; it then proceeds forwards along this cartilaginous bar, and ſends off a number of branches which run outwards along the rays of the anterior part of the fin, ſupplying the muſcles placed between theſe rays, and the integuments, as far as the external edge of the fin.

A ſecond cord is thus formed by the four or five next vertebral nerves, which divides at the roots of the rays of the middle part of the fin into ſeven or eight filaments; theſe are diſtributed in the ſame manner as the branches of the firſt cord.

Afterwards each two vertebral nerves, as far as the forty-fourth, are united into cords, which penetrate the cartilaginous bar, and ſupply the poſterior portion of the fin.

Theſe different cords, which reſult from the junction of the vertebral nerves, may be conſidered as repreſenting the *brachial plexus* of other animals.

The *pelvic nerves,* or thoſe which ſupply the *ventral fins* of the *flat cartilaginous fiſhes,* are diſpoſed in the ſame manner as thoſe of the pectoral fins. Four or five vertebral nerves unite to form a ſingle cord, which penetrate the cartilage that ſuſtains the rays of the fin, and is expanded in filaments, in the muſcles of the fin. There are uſually four more vertebral nerves ſent to the poſterior part of the ventral fin, upon which they are diſtributed in the ſame manner as the preceding cord.

The nerves of the ventral fin in *oſſeous* fiſhes are filaments of the vertebral pairs, which are diſtributed to the intercoſtal ſpaces. Theſe filaments ſupply the muſcles of the rays, and may be traced upon the ſkin to the edge of the fin.

The nerves of fiſhes are diſtinguiſhed from thoſe of other animals by the want of ganglia, and their great magnitude in proportion to the bulk of the brain, and of the whole body. Monroe has deſcribed the coats of the nerves of fiſhes alſo as being covered by a number of ſpheroidal bodies.

Organs of Touch.

Fiſhes are unprovided with any members capable of encompaſſing external bodies, and conſequently poſſeſs the ſenſe of touch in but an imperfect degree. The only parts in which any peculiar feeling appears to reſide, are the *cirri,* the *tentacula,* and the *extremity* of the *ſnout.*

The *cirri* are ſituated upon the lips or about the mouth; they are commonly pointed taper proceſſes, which in ſome inſtances appear to be compoſed chiefly by the common integuments; in the *cod* (*gadus morhua*), however, there is a very firm cartilage, and perhaps the ſame in other ſpecies.

Theſe parts are not better ſupplied with blood veſſels or nerves than the adjacent parts, and their ſurface is ſmooth and without papillæ; from which circumſtance it is probable, that they do not enjoy any peculiar feeling or ſenſe of touch except what they derive from their form and prominent ſituation. Cuvier mentions only one proceſs of this kind in the genus *gadus,* in which he differs from other naturaliſts, who allow to ſome ſpecies three, four, and five cirri. There are two long cirri in the *ſurmullet* (*mullus*). In the *gudgeon* (*cyprinus gobio*) there are two, in the *carp* (*cyprinus carpio*) there are four ſhort cirri, and in the *barbel* (*cyprinus barbus*) there are four, two from the ſides of the mouth and two from the ſummit of the head.

There are ſeveral cirri in the *pogge* or *armed bull-head,* (*cottus cataphractus*) which appear like a beard; there are ſix or eight in the genera *cobitis* and *ſilurus*; in the latter two are placed before the eyes, like the antennæ of inſects, and four project from the under lip, which the animal is ſaid to caſt every year.

The cirri are numerous around the mouth in the *frog-fiſh,* (*lophius piſcatorius,*) and the *gadus taru.*

The *tentacula* appear better calculated than the cirri, from their figure, for receiving the impreſſions of external bodies. In the *gattorugine* and *creſted blenny* there are two tentacula on the top of the head, which form tufts, or are ſetaceous at the end.

The tentacula are moſt remarkable in the genus *lophius*;

the anterior tentaculum of the *lophius hiſtrio* is divided at the extremity into two branches, the ends of which terminate in fleſhy maſſes; the other tentacula are very long and conical, and end in filaments.

The *lophius piſcatorius* has ſome long tentacula on the head, which it has the power of moving in different directions. It is ſuppoſed by ſome naturaliſts, that it employs theſe tentacula in angling for its prey, and hence it derives the ſpecific name *piſcatorius*.

The principal ſeat of the ſenſe of touch appears to be the end of the ſnout; the ſenſibility of this part, however, does not depend upon any peculiar organization of its ſurface, but ariſes entirely from being largely ſupplied with nerves.

The *ophthalmic branch* of the fifth pair of nerves in the *thornback* and *ſkate*, after diſtributing branches to other parts in its courſe, as already deſcribed, runs along the ſide of the cartilage which forms the middle of the ſnout, and ſends off a great number of ſhort filaments which are loſt upon this cartilage, and the gelatinous ſubſtance on the ſide of it, as far as the very point of the ſnout, where theſe nerves terminate in ſome fine fibrillæ: the laſt branch of the *ſuperior maxillary* nerve of the fifth pair exhibits, in theſe fiſhes, a ſimilar diſtribution along the ſides of the cartilage inferiorly. According to Cuvier, the ophthalmic and ſuperior maxillary nerves terminate in ſmall branches, which are ſent to the hooks of the ſnout in the *ſaw-ſhark* (*ſqualus priſtis*), and in the ſpines or tubercles of the ſnout in the *ray* genus.

In the *leſſer dog-fiſh* (*ſqualus catulus*) the ophthalmic nerve goes on to the end of the ſnout, where it terminates in ſeveral ſhort branches.

In *oſſeous* fiſhes the ſnout is alſo ſupplied in a ſimilar manner by large nerves.

The above account ſhews, that the ſnout of fiſhes ſtrongly reſembles the bill of birds, as far as regards its ſenſibility and its functions as an organ of touch; through its means the animal will be advertiſed of the approach of any foreign body, but it is by no means calculated to take cognizance of the qualities of ſubſtances applied to it.

In *Plate* VII. *of the Anatomy of Fiſhes*, *fig.* 1. exhibits the diſtribution of the *ophthalmic nerve* in the ſnout of the *thornback* (*raja clavata*); *x*, indicates the origin of the nerve, *y*, its ramification in the ſnout.

Fig. 3. of *Plate* VIII. ſhews the ophthalmic nerve as it appears in the *pike* (*eſox lucius*); *f*, the nerve paſſing to the ſnout; *g*, an artery derived from the internal carotid, which accompanies it.

In *Plate* IX. *of the Anatomy of Fiſhes*, *fig.* 2. exhibits the external part of the ſnout of the *frog-fiſh* (*lophius piſcatorius*); *c*, *c*, *c*, numerous branched cirri around the lower jaw; *d*, *d*, long tentacula from the front of the ſnout, with which this fiſh is ſuppoſed to angle.

Integuments.

Fiſhes are covered by ſkin like other animals, in addition to which they have a peculiar integument formed by the *ſcales*.

Although fiſhes inhabit the ſame element as the *cetacea*, they are not provided with a ſubcutaneous layer of fat. This ſeems to ariſe from the ſtandard of their animal heat approaching ſo near the temperature of the water, that they do not ſtand in need of defence againſt the latter. It is to be obſerved, however, that ſome fiſhes have a conſiderable quantity of oil diffuſed amongſt their muſcles and under the integuments, examples of which are found in the genera *clupea* and *ſalmo*, &c.

The only fiſh which appears to have really an integument of fat is the *moon-fiſh* (*tetraodon mola*). There is ſpread under the ſkin of this ſpecies a layer of a fatty looking ſubſtance, of about two inches in thickneſs. Upon examination this matter is found, however, to poſſeſs all the chemical properties of albumen. The uſe of ſuch a covering on this fiſh is not underſtood.

It cannot be properly ſaid that fiſhes poſſeſs a *panniculus carnoſus*, or *muſcular integument*; in many ſpecies the ſkin adheres to the muſcles of the body, which ſeem in ſome places to be inſerted into it; by this connection the ſkin more exactly complies with the motions of the body, but we doubt whether any fiſh is capable of moving the ſkin diſtinctly or independently of the body. Cuvier deſcribes a ſubcutaneous layer of muſcular fibres in the *carp* (*cyprinus carpio*), and ſome other fiſhes with large ſcales. It adheres to the inner ſurface of the ſkin, and is divided into two portions by a longitudinal line correſponding to the ſituation of the vertebral column. At this place there are impreſſions made by the tendons inſerted into the ſkin. They deſcribe curves, the convexity of which is towards the tail. Theſe muſcular fibres ſeem to perform the office of conſtricting the ſkin, and thus regulating, in a degree, the poſition of the ſcales.

The *ſkin* of fiſhes conſiſts, as in mammalia, of the *cutis*, or *true ſkin*; the colouring ſubſtance, or *rete mucoſum*; and the *inſenſible integument* or *epidermis*.

The *cutis* ſeems to poſſeſs eſſentially the ſame ſtructure in fiſhes as in mammalia, but more particularly reſembles the cutis of *lizards* and *ſerpents*.

The ſkin adheres commonly very firmly to the external ſurface of the muſcles by means of a web of aponeurotic fibres, which appear in ſome ſpecies, as the *ſole* (*pleuronectes ſolea*), the *common eel* (*murena anguilla*), &c. as a complete integument. The ſkin, or the aponeurotic fibres under it, adhere to the muſcles chiefly at the parts where the latter are divided into longitudinal maſſes; the middle portions of theſe maſſes are at liberty, and lie encloſed by this means in a ſort of ſheath.

The ſkin appears to vary in thickneſs according to the ſtrength of the ſcales; it is very thick in the *ray* and *ſhark* genera, the *eels* (*murena*), &c. and thin in thoſe ſpecies that poſſeſs large ſcales, as the *carp* and *bream* (*cyprinus carpio* and *c. brama*), hence in preparing theſe fiſhes for the table, the former are deprived of their ſkin, and the latter of their ſcales.

The *rete mucoſum* is very palpable in this claſs. It adheres to the ſurface of the ſcales, and produces all thoſe brilliant colours, and varying metallic tints, for which the bodies of fiſhes are ſo remarkable. It poſſeſſes, in general, conſiderable firmneſs, and in ſome inſtances has a ſmooth membranous appearance, which, however, we believe does not depend upon a fibrous texture, but the compreſſion of the mucous pigment.

The whole of the external ſurface of fiſhes is covered by a ſoft mucous coat, which correſponds to the *epidermis*; it forms a thicker layer in the fiſhes that have ſmooth ſkins, than in thoſe with large ſcales. The epidermis is ſo ſoft and pulpy that it does not deſerve the name of a membrane; it is very eaſily rubbed off the ſkin, and is alſo ſpontaneouſly ſhed; in both caſes, however, it is ſpeedily removed.

The ſurface of the ſkin of fiſhes is more or leſs beſmeared with a ſlimy ſubſtance of a peculiar nature. The apparatus by which it is ſecreted is one of the moſt curious parts of the anatomy of this claſs of animals. Beneath the integument there are a number of ducts, or tubes, which open by many orifices upon the ſkin, more particularly about the head, and thoſe parts of the ſurface of the body which are the moſt expoſed to friction. Their ducts are largeſt and moſt numerous in the fiſhes with ſoft ſkins, but we believe they exiſt in every ſpecies, even thoſe with large ſcales, and with oſſeous integuments. They are moſt remarkable in the *ſhark* and *ray* genera, in which they have an arrangement, not the ſame as in the oſſeous fiſhes.

In the *ſkate* (*raja batis*) there is, on the outſide of the branchial apertures, a duct under the ſkin, about the thickneſs of a crow's quill, which is coiled or reflected in a waving line towards the head; one extremity of it is ſhut, and ends at the anterior edge of the head; the other paſſes round to the upper ſurface of the head, where it ſends off upwards of thirty ſmaller ducts, that terminate by open ends upon the ſkin; other branches are expended upon the inferior ſurface of the ſnout, dividing and re-uniting to form ſeveral curves and zig zags, without being materially diminiſhed in their diameter; from one of which a large duct goes to the upper part of the ſnout. There are not, according to Monroe, above ſix or eight outlets on the inferior ſurface of the fiſh's body.

On each ſide of the fiſh, a little farther forward than the foremoſt of the five breathing holes, there is a central part, from which ſeveral faſciculi, compoſed of a great number of ducts of a ſubordinate order or magnitude, go off in different directions, to open upon the greateſt part of the ſurface of the body. Theſe centres preſent the appearance of an irradiation of membranous cells. A very conſiderable branch of the fifth pair of nerves, already deſcribed, after forming an enlargement, reſembling a ganglion, is inſtantaneouſly loſt in filaments upon the parietes of this ſtructure, with which they become ſo inextricably united, that it is impoſſible any longer to diſtinguiſh them. Monroe ſuppoſes that the nerves diſappear in conſequence of changing their ſtructure, but it ſhould rather be ſaid that they become imperceptible by abruptly terminating; for how can they be called nerves after they ceaſe to poſſeſs the characters of ſuch? This affords the moſt ſtriking example of the ſudden termination of a nerve with which we are acquainted in the whole animal economy, and illuſtrates what we have obſerved leſs evidently with reſpect to the nerves that go to the pulps of feathers and bulbs of hairs, &c.

In the *ſharks*, the principal ſubcutaneous ducts about the head are ſo large, that they would admit a gooſe's quill.

In the *tope (ſqualus galeus)*, according to Cuvier, there is but one centre of communication for the ducts, which is ſituated in the ſnout.

In the *oſſeous* fiſhes the ducts are leſs numerous than in the *chondropterygii*; they are likewiſe unprovided with centres of communication. The principal ducts are ſituated upon the ſides of the head, or over the jaws; where they ſend off ſeveral ſhort ducts to terminate upon the ſurface. The ducts of each ſide communicate with one another on the top of the head, and with one which extends along the ſide of the body parallel to the lateral abſorbent veſſel.

The pores by which the ducts open upon the ſkin of the head are very viſible in the *common pike* (*eſox lucius*), and the *ſea pike* (*eſox belone.*) Cuvier ſtates them to be more diſtinct upon the head of the *chimera monſtroſa* than in any other fiſh.

The ſubſtance contained in the ſubcutaneous ducts of fiſhes has not yet been ſtrictly analized as far as we are informed. It is a ſemifluid tranſparent jelly. It reſembles very much the matter found in the cells of the electric organs of fiſhes, and that which ſurrounds the ova of frogs. It appears to be a combination of albumen and gelatine, in which the proportion of the former is ſo great, that inſtead of being diſſolved by water it is ſlightly coagulated, by coming into contact with it: we have ſubmitted it to the action of tannin, with which it combines like common gelatine. It however reſembles in no reſpect mucus; therefore, Dr. Monroe very improperly calls the tubes containing it, *mucous ducts*. See his Phyſiology of Fiſhes.

There can be no queſtion, both from the parts of the body upon which this gelatinous ſubſtance is principally ſhed, and its being moſt abundant in thoſe ſpecies which are not protected by hard integuments, that it is a defenſive ſecretion againſt the continual friction and waſhing of the water to which fiſhes are expoſed. Cuvier however, and other anatomiſts, are diſpoſed to think that the ſubcutaneous ducts are in a degree analogous to the electric organs of fiſhes, which opinion is rendered not improbable from the great ſize and ſingular termination of the nerve ſent excluſively to the centres of the ducts in the *ray* kind. Perhaps delicate experiments might detect a degree of this electric property in all fiſhes; if ſo, this faculty muſt anſwer other purpoſes in their economy than to preſerve them from the attacks of the larger ſpecies of their own kind. We do not pretend to decide upon thoſe queſtions, which can only be determined by nicer inveſtigations, that have yet been made upon the ſubject.

The diſtribution of the albumino-gelatinous ducts is repreſented in *Plates* X. and XI. of the *Anatomy of Fiſhes*. In *Plate* X. the upper ſurface of a *ſkate* (*raja batis*) is ſhewn; *a*, the centre of the ducts on the left ſide; *b*, faſciculus of ducts going towards the ſpine; *c*, *c*, other faſciculi ſent to the anterior parts of the fiſh; *d*, *d*, faſciculi proceeding to terminate upon the outer and back part of the great fins; *e*, a long faſciculus running backwards to terminate near the tail; *f*, a large branch of the fifth pair of nerves paſſing outwards from the cranium; *g*, its ſingular termination on the common centre of the ducts of the right ſide; *h i k*, the beginning of the large duct of the under ſurface of the ſnout; *l*, the ſame duct ſeen through the ſnout; *m*, the duct which is reflected from the anterior ſurface of the ſnout; *n*, *n*, *n*, ſeveral branches of this duct which open upon the ſkin, on the ſide of the ſnout.

Fig. 1. of *Plate* XI. exhibits the anterior quarter of the under ſurface of the *ſkate* (*raja batis*); *a*, the large ſerpentine duct reflected upon itſelf on the external ſide of the branchial apertures; *b*, *b*, *b*, branches of the ſerpentine duct that open upon the inferior ſurface of the body; *c*, *c*, the branches that ſurround the naſal cavity; *d*, *d*, anaſtomoſes with the duct of the oppoſite ſide; *e*, the point from which a large branch is ſent to the upper part of the ſnout; *f*, the extremity of the ſerpentine duct which turns round to the upper ſurface of the fiſh; *g*, the blind extremity of the ſerpentine duct; *h*, *h*, parts of the correſponding ducts of the oppoſite ſide of the fiſh; *i*, the centre of the ducts on one ſide; *k*, *k*, *k*, *k*, *k*, *k*, faſciculi going off from the centre in different directions to open upon the under ſurface of the body of the fiſh.

Fig. 2. of *Plate* XI. is a lateral view of the head and part of the body of the *cod*, (*gadus morhua*); *a* is the anterior portion of an albumino-gelatinous duct, which runs upon the ſide of the fiſh, and has numerous ſhort branches terminating by open mouths on the ſurface; *b*, the ſuperior branch of this duct, which unites with the correſponding one of the other ſide, upon the top of the head, as ſeen at *c*, and terminates in a blind extremity on the end of the ſnout, as indicated by *d*; *e*, ſhews the inferior branch of the lateral duct, running along the upper jaw; *f*, *f*, *f*, &c. are its branches opening upon the ſkin; *g* is another large duct lying on the lower jaw, which has no communication with the others; *h*, *h*, *h*, &c. are the ſhort branches it ſends off to terminate upon the ſurface.

The integument which furniſhes the moſt effectual defence to fiſhes is produced by the *ſcales*, and the other *oſſeous pieces*, which grow on their ſkin. For the deſcription of theſe parts, ſee the article SCALES, in this dictionary.

Organ of Smelling.

The apparatus for receiving the ſenſation excited by odorous ſubſtances is more complicated in fiſhes than other animals, although the organs are leſs oſtenſible.

The *naſal cavity*, except rarely, as in the *frog fiſh*, (*lophius piſcatorius*,) does not form any external projection; the organ of ſmelling, therefore, from not ſtriking the eye, received little attention from anatomiſts, and no full or accurate deſcription of it was given before the publication of Scarpa's book De Auditu & Olfactu; it was even formerly miſtaken for the organ of hearing; and Blumenbach ſays, this abſurd opinion has been revived in modern times, but we are unacquainted with any anatomiſt at preſent who entertains ſuch an opinion.

In the *chondropterygeous* fiſhes the organ of ſmelling is ſituated on the under ſurface of the ſnout; but in the *oſſeous* fiſhes on the upper and fore part of it; it is contained in an oval or round ſhallow cavity, which in the *rays* and *ſharks*, and in ſome *oſſeous* fiſhes, as the *gurnard*, &c. is formed by an excavation of the cartilage or bones of the head, but in moſt oſſeous fiſhes it is partly compoſed of bone, and partly of membrane.

The naſal cavity has no internal communication with the fauces, nor is it connected with any ſinuſes or hollow parts in the bones of the face; in the *chondropterygii*, however, there is a groove or hollow, leading from the edge of the organ of ſmell, under the operculum, to the angle of the mouth.

The apertures of the naſal cavities, or *external nares*, of the genera *raja* and *ſqualus*, are in a great meaſure covered by an *operculum*, compoſed of two irregularly-formed cartilaginous flaps connected and covered by the common integuments. The operculum is elevated at the pleaſure of the animal, according to Scarpa, by a number of fine muſcular fibres which ariſe from the end and fore parts of the ſnout, proceed obliquely backwards towards the angle of the mouth, and are inſerted into the operculum. The nares are cloſed by ſome fibres which act like a ſphincter. We confeſs we have not been able to diſcern either of theſe muſcles, although we have examined very large *ſkates* for the purpoſe. As the opercule is opened or ſhut, the water flows in and out of the naſal cavity with more or leſs force, and thus the odorous matter is expoſed to the ſurface of the organ.

In the *oſſeous*, and moſt other fiſhes, the apertures of the naſal cavity are croſſed by a flexible ſeptum or bar; in ſome fiſhes this ligament is narrow like a cord; in others it is broader, and formed with irregular edges: each aperture is thus divided, ſo as to preſent the appearance of two nares on each ſide, an anterior and poſterior; the former always continues open, and preſerves the ſame figure, but the latter varies in ſize, in proportion as the cord is drawn outwards or recedes into the cavity of the noſe.

The ſeptum of the nares is drawn outwards by a faſciculus of muſcular fibres which ariſes from the bones of the ſnout, and is inſerted into the middle of the ſeptum. When this muſcle is not in action, the elaſticity of the parts, and the impulſe of the water, are ſufficient to depreſs the ſeptum, and force it within the nares. Under theſe circumſtances the poſterior aperture is contracted into the figure of a chink. Some fiſhes, as the *carp*, (*cyprinus carpio*,) have the power of elevating the ſeptum ſo much, that the aperture of the nares is drawn out as a tube.

The *frog fiſh* (*lophius piſcatorius*) has the nares, and indeed the whole naſal cavity of each ſide, elevated upon the top of the ſnout, in the ſhape of two drinking glaſſes, which are moveable in every direction.

The external integuments are reflected into the naſal cavity; on arriving at the bottom of which they ſeem to form the pituitary or olfactory membrane.

The immediate organ of ſmelling conſiſts in all fiſhes of a number of fine laminæ, upon which the olfactory nerves are diſtributed. The varieties in its ſtructure depend upon the different arrangement of theſe laminæ, and the form and mode of ramification of the nerves.

In the *ray* kind (*raja*) there are two ſeries or rows of laminæ, ſeparated from each other by a ligament which extends through the middle of the naſal cavity, from one end to the other. The laminæ are round upon the ſuperior edge, and falciform upon the inferior margin. They are broader in the middle of the cavity than towards each end of it, correſponding to its oval ſhape.

The ſurfaces of the laminæ that are applied to each other furniſh a number of thin narrow laminæ, which are arranged in a radiated manner.

The diſpoſition of the pituitary membrane is ſimilar in the *ſhark* genus (*ſqualus*.)

The other cartilaginous, and the oſſeous fiſhes have the internal laminæ of the naſal cavity arranged in radii, around an elevated tubercle. In the *ſturgeon* (*acipenſer ſturio*,) the laminæ ramify or divide upon their free border into thinner plates. The *carp* (*cyprinus carpio*), and ſome others, have the central tubercle approaching an oval figure, which gives the organ a good deal of the appearance it has in the *ray* and *ſhark*.

The pituitary membrane is abundantly beſmeared with mucus in fiſhes, as is uſual in other animals; the glands which ſecrete it are evident on the membrane of the *ray* and *ſhark*; it is generally covered with red veſſels, and ſometimes with black, as in the *pike* (*eſox lucius*.)

The *olfactory nerves*, after ariſing from the brain in the manner already deſcribed, proceed a conſiderable way forwards, either in a canal left in the bones of the head for the purpoſe, or in the continued cavity of the cranium, as the caſe may be, during which courſe they uſually acquire a greater ſize than when they left the brain.

After the olfactory nerves paſs out of the cranium, and arrive at the organ of ſmelling in the *ray*, they become enlarged and ſofter in their texture, and proceed tranſverſely outwards along the middle of the ſuperior ſurface of the organ, incloſed in a firm ſheath, which is perforated by a number of foramina on each ſide: through each of theſe foramina a branch of the olfactory nerve paſſes, and ſoon after divides into a tuft or bunch of fibrillæ, which are diſtributed in a beautiful manner upon the laminæ already deſcribed.

In the *tope* (*ſqualus galeus*) the olfactory nerve is at firſt very ſlender, it paſſes out of the cavity of the cranium through a particular foramen, and ſoon after forms a round ganglion, from which two faſciculi of nerves are produced: theſe ſend branches to the olfactory laminæ on each ſide of the ligament which divides the organ into two portions.

The olfactory nerves of *oſſeous* fiſhes uſually begin to divide into branches on approaching the back of the organ; theſe again divide into others, which are diſtributed in a very palpable manner on the olfactory laminæ.

The *carp* (*cyprinus carpio*), the *ſilurus glanis*, the *haddock* (*gadus æglefinus*), and the *cod* (*gadus morhua*), have each of the olfactory nerves enlarged into a remarkable round ganglion juſt before they penetrate the back of the organ of ſmell; from this ganglion a bundle of branches go immediately off to be diſperſed upon the olfactory laminæ. It is probable that ganglia alſo exiſt upon the olfactory nerves of the other ſpecies of *gadus*, *cyprinus*, and *ſilurus*.

It would ſeem, from the greater extent and ſub-diviſion of the olfactory membrane, that the *ray* and *ſhark* genera have a more acute ſenſe of ſmelling than the *oſſeous* fiſhes. All this claſs of animals poſſeſs it in a high degree, which is ſhewn by their nicety with reſpect to the different baits employed in catching them; thus, a worm which has loſt its flavour by maceration will be refuſed by a fiſh; but the ſame worm, having its ſmell revived by inciſions made on it, will be taken greedily; we cannot, however, determine exactly the degree of excellence of the ſenſe of ſmelling in fiſhes, as the medium through which they receive the impreſſion of odorous matter is different from that by which it is applied to other animals; but we may ſuppoſe their perception of odorous ſubſtances to exceed that of mammalia, as the latter have no diſcernment of odour when diffuſed in water, and brought into contact with their organs of ſmelling in that ſtate. The ſtructure of theſe organs in fiſhes would alſo lead us to make the ſame concluſion; for the magnitude of the nerves of ſmelling, and the ſurfaces upon which theſe nerves are ſpread, are proportionally greater in fiſhes than in any quadruped.

In *fig.* 10. of *Plate* VI. of the *Anatomy of Fiſhes*, will be ſeen the external parts of the organ of ſmelling on the under ſurface of the ſnout of the *thornback* (*raja clavata*); *a a*, the operculum, partially covering the naſal cavity, exhibiting a thin layer of muſcular fibres running obliquely from before backwards; *b*, *b*, the ducts containing gelatinous matter, ſeen faintly through the muſcular fibres of the operculum; *c*, *c*, the cartilaginous folds placed around the naſal cavity, and forming the interior part of the operculum; *d*, the conjunction of the cartilaginous folds ſeen through the muſcle; *e e*, the ligament of each ſide which divides the olfactory laminæ; *f*, *f*, *f*, *f*, the membranous plates or laminæ arranged on each ſide of the ligament; *g*, *g*, the hollow folds by which the naſal cavity communicates with the angles of the mouth.

Fig. 1. in *Plate* VII. of the *Anatomy of Fiſhes*, exhibits a diſſected view of the upper part of the organs of ſmelling in the ſame fiſh; *n*, *n*, the olfactory nerves enlarged, previous to their entering the ſheath; *o*, *o*, the bulbs of the olfactory nerves ſeen paſſing acroſs the naſal cavity, the ſheath being laid open on one ſide, and removed on the other, the branches that ariſe from the bulb are expoſed; *p*, *p*, the ſuperior or convex edges of the laminæ covered with membrane; *q q*, the ramification of the olfactory nerve brought into view by removing the membrane on the back of the organ.

Fig. 5. in *Plate* VII. of the *Anatomy of Fiſhes*, is a tranſverſe ſection of the organ of ſmelling in the *thornback*; *a*, the bulb of the olfactory nerve; *b b*, the ligament which runs through the centre of the olfactory laminæ; *c*, *c*, the membranous laminæ of the ſecond order that ariſe from the ſides of the others.

Fig. 6. of the ſame plate, ſhews about the half of the organ of ſmelling in the *thornback*, magnified; *a a*, the ligament; *b*, *b*, the laminæ of either ſide; *c*, one of the nerves given off from the bulb; *d d d*, the ramification of the nerve upon the duplicature of the olfactory membrane; *e*, the membranes of the ſecond order.

Fig. 7. of the ſame plate, repreſents the diſtribution of the olfactory nerve in the *tope* (*ſqualus galeus*); *a*, *a*, the olfactory laminæ from above; *b*, the trunk of the olfactory nerve; *c c*, the bulb or ganglion; *d*, the faſciculi of nervous filaments; *e*, the diviſion of theſe into two parts, indicated by *f f*; *g*, *g*, *g*, *g*, the double ſeries of branches of the olfactory nerve diſtributed to the two ſets of laminæ.

Fig. 1. of *Plate* VIII. of the *Anatomy of Fiſhes*, exhibits a diſſected view of the olfactory nerves in the *pike*, (*eſox lucius*); *s*, *s*, the olfactory nerves when they firſt begin to break into filaments; *t*, *t*, the filaments diſtributed to the bottom of the naſal cavity; *u u*, the anterior aperture of the nares; *v v*, the poſterior aperture; *x x*, the bar or bridge acroſs the nares; *y*, *y*, branches of the fifth pair of nerves ſent to the organ of ſmelling for common ſenſation.

Fig. 3. of *Plate* VIII. ſhews the external parts of the organ of ſmelling in the *pike*; *a*, the poſterior opening of the naſal cavity; *b*, the anterior opening; *c*, the bar or bridge between them; *d*, muſcular fibres for elevating the bar or ſeptum of the external opening of the naſal cavity; the bar being removed, the bottom of the naſal cavity is expoſed, in which are ſeen the radiated membranes or laminæ of the organ indicated by the letters *e*, *e*.

In *fig.* 4. of the ſame plate, the diſtribution of the olfactory nerves is expoſed in the *carp* (*cyprinus carpio*); *d*, *d*, the trunks of the olfactory nerves; *e*, *e*, the trunks becoming faſciculated or compoſed of filaments; *f f*, the bulb or ganglion of the olfactory nerves; *g*, *g*, branches ſent off from the ganglia, and diſtributed upon the olfactory membranes; *h*, foramen left on one ſide, through which the branches of the olfactory nerve paſs to the organ of ſmelling.

The diſſected head of the *frog fiſh* (*lophius piſcatorius*) in *fig.* 1. *Plate* IX. of the *Anatomy of Fiſhes*, exhibits the courſe and termination of the olfactory nerves; *x*, the olfactory nerve paſſing through the cranium; *y*, the ſame nerve continued along a canal in the ſnout; *z*, the nerve ſpreading into filaments, previous to its diſtribution upon the laminated ſtructure of the organ, indicated by *.

The ſecond figure of the ſame plate repreſents the external part of the ſnout of the *frog fiſh*; *a*, the organ of ſmelling as it appears elevated upon a footſtalk; *b*, the organ of the other ſide with a part of it cut out, to bring into view the olfactory laminæ.

Organ of Taſte.

There is every reaſon for denying the ſenſe of taſte to the tongue of fiſhes. This organ in them wants almoſt all the peculiarities of ſtructure which fit it for receiving the impreſſions of ſapid ſubſtances. The integuments are without papillæ, and do not poſſeſs greater vaſcularity, or a larger ſupply of nerves, than the covering of the other parts of the mouth, and in many ſpecies the ſurface of the tongue is beſet with teeth. The movements of the tongue of fiſhes are alſo limited to elevation, depreſſion, and a very ſlight degree of lateral motion; it is incapable of flexion or extenſion, which are the actions moſtly employed in taſting; the extent of ſurface the tongue affords is uſually very inconſiderable in fiſhes, as this member projects but a little way into the cavity of the mouth; and in the *chondropterygii* there is no prominence of the parietes of the interior part of the mouth to be diſcerned. Laſtly, the whole ſurface of the mouth in fiſhes being beſmeared with a thick tenacious mucus, muſt very much obſcure the perception of ſapid ſubſtances.

In the *ray* genus there are two flaps of the integuments upon the edge of the mouth, ſomewhat of a triangular ſhape, with the free border denticulated, or rather fringed. Theſe parts appear to us better adapted for receiving the impreſſions of taſte than the tongues of fiſhes.

It is moſt probable, that the ſenſe of taſte is extremely imperfect, if it exiſts at all in this claſs of animals; indeed, it could ſeldom be called into action, as moſt fiſhes chooſe their food by the aſſiſtance of the ſenſes of ſeeing and of ſmelling.

Organ of Hearing.

As ſound is always conveyed to the ear of fiſhes through the medium of water, they do not require an external *concha*, or any projecting parts for collecting the ſonorous vibrations. The whole of the organ is, properly ſpeaking, internal, or within the head, in theſe animals.

Anatomiſts diſagree with reſpect to there being any meatus auditorius externus, or external opening leading to the interior of the organ. It is only contended for in the cartilaginous fiſhes with free branchiæ. Both Monroe and Hunter aſſumed the merit of diſcovering this part. The former deſcribed it in the *ſkate* (*raja batis*) in theſe words: "In the back part of the occiput, near the joining of the head with the ſpine, two holes, not larger than to admit the head of a ſmall pin, are found at the diſtance of an inch from each other; in a large fiſh each of theſe leads into a capacious winding canal or concha, which deſcribes nearly a complete circle; the two conchæ are ſeparated from each other by a thin partition; each concha terminates in a funnel, from which a ſmall cylindrical canal, or meatus auditorius externus, is continued; the meatus is lodged in a hollow left between two thick cartilages; and as there is no membrana tympani, it opens, he ſays, into a large ſac, which contains a white or opaque matter, with a quantity of clear watery-looking, but viſcid matter."

This ſac is the part upon which the auditory nerve is ſpread, as will be afterwards deſcribed.

He further ſays, "that generally ſome portion of a ſimilar white matter is found in the meatus auditorius externus and concha, as if part of it paſſed off by the meatus, or was ſomehow neceſſary for communicating the impreſſion of ſound to the bottom of the ear."

In another place Doctor Monroe conjectures this "meatus auditorius externus performs the office of the Euſtachian tube, at leaſt ſo far as that tube may be ſuppoſed to ſerve the purpoſe of diſcharging uſeleſs or hurtful matter." Monroe's Phyſiology of Fiſhes, p. 48, 49.

Mr. Hunter does not give any particular deſcription of the external opening of the ear in the *ray* or *ſhark* genera, but frequently mentions it as a part he had diſcovered, and notices a paſſage in Willoughby's Hiſtory of Fiſhes, in which there is ſome account given of an external opening on the head of the *ſkate*, in the neighbourhood of what Willoughby ſuppoſed to be the organ of hearing in that fiſh.

The exiſtence of any opening into the interior of the ear from the external part of the body has been denied by a number of highly reſpectable anatomiſts.

M. Geoffroy, who deſcribed the organ of hearing before either Mr. Hunter or Doctor Monroe, mentioned an external opening, which he ſtates as being difficult to find; he ſays it is concealed by the muſcles, and ſituated near the condyles at their lateral external part; and in another place he ſpeaks of the auditory foramen being covered with the muſcles and the fat. This account is different from the one given by Monroe and Hunter, that it adds no confirmation to their opinion.

Camper poſitively denies an external opening to the ear of the ſkate. He ſays, "L'organe de l'ouie de la raye n'a donc aucune communication avec l'air de l'atmoſphere; mais il eſt enfermé," &c. Camper, Mem. de Math. tom. vi. p. 194.

Vicq d'Azyr entertained the ſame opinion; in ſpeaking of the cartilaginous fiſhes with fixed branchiæ, he ſays, "L'organe de l'ouie n'a point chez eux d'ouverture exterieure." Vic. d'Azyr, tom. 7. p. 20.

To theſe authorities we may add that of Scarpa, who aſſerts, in the moſt poſitive manner, that there is no external opening to the ear of either the flat or round cartilaginous fiſhes; he ſuppoſes, that the foramina which Doctor Monroe diſcovered were the openings of ſome of the ducts containing gelatine, which are found in this ſituation; he even treats Doctor Monroe's account with deriſion; and conſiders it abſurd to ſuppoſe that there ſhould be a communication between the external element and the immediate ſeat of the ſenſe of hearing.

Scarpa, in denying an external opening, admits the exiſtence of a conduit from the integuments into the veſtibulum or ſac containing the amylaceous ſubſtance.

In this Cuvier agrees with him, and we may add, that we have frequently and carefully diſſected the organ of hearing in the *ray* and *ſhark* genera, but have never been able to diſcover the openings mentioned by Monroe and Hunter. What we have obſerved agrees almoſt exactly with the deſcription given by Scarpa.

Behind the occiput, where it is articulated with the firſt vertebræ of the neck, the ſkin is ſmooth and a little depreſſed; if it be raiſed at this place two oval membranes preſent themſelves, one on each ſide. Theſe are pellucid, but at the ſame time denſe and unyielding; they adhere ſtrictly to the edges of two foramina, from each of which a funnel-ſhaped duct leads directly into the veſtibulum. Scarpa conſiders theſe foramina analogous to the *feneſtræ ovales*; the membrane which covers them, however, has ſome of the properties of the membrana tympani, and may have ſome effect in regulating or increaſing the impreſſion of ſound; we perceive then that the cavity of the labyrinth is perfectly cloſed at every point, as well in the *chondropterygii* as in the oſſeous fiſhes: indeed, a different ſtructure would be a departure from the plan of the organ in all other animals.

The membranous labyrinth in the *cartilaginous* fiſhes with *fixed branchiæ* is ſituated in a correſponding excavation of the ſides of the back part of the head; it is ſo much wider than the part it encloſes that they would not preſerve their places, but from their connection with veſſels, nerves, and proceſſes of cellular ſubſtance, which paſs to them in different directions: the cartilaginous labyrinth has no communication with the cavity of the cranium, except through the foramina, for tranſmitting the nerves to the ear. It is compoſed of very tranſparent, and much ſofter cartilage, than the other parts of the head.

In the fiſhes with *free* branchiæ, whether *cartilaginous* or *oſſeous*, the greateſt part of the membranous labyrinth is contained in the ſides of the ſame cavity which holds the brain; there are, however, ſome depreſſions on the inſide of the cranium for receiving parts of the ear, and ſome portion of the ſemicircular canals is ſituated round the projecting columns of bone, or in ſhort oſſeous canals.

According to Cuvier, the large lateral depreſſion of the cranium in the *moon fiſh* (*tetraodon mola*), containing the ear, is divided by only two ſmall cartilaginous columns, one of which is horizontal, and furniſhes a pulley to the poſterior ſemi-circular canal; the other is vertical, and affords one to the horizontal canal; but as the interval between theſe columns and the parietes of the cranium is ten times greater than the diameter of the canals, they are ſuſpended in that ſpace by veſſels and cellular ſubſtance. The anterior vertical canal has even no column of this kind, and there is no depreſſion for the ſac in the baſe of the cranium.

In the *frog-fiſh* (*lophius piſcatorius*) the cartilaginous columns are broader, and approach more to the parietes of the cranium, and form two pulleys, through which the poſterior and horizontal canals paſs.

In the *oſſeous* fiſhes there are larger columns or diviſions of the cavity of the ear than exiſt in the *branchioſtegous* fiſhes, and the pulleys are lengthened into ſhort canals, which include a certain portion of the membranous ſemi-circular canals, more eſpecially the poſterior and horizontal ones. The anterior ſemi-circular canal is ſometimes uncovered. In the *pike* (*eſox lucius*), the *eel* (*murena anguilla*), the *roach* (*cyprinus rutilus*), and the *mackarel* (*ſcomber ſcombrus*), there is only a ſmall oſſeous pillar correſponding to the ſpace within the anterior canal. In the *dory* (*zeus faber*) this canal reſts in a furrow. In the *cod* (*gadus morhua*), and the *carp* (*cyprinus carpio*), the anterior canal is partly incloſed in one of bone, and the poſterior and horizontal canals are almoſt concealed in the bones of the cranium.

When the ſac which contains the oſſiculum is at a diſtance from the ſinus, the depreſſion which receives it is deep. The *cod* affords an example of this, but it is more remarkable in the *carp* and *herring*.

In theſe fiſhes the cell for holding the ſac ſurrounds it, leaving an opening only for the narrow canal which joins the ſac and ſinus together.

In every inſtance amongſt the *oſſeous* fiſhes, in whatever way the ſac and canals may be incloſed, the ſinus and extremities of the canals remain in the cavity of the cranium; the nerves therefore, in paſſing to theſe, do not go through any foramina in the bones. But in the *ſturgeon* (*acipenſer ſturio*) there is an approach to the ſtructure deſcribed in the cartilaginous fiſhes with fixed branchiæ; each of the canals is entirely enveloped in a tube, conſiderably larger however than the one it incloſes; the ſac lies cloſe to the ſide of the cranium, from the common cavity of which it is ſeparated by a very thick membrane, ſecured there by ſeveral ligamentous proceſſes. The nerves are tranſmitted through holes in this membrane left for that purpoſe.

The parts which immediately conſtitute the organ of hearing are eſſentially the ſame in all the orders of fiſhes; they conſiſt of membranous ſemi-circular canals, and certain dilated parts or ſacs, which contain calcareous ſubſtances, either hard or ſoft, and upon which the nerves of hearing are chiefly ſpread; all theſe parts are further completely filled up with a gelatinous fluid, or tranſparent pulp.

The ſtructure of the canals and ſac is nearly the ſame in all fiſhes, they are as thin as membrane, but tranſparent and elaſtic, like cartilage, of the nature of which they ſhould probably be conſidered: when theſe parts are cut aſunder, they do not collapſe, but preſent open mouths, like the ſection of an artery.

All fiſhes agree with reſpect to the number and direction of the canals; they are always three, an *anterior*, *poſterior*, and *horizontal*; the firſt is ſituated forwards, is inclined outwards, and ſtands nearly upright; the ſecond is directed backwards and outwards, and its poſition is alſo nearly vertical; and the third makes its circuit outwards, and in a horizontal plane.

Each of theſe canals forms an *ampulla* or ſpherical dilatation at one of its extremities; the ampulla of the anterior canal is placed at its anterior or inferior extremity; that of the horizontal canal at its anterior extremity, therefore, near the preceding; the ampulla of the poſterior canal is ſituated at the inferior extremity.

The anterior extremity of the poſterior canal, and the poſterior extremity of the anterior canal, form a junction before they terminate in the ſac. The other extremities of theſe canals, and both the extremities of the horizontal canal, have diſtinct terminations. There are therefore five openings from the three ſemi-circular canals.

As far as reſpects the form and diſtribution of the ſemicircular canals, the organ of hearing in fiſhes will be perceived to reſemble the membranous labyrinth in the higher claſſes of animals: the circumſtance in which it moſt materially differs is the exiſtence of the ſac containing the calcareous bodies.

In the *cartilaginous fiſhes* with *fixed branchiæ*, the ſac is triangular in its form; the internal angle, or that next the brain, communicates with the duct leading from the feneſtra ovalis. The part correſponding to the ſecond angle is round or oval, and ſituated poſteriorly. The third angle has an anterior and external direction.

In theſe fiſhes there are three calcareous maſſes, a *large* or principal one; and two ſmaller, of which one is ſmaller than the other, and therefore they are called the *leſſer* and *leaſt* bodies of this kind. The conſiſtence of theſe ſubſtances is ſoft, reſembling a mixture of plaſter of Paris before it is uſed for making a caſt more nearly than any other ſubſtance with which we are acquainted: they have been likened to a ſoft mixture of chalk, and to ſtarch, and hence they are called the *cretaceous* and *amylaceous* bodies. The large cretaceous body has ſomewhat the figure of a bivalve ſhell; one ſide is convex, and the other a little concave, with a groove along its broadeſt margin; the leſſer cretaceous body is triangular; and the leaſt has the figure of a kidney bean, but is a vaſt deal ſmaller in ſize.

Theſe bodies are not allowed to float at liberty in the ſac; ſome of their ſurfaces are applied cloſe to the membrane, and the others adhere to the gelatinous pulp, which is moulded to their ſhape, and they are further retained in their ſituation by the ramifications of the auditory nerves.

In the *fiſhes* with *free branchiæ*, there is conſiderable variety in the ſtructure of the dilated parts, for containing the calcareous bodies, and in the form of theſe bodies.

The ſac in the *moon-fiſh* (*tetraodon mola*) is cone-ſhaped; the pointed end is turned towards the brain, and the baſe receives the ſemi-circular canals.

In the *ſturgeon* (*acipenſer ſturio*) the ſac is a broad flat diſk, placed in a vertical direction.

In theſe, the *frog-fiſh* (*lophius piſcatorius*), and as far as it has been obſerved in all the *cartilaginous* fiſhes with *free* branchiæ, the ſac is an undivided cavity; but in the *oſſeous* fiſhes, the coalition of the extremities of the ſemi-circular canals produce an intermediate cavity between theſe and the ſac.

Scarpa calls this part *ſinus utriculliformis*, or the *bottle-ſhaped ſinus*. It might with great propriety be conſidered as analogous to the membranous veſtibulum of other animals, although conſiderably different from it in ſhape. The ſinus is uſually elongated, and tubular in its appearance, and diſtinguiſhed from the ſac by a contraction: it contains the third oſſiculum or calcareous body.

The *ſac* of *oſſeous fiſhes* is generally oval in its figure, and placed on the lower ſurface of the cranium, ſo as frequently to approach the one of the oppoſite ſide; ſometimes there is a hollow in the baſe of the cranium for its reception, as already mentioned. Cuvier conſiders the ſacs analogous to the cochleæ, on account of there being a ſeptum formed within them by their internal membrane and contained parts.

In the *pike* (*eſox lucius*) there is a ſmall oval cavity lying behind and below the ſinus, to which it is connected by a ſmall canal. This part has been called the *appendix* of the ſemicircular canals by Scarpa and others; but it ſhould rather be called an additional ſac. It has not yet been obſerved in any other fiſh except the *pike;* but there is nothing peculiar in the general anatomy of this ſpecies, which would lead us to ſuppoſe that it is confined to it. The appendix receives a branch from the firſt ſpinal nerve.

Amongſt the *cartilaginous* fiſhes with *free branchiæ,* the *frog-fiſh* (*lophius piſcatorius*), has three calcareous bodies: a large one and a ſmall behind it are contained in the ſac; the third is very ſmall, and is ſituated in the cavity formed by the junction of the anterior and horizontal ſemicircular canals, juſt below the ampulla of the former. It is triangular in its figure.

In the *ſturgeon* (*acipenſer ſturio*) there is only one calcareous body: it is triangular, and conſiſts of a hard nucleus, which is partly ſurrounded by ſoft cretaceous matter.

The ſubſtances found in the ſac of the *moon fiſh* (*tetraodon mola*) appear more like mucus than chalk.

Probably many more varieties would be diſcovered in the cartilaginous fiſhes with free branchiæ, if their anatomy were better known.

In all the *oſſeous* fiſhes there are three calcareous bodies, which have commonly been called *oſſicula:* their compoſition is, however, different from that of any other bones; they are extremely hard, of a pearly white colour, and almoſt tranſparent in their thinner parts. They appear to conſiſt of pure calcareous matter, without any mixture of animal ſubſtance, and more nearly reſemble the enamel of the teeth than any other part of the oſſeous ſyſtem.

There are conſiderable varieties in the bulk and form of the oſſicula, reſpecting which we are indebted to Cuvier for ſome details.

The principal oſſiculum is uſually placed obliquely in the ſac. It is commonly an oval figure in the genus *gadus;* it is nearly round, with an angle internally, in the genus *ſilurus,* and in the ſpecies of *cyprinus* that have been examined, as the *carp* (C. *carpio*), the *bream* (C. *brama*), the *tench* (C. *tinca*), and the *roach* (C. *rutilus*). In the genus *ſalmo,* the *pike* (*eſox lucius*), and the *ſturgeon* (*acipenſer ſturio*), it is irregularly triangular.

The oſſiculum is ſmall in the *eel* (*murena anguilla*), the *ſtar gazer* (*uranoſcopus ſcaber*), the *flat fiſh* (*pleuronectes*), the *dory* (*zeus faber*), and the *pike* (*eſox lucius*); of a middle ſize in the *herring* (*clupea harengus*); and large in the genus *gadus,* particularly the *cod,* in the *carp* (*cyprinus carpio*), and a number of the *thoracic* fiſhes.

The chief oſſiculum is convex on one ſide, and concave on the other; the external ſurface is rough; the internal is ſmooth, except a furrow which appears to form, with a production of the internal membrane of the ſac, a ſmall canal which paſſes through the interior of the ſac. This furrow is commonly longitudinal; ſometimes it is ſhaped like a horſe-ſhoe. In the *carp* (*cyprinus carpio*), it is nearly circular; in the *cod* (*gadus morhua*), its place is ſupplied by an elevated ridge.

The anterior end of the oſſiculum has frequently ſome projections from it. There are two of them in the *pike* (*eſox lucius*), the *mackarel* (*ſcomber ſcombrus*), and the *herring* (*clupea harengus*). The oſſiculum of the *carp* (*cyprinus carpio*) has three; the one in the middle projects like a ſtyle. The end of this bone is round and without points in the genus *gadus* and *labrus,* the *roach* (*cyprinus rutilus*), &c.

The edges of this bone are uſually notched or denticulated, and the ſuperior margin is moſt ſo. The denticulations are nearly equal all round the edge of the oſſiculum of the *cod* and *carp;* in the former they are blunt, in the latter they are pointed. They only exiſt on one edge in the genus *ſalmo* and the genus *perca.* There are but three which are on the ſuperior margin in the *conger eel* (*murena conger*).

Some ſtriæ are almoſt always obſerved to extend tranſverſely from the furrow to the edge of the principal oſſiculum: theſe are intended to lodge the numerous fibrillæ of the auditory nerves. Theſe impreſſions are particularly remarkable in the *carp* genus (*cyprinus*), in which they have a radiated appearance.

The ſecond or middle ſized oſſiculum is commonly ſituated behind the large bone, but ſomewhat more externally: its moſt uſual form is ſemilunar, the concave ſide being anterior. Its ſize varies, but it is always much leſs than the principal oſſiculum. Its figure is peculiar in the *carp,* in which it reſembles that of the head of a ſpear.

The third oſſiculum, as already mentioned, is ſituated in the ſinus utriculliformis: it is ſometimes ſo near the principal bone, that it is apt to eſcape obſervation; its figure varies. In the genera *gadus, ſcomber,* &c. it is triangular; in the *gurnards* (*trigla*), it is lenticular; in the *pike,* it is rounded and unequal. It is larger proportionally in the *carp* than in any other genera, and its ſurface is ſcabrous, and the edge ſerrated.

By theſe hard or extraneous ſubſtances being placed in the gelatinous pulp, and in contact with the nerves, it is evidently deſigned to increaſe the impreſſions of ſound upon theſe parts: they thus compenſate for the want of an oſſeous labyrinth, which moſt probably in mammalia and birds has the effect of rendering the concuſſion of ſound more ſenſible. Camper has ingeniouſly obſerved, that to be convinced that a hard body floating in a gelatinous ſubſtance is affected by the ſlighteſt external motion, it is only neceſſary to introduce ſome hard body into a glaſs of jelly, when the motion of this body will be ſenſible to the fingers holding the glaſs, on ſhaking the jelly, or giving the glaſs a little ſhock with the finger of the other hand. He mentions another ſimple but illuſtrative experiment, which conſiſts in putting ſome hard body into a bladder containing a fluid, the ſlighteſt motion of which will be communicated to the hard ſubſtance, by which a ſtrong ſenſation will be excited in the finger holding the bladder.

Two nerves, which correſpond to the *portio dura* and *portio mollis* of the ſeventh pair, are found in fiſhes. The latter has a peculiar origin, not being a diſtinct trunk, but conjoined at its root with the fifth pair of nerves, of which it is uſually reputed a branch, although, with more propriety perhaps, the fifth pair ſhould be conſidered a branch of the portio mollis.

In the *cartilaginous fiſhes* with *fixed branchiæ,* the *auditory* branch, or portio mollis of the fifth pair, after paſſing through the foramen, which tranſmits it from the cavity of the cranium into that of the ear, bends round behind the external parietes of the veſtibulum, and divides into two principal branches, one of which is vaſtly larger than the other. The *leſſer* branch is diſtributed in a retiform manner upon the poſterior ſurface of the ſac, containing the ſmaller cretaceous body, and ſends off two longer branches, which proceed to the ampullæ of the anterior and horizontal canals, in which they are expended. The *large* or *principal* auditory nerve forms a faſciculus, the filaments of which divide, ſubdivide, and re-unite upon the poſterior ſurface of the ſac containing the large cretaceous body, ſo as to produce an intricate and cloſe plexus, from the poſterior ſide of which a nerve goes off to be diſtributed upon the ſac of the ſmalleſt cretaceous ſubſtance. A branch, alſo furniſhed from the poſterior ſide of the plexus, coaleſces with one belonging to the *portio dura,* which paſſes through a particular foramen from the cranium, and arrives behind the large ſac. From this anaſtomoſis a branch, which ſupplies the ampullæ of the poſterior ſemicircular canal, is given off. The nerve afterwards proceeds to the external part of the head, and is diſtributed immediately under the integuments about the occiput, and the beginning of the neck.

The *portio mollis* in *oſſeous* fiſhes, which alſo is a branch of the fifth pair of nerves, almoſt immediately divides into two branches, of which one goes to the ampulla of the anterior canal, and the other paſſes under the ſinus to the ampulla of the horizontal canal. The ſecond branch of the portio mollis further gives off a longer branch, which goes to the poſterior part of the head, behind the ſuperior margin of the cavity for lodging the ſac, and divides into many filaments, which are diſperſed in a net-work upon the portion of the ſac next the brain. From the upper and poſterior part of this reticulation a nerve is joined by a branch of the *portio dura*, and proceeds to the ampulla of the poſterior canal. In the *oſſeous*, therefore, as well as the *cartilaginous* fiſhes, the ampulla of the poſterior ſemicircular canal is ſupplied by an anaſtomoſis of the portio dura and mollis.

Dr. Monroe and Mr. Hunter thought that the auditory nerves did not paſs through the parietes of the membranous labyrinth in fiſhes; but, after running a little way upon the ſurface of the ſacs and canals, became pellucid and diſappeared: the termination of theſe nerves is very differently deſcribed by Scarpa and Cuvier; the former traced the branches into the ampullæ of the ſemicircular canals, in which they become ſoft and pulpy, and with the aſſiſtance of the membrane produce a ſeptum which nearly interrupts the half of the cavity. Cuvier ſtates that the nerves of the ſac penetrate into the interior of the cavity, and are diſtributed immediately upon the calcareous bodies contained therein. As we have not at preſent examined this matter, we quote the authorities. See Hunter in Phil. Tranſ. vol. lxxii. part 2. Monroe's Phyſiology of Fiſhes, p. 50. Scarpa de Auditu & Olfactu, p. 15. Cuvier's Lectures on Comparative Anatomy, tranſlated, vol. ii. p. 468 and 546.

Hunter and Monroe have made ſome experiments to determine the poſſibility of hearing under water, which were very unneceſſary, as it was well known that fiſhes were ſenſible of ſounds produced even in the air. In fact, ſound is communicated with greater or leſs facility according to the denſity and elaſticity of the medium through which it paſſes; conſequently it will be more readily propagated through ſolid ſubſtances and water than through air, and hence we find the organ of hearing leſs complicated in thoſe animals that receive impreſſions of ſound from the earth or water, than in thoſe that inhabit the air. The ear of fiſhes is admirably conſtructed for receiving ſonorous vibrations in a denſe medium; the great extent and elaſticity of the ſac and canals; the exiſtence of calcareous bodies, more eſpecially when they are hard, and the large plexus of nerves, all ſeem calculated for this purpoſe. If the ear of fiſhes were provided with a tympanum, it would probably be of no uſe, unleſs it were filled with ſome fluid as denſe, at leaſt, as water.

In *Plate* VII. of the *Anatomy of Fiſhes*, *fig.* 1. exhibits a view of the organs of hearing in the *thornback* (*raja clavata*) in ſitu; *g*, anterior ſemicircular canal; *h*, poſterior ſemicircular canal; *i*, horizontal ſemicircular canal; *j*, the ampulla of the horizontal canal; *k*, cavity of the veſtibulum, which contains the large ſac laid open; on the other ſide, at *l*, is ſeen the cellular reticulation of this part; *m m*, the membrane of the feneſtra ovalis on each ſide.

Fig. 2. of *Plate* VII. of the *Anatomy of Fiſhes*, ſhews the organ of hearing of the right ſide of the *thornback*, abſtracted from its ſituation, and viewed from the ſide next the brain, the cavity of the veſtibulum and the cartilaginous tubes which encloſe the membranous canals being laid open; *a*, the anterior ſemicircular canal; *b*, the poſterior ſemicircular canal; *c*, the horizontal ſemircircular canal; the ampullæ of each of the canals is ſufficiently evident without letters of reference; *d*, the membrane of the feneſtra ovalis ſeen on the ſide of the veſtibulum; *e*, ſulcus leading from the membrane of the feneſtra to the interior of the veſtibulum; *f*, the portion of the ſac containing the large cretaceous ſubſtance; *g*, that of the leſſer; *h*, the ſituation of the ſmalleſt cretaceous body; *i*, the coalition of the anterior and horizontal membranous canals; *j*, the branch of the auditory nerve diſtributed to the ampulla of the anterior ſemircircular canal; *k*, branch of the auditory nerve to the ampulla of the poſterior canal; *l*, branch of the auditory nerve to the ampulla of the horizontal canal.

In *fig.* 3. of *Plate* VII. of the *Anatomy of Fiſhes*, an oppoſite view is given of the organ of hearing in the *thornback*, by which the poſterior ſurface of the ſac and the diſtribution of the nerves upon the immediate ſeat of hearing are expoſed; *a*, the anterior ſemicircular canal; *b*, the poſterior ſemicircular canal; *c*, the horizontal ſemicircular canal; *d*, auditory nerve; *e*, branch of the auditory nerve to the ampulla of the anterior canal; *f*, branch of the auditory nerve to the ampulla of the horizontal canal; *g*, nervous plexus upon the capſule of the large cretaceous body; *h*, nervous plexus upon the capſule of the leſſer cretaceous body; *i*, plexus upon the capſule of the ſmalleſt cretaceous body; *k*, portio dura; *l*, anaſtomoſis of the portio dura with the auditory nerve; *m*, nerve furniſhed by this anaſtomoſis to the ampulla of the poſterior ſemicircular canal; *n*, continuation of the trunk of the portio dura; *p*, part of the cavity of the cranium; *q*, a part of the tranſverſe cartilage which paſſes outwardly to ſuſtain the jaws; *r*, the firſt vertebra of the neck.

Fig. 8. of the ſame plate repreſents the thin cretaceous bodies of the ear of the *thornback*; *a* is the large cretaceous body viewed upon the anterior ſurface; *b*, the groove that runs along it; *c*, the ſame ſubſtance viewed poſteriorly; *d*, the leſſer cretaceous body; *e*, the ſmalleſt cretaceous body.

Fig. 4. of *Plate* VII. exhibits the ampulla of one of the membranous ſemicircular canals magnified and laid open to expoſe the diſtribution of the auditory nerve in its interior; *aa*, the enlarged part, or ampulla opened; *b*, the branch of the auditory nerve, becoming gradually broader and ſeparated into filaments; *c*, the nervous ſeptum of the ampulla; *d d*, ſemicircular canal above and below the ampulla.

In the diſſected head of the *pike* (*eſox lucius*), repreſented in *fig.* 1. of *Plate* VIII. of the *Anatomy of Fiſhes*, there is a view of the organ of hearing on each ſide ſeen from above; *e*, the anterior ſemicircular canal entirely ſeen; *f*, its ampulla; *g*, the poſterior ſemicircular canal partially expoſed; *h*, its ampulla ſeen below; *i*, the courſe of the horizontal ſemicircular canal; *j*, its ampulla; *k*, ſinus utriculliformis of the ſemicircular canals; *l*, appendix of the ſinus, which is a part peculiar to the *pike*; *m*, the ſituation of the ſmalleſt oſſiculum. No. 5 is the trunk of the fifth pair, and any other nerves ſeen in this figure ariſing from the brain are indicated by correſponding numbers; *n*, the branch of the auditory nerve ſent to the ampulla of the anterior ſemicircular canal; *o*, the branch of the auditory nerve ſent to the horizontal canal; *p*, the branch ſent to the ampulla of the poſterior canal; *q*, branches of the auditory nerve expended upon the ſac containing the principal oſſiculum; *r*, nerve going to be inſerted behind the ſinus, where the ſmalleſt oſſiculum is contained.

Fig. 2. of *Plate* VIII. ſhews the three oſſicula of the *pike*; *a*, the principal one; *b*, the leſſer oſſiculum; *c*, the ſmalleſt oſſiculum; *d*, the ſame magnified.

In *Plate* IX. of the *Anatomy of Fiſhes*, *fig.* 3. exhibits a lateral view of the organ of hearing in the *pike*; *a*, the cavity of the cranium; *b*, ſpinal canal; *c*, anterior ſemicircular canal; *d*, its ampulla; *e*, the ampulla of the horizontal canal; *f*, the other extremity of the ſame canal; *g*, the ampulla of the poſterior canal; *h*, the other extremity of the poſterior canal; *i*, the utriculliform ſinus of the ſemicircular canals; *j*, appendix peculiar to the *pike*; *k*, the ſmalleſt oſſiculum ſeen through the ſinus; *l*, the ſac containing the other two oſſicula. No. 5 indicates the trunk of the fifth pair of nerves; *m*, the auditory nerves; *n*, the branch of the auditory nerve to the ampulla of the anterior canal; *o*, the branch of the auditory nerve to the ampulla of the horizontal canal; *p*, nerves derived from the auditory going behind the ſmalleſt oſſiculum; *q*, the branch of the auditory nerve ſent to the ampulla of the poſterior canal; *r*, auditory nerves diſtributed upon the ſac on the ſide next the brain; *s*, nerve analogous to the par vagum or portio dura; *t*, the anaſtomoſis of the preceding nerve, with a branch of the auditory or portio mollis, from which the ampulla of the poſterior canal is ſupplied; *u*, a nervous filament ſent from the firſt ſpinal nerve to the bottom of the appendix.

Fig. 4. of the ſame plate explains the different cavities of the bones of the cranium, in which parts of the labyrinth are encloſed; *a*, the cavity of the cranium; *b*, a hollow, in which the ſac with the oſſicula is lodged; *c*, a ſinuoſity for containing the ampulla of the anterior ſemi-circular canal; *d*, the aperture leading into the paſſage which holds the horizontal ſemi-circular canal; *e*, the common foramen to the horizontal and poſterior canals; *f*, the other opening, through which the poſterior ſemi-circular canal paſſes; *g*, the foramen, by which the portio dura goes out of the cranium; *h*, canal of the ſpine; *i*, *i*, foramina for the exit of the fifth pair of nerves; *k*, foramen for the firſt ſpinal nerve.

In *Plate* IX. *of the Anatomy of Fiſhes*, *fig.* 1. is a ſection of the head of the *frog-fiſh* (*lophius piſcatorius*); *a*, the anterior ſemi-circular canal; *b*, its ampulla; *c*, the horizontal ſemi-circular canal; *d*, its ampulla; *e*, the poſterior ſemi-circular canal; *f*, its ampulla; *g*, the conjunction of the anterior and poſterior ſemi-circular canals; *h*, a large canal, into which all the others open; *i*, principal ſac containing the large oſſiculum; *k*, the ſacculus of the leſſer oſſiculum; *l*, the third or ſmalleſt oſſiculum ſeen through the membrane below the ampulla of the anterior canal; *m*, the nerve going to the ampulla of the anterior canal; *n*, the nerve of the ampulla of the horizontal canal; *o*, nervous filaments ſent behind the ſeat of the third oſſiculum; *p*, filaments of nerves diſtributed to the capſule of the large oſſiculum; *q*, a filament which goes to be expended upon the capſule of the leſſer oſſiculum; *r*, a long nerve ſent to the ampulla of the poſterior ſemi-circular canal; *s*, the portion of the fifth pair of nerves that go out of the cranium; *t*, the fourth pair of nerves; *u*, the third pair of nerves; *v*, the ſecond or optic nerves; *x*, the firſt or olfactory pair of nerves.

Organs of Viſion.

The eyes of fiſhes are uſually ſituated on the ſides of the head, in which caſes the animal only beholds objects with one eye at a time; ſome remarkable exceptions exiſt, however, with reſpect to the poſition of the eyes in this claſs; they are turned directly upwards in the *ſtar-gazer* (*uranoſcopus*). All the genus *pleuronectes* have both eyes placed on one ſide of the head, which, from the poſition the fiſh obſerves, is always the uppermoſt. In the *callionymus* and the *ray* genus the eyes have an oblique aſpect.

The figure of the eye in fiſhes uſually approaches that of a ſemi-ſphere, the flat ſurface of which belongs to the cornea. In the *ray* genus the eye is flat alſo ſuperiorly, and has, conſequently, the form of a quarter of a ſphere. Some fiſhes have the cornea gibbous, and the eye of the ſame figure that it poſſeſſes in thoſe animals which inhabit the air; the *gadus lota* affords an example of this ſhaped eye.

The *ſclerotic* coat is denſe, elaſtic, and cartilaginous in its ſtructure; and although ſometimes thin, it preſerves the figure of the eye. In ſome ſpecies, more particularly amongſt the cartilaginous fiſhes, it is thick. This is remarkably the caſe in the *ſturgeon* (*acipenſer ſturio*); in this fiſh the ſclerotic compoſes the greater portion of the eyeball, the cavity for containing the tranſparent parts bearing but a ſmall proportion to the reſt of the globe. This coat is thin in the poſterior part of the eye of the *ſalmon* (*ſalmo ſalar*), and hard and unyielding as bone on the fore part. The induration of the front of the ſclerotic is alſo found in ſeveral other ſpecies.

The ſclerotic of the *ray* and *ſhark* genera forms a tubercular projection at the back of the eye; this is articulated with a piece of cartilage which is connected at the other extremity to the bottom of the orbit. The eye in theſe animals, therefore, is ſuſtained upon a footſtalk, upon which it is moveable only to a certain extent.

The *cornea*, as before mentioned, is commonly flat in fiſhes.

The diſtinction between this coat and the ſclerotic is particularly plain in the *tope* (*ſqualus galeus*); theſe two coats are conjoined by oblique edges, between which is interpoſed ſome compact cellular ſubſtance, which appears to be a production of the conjunctiva that paſſes into the eye to be united to the ciliary ligament.

The *conjunctiva* is reflected over the external part of the globe of the eye in fiſhes as in other animals. This is ſatiſfactorily ſhewn in the *eel* kind (*murena*), in which it adheres ſo ſlightly at this place, that it is removed in ſtripping the ſkin off the reſt of the body.

The *choroid coat*, and *membrana ruyſchiana*, are very diſtinct from each other in this claſs.

In the genera *raja* and *ſqualus* the choroides poſſeſſes the uſual vaſcular ſtructure, and is of ſome thickneſs and conſiſtency; the ruyſchian membrane is very thin and tranſparent, and between the two membranes there is ſpread a ſilvery pigment.

But in other fiſhes the choroides is very thin and little vaſcular. It is a white ſilver or gold colour. The ruyſchiana has more conſiſtence, and is compoſed of an infinite number of veſſels interwoven together. It is a black colour. There is interpoſed between theſe coats a remarkable body called the *choroid gland*, which is not found in the *chondropterygii*.

The *choroid gland* has uſually the figure of a thick flat ring; it encircles the optic nerve, but not entirely, as there is always a ſmall deficiency in the ring.

In the *cod* (*gadus morhua*), the *ſalmon* (*ſalmo ſalar*), and the *moon-fiſh* (*tetraodon mola*), it has been obſerved to form not a true circle, but to be irregularly bent; and in the *perca labrax* it is compoſed of two pieces placed on oppoſite ſides of the optic nerve.

The choroid gland is very compact in its ſtructure; it receives a multitude of fine veſſels which paſs through the membrana ruyſchiana; they are covered by a white opaque mucus, anaſtomoſe with each other, and ſeem to terminate in an infinite number of ramifications in the ſubſtance of the gland, which thereby acquires an uniform, vivid, red colour at every point, appearing more like a dyed body than one coloured by blood-veſſels, in which circumſtance, and the obſcurity of its texture, it bears a ſtrong reſemblance to the vaſcular bodies found in the ſwimming bladder of fiſhes. The circulation of the blood through the choroid gland appears to be ſlow and embarraſſed, as the colour remains in the part in a conſiderable degree after it is macerated and preſerved in ſpirits.

The choroid gland likewiſe receives a number of nervous filaments from the ophthalmic branch of the fifth pair, which proceeds for ſome way in the ſame ſheath with the optic nerve.

Anatomiſts are not agreed with regard to the uſe of this ſingular part: ſome have ſuppoſed it to be a muſcular apparatus, intended to alter the figure of the eye when beholding objects at different diſtances; others, amongſt whom is Cuvier, conſider it as a gland which ſecretes ſome of the humours of the eye; this latter opinion is moſt conſiſtent with the form and ſtructure of the part, which are very unlike thoſe of any other muſcle; but, on the other hand, its ſituation on the outſide of the ruyſchiana, and the want of any excretory opening, are difficulties in the way of its furniſhing any of the tranſparent parts of the eye; it appears to us to ſupply the place of the vaſcular ſtructure of the choroïdes, which membrane is always thin and deficient in blood-veſſels in thoſe fiſhes that poſſeſs the choroid gland. The functions of the choroid coat are not, we conceive, yet fully underſtood; it enjoys a degree of vaſcularity greater than is neceſſary for its ſuppoſed offices of ſecretion; we have examples of the ſame circumſtance in ſeveral other organs in the body, but the moſt ſtriking are the choroid gland and the vaſcular bodies of the ſwimming bladder of fiſhes.

The membrana ruyſchiana, near the front of the eye, ſends off, in ſome fiſhes, a triangular proceſs, which paſſes through the vitreous humour, and is attached to the ſide of the capſule of the cryſtalline lens, in the manner of the marſupium of birds. Some very evident veſſels which come through the vitreous humour, are tranſmitted along this proceſs. On the oppoſite pole of the capſule of the cryſtalline we have obſerved in the *dory* (*zeus faber*), and others, the mark of an attachment which appears to be produced by a veſſel. This mode of connection between the cryſtalline and the internal coats of the eye appears perfectly analogous to the *pecten* or *marſupium* in the eye of birds, and no doubt anſwers a ſimilar purpoſe.

The *ciliary proceſſes* have not been obſerved to exiſt in any fiſh except the *tope* (*ſqualus galeus*), in which the laminæ, according to Cuvier, project as much as in birds, and after forming a ſhort point, which joins the capſule of the cryſtalline, they are continued with the ſtriæ of the uvea.

Fiſhes want that coloured appearance of the bottom of the ruyſchiana, which is called the *tapetum*; this membrane is black at every part, except in the *ray* kind, which have it tranſparent at the bottom of the eye, and therefore admitting the ſilver colour of the choroides to be ſeen through it.

The *iris* is in general a very fine membrane in fiſhes, and ſo tranſparent that the uvea is viſible.

The *uvea* has commonly a brilliant metallic colour, which makes the eyes of fiſhes ſo ſtriking.

The form of the *pupil* is round in this claſs, with the exception of the genus *raja*, in which a very remarkable *curtain* or *veil* is continued from the ſuperior edge of the pupil. It is nearly a triangular ſhape; the baſe is connected above, and the two ſides hang down. Theſe are notched, or rather divided into ſhort ſtripes or ſhreds along the edge: they appear gilded externally, but are black on the inſide. When the eye is unmoved, the veil is turned up between the ſuperior edge of the pupil and the vitreous humour; but if it be depreſſed, either by external force or the will of the animal, the veil comes down and entirely covers the pupil. The *torpedo* has been obſerved to let down its veil in this manner always at the moment of communicating an electric ſhock.

In the *ray* and *ſhark* kinds, the *carp* genus, and a number of other fiſhes, the *optic nerve* has been obſerved to enter the eye by a round hole, and to produce a tubercle on the inner ſide, from which the *retina* goes off in a radiated manner. In the *ray* genus, the tubercle of the optic nerve is irregular in its figure, or papillated.

Cuvier has obſerved in ſeveral of the genera *ſalmo*, *clupea*, *ſcomber*, *perca*, *gadus*, *zeus*, and *tetraodon*, that the optic nerve, after entering the eye, and traverſing the ruyſchiana, forms two ſtreaks or tails: theſe tails are parallel, but not contiguous, a production of the ruyſchiana paſſing between them. The *retina* is produced from the oppoſite edges of theſe ſtreaks, in the ſame manner as it ariſes in birds, from the ſingle white line.

The *aqueous humour* is very ſmall in quantity, or totally wanting in fiſhes; it is alſo of a different conſiſtence than in the animals which do not inhabit the water. It is viſcid and filamentous.

The *cryſtalline lens* has generally in fiſhes very nearly the ſpherical form, and in ſome inſtances it is a perfect ſphere. It is more denſe and hard, eſpecially in the nucleus or internal part, than it is in any other animal, except the *cuttle fiſh* (*ſepia*). As the aqueous humour is ſmall, the cryſtalline is in the ſame degree large in this tribe of animals.

The *vitreous humour* of fiſhes is leſs in proportion to the other parts, and has more conſiſtence than in the animals living out of the water.

Cuvier has furniſhed us with ſome tables, partly the reſult of his own obſervation, and partly derived from other ſources, exhibiting the proportions that exiſt as to the form, magnitude, denſity, &c. of the tranſparent parts of the eye in different animals. We ſhall extract the following particulars, as ſerving to explain the optical properties of the humours of the eye in fiſhes.

The degree of convexity or approximation of the cryſtalline to a ſphere is determined by comparing the axis with the diameter. In the human ſubject, the axis is to the diameter as 1 to 2.

In the following fiſhes as below:

Salmon (*ſalmo ſalar*)	9 to 10
Sword fiſh (*xyphias*)	25 — 26
Shad (*clupea*)	10 — 11
Pike (*eſox lucius*)	14 — 15
Barbel (*cyprinus barbus*)	11 — 12
Carp (*cyprinus carpio*)	14 — 15
Whiting (*gadus merlangus*)	14 — 15
Mackarel (*ſcomber ſcombrus*)	12 — 13
Shark (*ſqualus*)	21 — 2
Ray (*raja*)	21 — 2
Herring (*clupea harengus*)	10 — 11
Tench (*cyprinus tinca*)	7 — 8
Eel (*murena anguilla*)	11 — 12
Conger (*murena conger*)	9 — 10

The portion of the axis occupied by each of the three tranſparent parts of the eye are repreſented by fractions, the length of the axis being conſidered the unit.

	Aqueous humour.	Cryſtalline lens.	Vitreous humour.
In man	$\frac{3}{22}$	$\frac{4}{22}$	$\frac{15}{22}$
In the *herring* (*clupea harengus*)	$\frac{1}{7}$	$\frac{5}{7}$	$\frac{1}{7}$

The following table has been given by Monroe, of the comparative ſpecific gravity of the humours of the eye in the *cod* (*gadus morhua*) and the *ox* (*bos*); diſtilled water being ſuppoſed a thouſand.

	In the *ox*.	In the *cod*.
Of the aqueous humour	1000	1000
Of the vitreous humour	1016	1013
Of the whole cryſtalline	1114	1165
Of its external part	1070	1140
Of its nucleus	1160	1200

We have not proved the accuracy of this table, but it appears to be incorrect, particularly with reſpect to the denſity of the aqueous and vitreous humours, which are probably greater than are here repreſented.

We have not a ſufficient number of experiments to determine accurately the refractive power of the different humours of the eye. All that have been made, however, as well as common obſervation, ſhew that the refrangibility of the humour is much greater in fiſhes than in terreſtrial animals, by which means they are enabled to perceive objects through ſo denſe a medium as water.

The eye in fiſhes is moved by ſix muſcles, as in the human ſubject. The one analogous to the *trochlearis* does not, however, paſs through a pulley.

Fiſhes are not provided with moveable eye-lids. In the *ſalmon* (*ſalmo*), and the *mackarel* (*ſcomber*), there is at each angle a vertical and immoveable veil, which projects a little way over the eye. Moſt *oſſeous* fiſhes have ſomething of the ſame ſtructure.

In the *moon fiſh* (*tetraodon mola*) there is a very ſingular apparatus for covering the eye. This animal can entirely cover its eye by a lid, which contains a circular perforation. This aperture is ſhut by a true ſphincter muſcle, and is opened by five muſcles which ariſe at the bottom of the orbit, and proceed in a radiated manner to be inſerted into the eye-lid.

Fiſhes, from the nature of the medium in which they reſide, do not require any aqueous ſecretion for keeping the ſurface of their eyes moiſt; we therefore do not find a lacrymal gland in any ſpecies of this claſs.

The figures which illuſtrate the ſtructure of the eye are contained in *Plate* IX. of the *Anatomy of Fiſhes*: *fig.* 5. exhibits a lateral view of the eye of the *ſkate* (*raja batis*); *a*, the eye, flat above and anteriorly; *b*, the tubercle of cartilage; *c*, the cartilaginous peduncle or footſtalk upon which the tubercle is articulated; *d*, a portion of the cartilage of the orbit to which the footſtalk is connected. *Fig.* 6. is an anterior view of the eye of the *ſkate*, with the cornea removed, to bring into view the veil which is ſeen at *a*, covering the greateſt part of the pupil. *Fig.* 7. is a ſection of the eye of the *ſturgeon* (*acipenſer ſturio*); *a*, the thick maſs formed by the ſclerotic coat; *b*, the cavity of the eye. *Fig.* 8. exhibits a portion of the ſkin taken from the ſide of the head of the *eel* (*murena anguilla*) including the ſpot covering the globe of the eye which correſponds to the conjunctiva. *Fig.* 9. ſhews the choroid gland in the *carp* (*cyprinus carpio*); *a*, the gland; *b*, the optic nerve; *c*, the ruyſchiana, the choroides being removed. *Fig.* 10. exhibits the choroid gland as it exiſts in the *cod* (*gadus morhua*); *a*, the gland ſomewhat irregular in its figure; *b*, the optic nerve; *c*, the ruyſchiana; *d*, *d*, veſſels paſſing into the gland. *Fig.* 11. expoſes the internal parts of the eye in the *dory* (*zeus faber*); *a*, the vitreous humour; *b*, the cryſtalline lens; *c*, veſſel paſſing through the vitreous humours, diſtributing branches to this humour and the lens; *d*, production of the ruyſchiana attached to the capſule of the cryſtalline; *e*, the other point of the capſule which ſeems to have a particular connection with the adjacent parts. *Fig.* 12. is intended to contraſt the ſpherical form of the cryſtalline of a fiſh at *a*, with the flattened appearance of the anterior part of the lens in a bird, as ſeen at *b*. *Fig.* 13. repreſents the tubercular termination of the optic nerve in the *ſkate* (*raja batis*); *a*, the optic nerve; *b*, the irregular or papillated tubercle formed within the eye; *c*, the retina. *Fig.* 14. ſhews the termination of the optic nerve in two ſtreaks, as it exiſts in the *gadus*, and many other genera; *a*, the optic nerve; *b*, *b*, the ſtreaks or tails; *c*, the retina.

Bones.

Fiſhes have been divided by all naturaliſts into two great tribes, according to the ſtructure of their ſkeleton; thoſe of the one have been called the *cartilaginous*, and thoſe of the other the *oſſeous* fiſhes. This diſtinction, although juſtified by the difference in the compoſition of their bones, and proper as being conſiſtent with natural habits and ſtructure, is nevertheleſs not ſtrictly correct; for the ſkeleton of the cartilaginous fiſhes poſſeſſes ſome calcareous matter, and the bones of the oſſeous fiſhes contain in general a much ſmaller quantity of earth than is found in thoſe of other animals: if they were compared with the bones of mammalia, or of birds, they would themſelves deſerve the epithet of cartilaginous. The compoſition is not uniform in the different bones of a fiſh's body; ſome contain a greater quantity of phoſphate of lime than others; the cranium, ſpine, and the thick bones, are hard, white, and opaque in the oſſeous fiſhes, but the thin bones are flexible and tranſparent; and in the cartilaginous tribe, although we can as readily cut with a knife many parts of their ſkeleton as we could common cartilage, yet their cranium and ſpine give conſiderable reſiſtance, eſpecially in the larger ſpecies, and preſent more of a fibrous texture.

The ſtructure of the ſkeleton is more purely cartilaginous in the fiſhes with fixed branchiæ, as the *ray* and *ſhark* genera, than in the order of cartilaginous fiſhes called *branchioſtegi*.

The colour of the bones of fiſhes does not appear to be ſubject to much variety; one ſpecies, however, the *gar fiſh* (*eſox belone*), is remarkable by having the whole ſkeleton green.

The ſkeleton of a fiſh is, in its general form and mechaniſm, ſo very unlike that of other animals, that a perſon at firſt view would not ſuppoſe there exiſted the moſt diſtant analogy between them; but after examining the parts in detail, and comparing their relations to each other, we are aſtoniſhed by the correſpondence which prevails between them, and the pieces of the ſkeleton of mammalia. Nature is always economical in her means, and never deviates from the type, or creates a new part, until all the modifications which the organ is capable of receiving be exhauſted. The combination of ſimplicity of deſign with diverſity of effect, cannot be more ſtrongly illuſtrated than in comparing the anatomy of the ſkeleton of fiſhes with that of the other claſſes.

The ſkeleton of the *chondropterygii*, and of the genus *ray* in particular, differs as much in form as in compoſition from that of the *oſſeous* fiſhes; it likewiſe bears leſs analogy to the ſkeleton of other animals: we ſhall therefore poſtpone its deſcription until we have given an account of the bones of *oſſeous* fiſhes, for which purpoſe we ſhall take in general the *dory* (*zeus faber*), as affording one of the beſt examples of the oſteology of this tribe of fiſhes.

The bones which compoſe the cranium are all united by a ſpecies of ſquamous ſuture; they not merely overlap each other, but the edge of each bone forms a great number of irregular, ſharp, thin proceſſes or ſpiculæ, which are inſerted into one another: the union thus produced does not admit of any motion of the ſeveral parts, and the cranium appears to be compoſed of a ſingle piece. Cuvier ſays that the bones of the cranium are anchyloſed with each other; but we have not only found the uſual number of bones to be diſtinct in the cranium of even old fiſhes, but the portions of which each bone is originally compoſed to be ſeparable from each other. To be ſatisfied of this fact it is only neceſſary to examine the ſkull of a fiſh that has been thoroughly cleaned and bleached by long maceration in the ſea, and expoſure to the weather, many of which are frequently found lying on our ſhores: theſe ſkulls we have been enabled to ſeparate into portions, correſponding to the *frontal*, *parietal*, *temporal*, *ſphenoidal*, and *occipital* bones, and to divide again the frontal and occipital bones into two pieces each.

The *external form of the cranium* is very irregular, and varies in different fiſhes. In the *dory* it has two flat ſides, which have an oblique direction, like the roof of a houſe; the top or part correſponding to the ridge is an irregular hollow or groove; the poſterior part of the cranium is much larger than the anterior; it is truncated or flat, except two thin proceſſes correſponding to the occipital ridge; the anterior portion of the cranium is ſlender, elongated, and ſlightly arched, ſomewhat reſembling the ſuperior mandible of a bird: under this part there is a very large vacancy, through which moſt of the nerves paſs out. The inferior part of the cranium is depreſſed on each ſide, and then forms a remarkably ſtrong proceſs, which is analogous to the *baſillary*, and extends from the condyle, with which the ſpine is articulated, to the bone analogous to the vomer, of which more will be ſaid hereafter. The parietes of the cranium, correſponding to the ſituation of the organs of hearing, are thin, cellular, and exhibit an irregular foſſa externally; in many fiſhes the ſides of the cranium are not flat and ſloping, but ſpread out into a thin edge, nearly on a plane with the ſuperior part: there is often alſo a ſharp thin ſpine extended along the medial line of the ſuperior part of the cranium, which, in ſome ſpecies, ſtands high, and projects conſiderably from the back of the head, in order to give attachment to the muſcles and ligaments of the ſpine. The lower part of the cranium is moſt commonly, in oſſeous fiſhes, enlarged on each ſide of the baſillary proceſs.

The *cavity of the cranium*, as before obſerved, is much larger than the brain; it is extremely irregular upon the internal ſurface, furniſhing a number of craggy and ſpiculated proceſſes, impoſſible to deſcribe: it is not, therefore, adapted, as in other animals, to the form of the brain. It is more nearly ovular than any other figure.

In the account given by Cuvier of the *bones of the face*, he does not appear to us to have named the different pieces according to their true analogy, or likeneſs to the parts compoſing the face of other animals. In the *dory*, from which we take our deſcription, the bones of the face are large and very diſtinct.

There is no *oſſeous ſeptum* to the orbits; the eyes are ſeparated from each other only by membrane. In the genus *anarrhichas*, however, the orbits are divided by bone.

The *zygoma* is formed by a chain of very thin bones, extended from the temporal to the malar bone; it makes the inferior margin of the external part of the orbit: theſe, in ſome fiſhes, are incomplete in the middle; Cuvier conſiders them as ſupplying the place of the *lacrymal bone*.

The bones which appear moſt analogous to the *lacrymal* are two irregular-ſhaped, ſmall, thin pieces, ſituated at the anterior part of the os frontis, on each ſide of the naſal bones.

The bones which ſupply the place of the *ethmoidal* of other animals are ſituated before the os frontis, immediately below the laſt mentioned; they deſcend obliquely from the frontal to the malar bones, with which they are articulated; they form the anterior margins of the orbits.

The *naſal bones* are ſupplied by a ſtrong proceſs of an arched figure, which is continued from the middle of the anterior part of the os frontis, under the poſterior ends of the inter-maxillary bones, which move over it; from this bone there ariſes a thin plate, which is analogous to the *oſſeous* ſeptum of the naſal cavity, and which is united to the vomer.

The *vomer* is a bone of a ſingular form, it is long, and paſſes in a ſtraight line from the baſilary proceſs of the occiput, with which it appears to be really anchyloſed, along the ſuperior part of the palate, and ends anteriorly in a thick broad extremity, ſomewhat reſembling in figure a horſe's foot, which is commonly armed with teeth: this bone ſerves as the baſe to the ſeptum of the orbits.

The bones we have called the *malar*, Cuvier appears to conſider as analogous to the *palatine*; they are thick, ſhort, and irregular in their ſhape; they are articulated with the zygomatic bones, with thoſe analogous to the ethmoidal, with the ſuperior maxillary, and with the articular bones, which will be hereafter deſcribed; they ſend proceſſes backwards and inwards, which contribute to form the vault of the palate.

The *ſuperior* jaw is formed of four pieces, which are connected to each other, and to the adjoining bones, by ligament, in ſuch a manner as to permit a conſiderable degree of motion; the two external pieces correſpond to the ſuperior *maxillary bones*; the intermediate ones to the *inter-maxillary bones*.

The *maxillary bones* are two arches placed with their convexity outwards; they are broader and thinner at their extremities than in the middle; near their ſuperior end they furniſh a thick proceſs, which projects anteriorly like a ſmall cone, and preſents on the ſurface next the mouth a rounded ridge; from entering into the compoſition of the roof of the mouth, ſome perſons would perhaps conſider them analogous to the *palatine* bones. They are connected by ligament with the malar bones ſuperiorly, with the coronoid proceſs of the lower jaw inferiorly, and anteriorly with the inter-maxillary bones.

The part of the upper jaw that correſponds to the *inter-maxillary bones* forms the ſuperior margin of the mouth, and is commonly furniſhed with teeth; it is compoſed of two pieces, which are united to each other by ligament and cartilage; each of theſe ſends off poſteriorly two thin plates, and one long round proceſs; the firſt ſlide under the maxillary bones, and the round proceſſes are tied together by ligament, and move in a ſheath which is thus formed upon the naſal bone: a free motion of theſe parts on each other becomes neceſſary in the protruſion, the opening, and the ſhutting of the mouth.

The *inferior jaw* conſiſts of two triangular ſhaped pieces, which are united to each other by ligament at their anterior part: the angle of thoſe pieces that is placed upwards correſponds to the *coronoid proceſs*; the articulation is ſituated near the poſterior angle, and this laſt correſponds with what is called the angle of the jaw in mammalia. The middle part of the pieces compoſing the lower jaw is either of extremely thin cartilage or membrane.

The lower jaw is articulated with a bone analogous to that to which Cuvier has given the name of *the ſquare bone*, (*l'os quarré*,) but which we have preferred calling the *articular bone* in the deſcription of the anatomy of birds, from the circumſtance of its being interpoſed between the articulation of the jaw and the cranium.

The articular bone is compoſed of ſeveral pieces firmly united together; they produce a conſiderable extent of ſurface on the ſide of the head in the *dory* : one piece, which is of ſome ſtrength, is articulated with the under ſurface of the temporal bone, from which it proceeds downwards and forwards in a curved manner, declining in thickneſs as it deſcends: this piece ſuſtains the thin bone of the operculum, and receives the horn of the os hyoides : over this piece there is another thinner one laid ; they are apparently anchyloſed with each other, and the external one commences a ſhort diſtance from the cranium, by a ſharp diſtinct point, and goes on to the articulation of the lower-jaw : another oſſeous piece is articulated below, and anterior to the orbit with the inferior end of the malar bone, from which it proceeds directly downwards to join the anterior end of the other piece, and forms with it the articular ſurface for the joint with the lower jaw. The intermediate ſpace left between theſe pieces, which is very conſiderable and of a triangular figure, is filled up with a very thin plate of cartilage, which is in parts oſſified. The articular bone in fiſhes is evidently formed to carry the lower-jaw forwards, and thus to facilitate the protruſion and dilatation of the mouth, and for affording a ſurface for the attachment of the muſcles of the jaw; it is therefore found much larger in this claſs than in birds.

The part correſponding to the *os hyoides* is formed by two flat oſſeous plates, which meet together anteriorly upon the bone which ſuſtains the tongue, and ſeparating from each other poſteriorly encompaſs the gills: a ſmall round branch goes off from the external end of each plate ; theſe are analogous to the horns of the os hyoides, and become attached to the internal ſurface of the articular bone by ligaments, which allow the hyoides to move nearer or farther from the cavity of the mouth : each plate of the hyoides is compoſed of ſeveral pieces, the edges of which are in a certain degree anchyloſed with each other : there are ſix pieces obſervable on each ſide in the *dory*. Cuvier ſtates three to be the uſual number.

There is a very thin oſſeous plate ſituated between the anterior ends of the two ſides of the hyoides, and the junction of the ſcapulæ; it is connected by pieces of ligament to each ſide of the os hyoides, to the lingual bone, and to the ſcapulæ, where they meet : this bone has almoſt exactly the outline of a heart, it has been therefore called the *cordiform* or *heart ſhaped bone* ; it is peculiar to fiſhes, but does not appear to have any other uſe, than to afford attachment to the ſtrong muſcles ſituated at this place.

There are a number of bones that are peculiar to the organs of reſpiration and of deglutition in this claſs of animals, which require a connected deſcription : theſe are the branchial arches, the pharyngeal bones and the bones which ſuſtain the operculum or gill cover, with thoſe of the membrana branchioſtega.

In deſcribing the organs of reſpiration we have ſtated that each of the gills is ſuſtained upon an arch of bone : each *branchial arch* is compoſed of two pieces or limbs, two of the ends of which are conjoined by ligament in ſuch a manner, that the other extremities can be moved nearer or farther aſunder, and thus the arch rendered narrower or wider : the ſuperior limb, or that next the cranium, meaſures about one-third of the whole arch, and the inferior about two thirds of its extent. The branchial arches are placed, with reſpect to each other, obliquely in ſucceſſion ; they are commonly ſlender, thin bones, and have four ſides, or rather two edges and two ſides : the convex edge is directed outwards and backwards : it is upon this the laminæ of the gills are planted : the concave edge is turned forwards and inwards, towards the mouth. Along the external or anterior ſide there are uſually a number of ſmall oſſeous eminences, placed at ſhort diſtances from each other, which project a little beyond the concave edge : theſe do not commonly ariſe from the bone, but the membrane covering it : they are furniſhed with teeth, which are thence called the branchial teeth, as already deſcribed. The inferior extremity of the branchial arches are attached in ſucceſſion along the ſides of ſome oſſeous pieces, which are ſituated in the lower part of the mouth, and appear as the continuation of the lingual bone : theſe bones vary in number in the different ſpecies, but they are firmly united to each other, ſo as to form a ſort of ſternum, to which the branchial arches are affixed like ribs. The ſuperior ſurface of theſe bones is ſmooth, but inferiorly they furniſh ſome proceſſes, through which ſome of the branches of the branchial artery paſs to the gills.

From the poſterior extremity of this ſpecies of ſternum there ariſe two ſlender branches, which ſeparate from each other in the manner of horns, and ſoon terminate in flattened ſurfaces or diſks : theſe are the inferior *pharyngeal bones*, and are, as before obſerved, commonly covered with teeth.

The ſuperior extremities of the branchial arches are indirectly connected with the baſis of the cranium ; a ſlender footſtalk is articulated at one end with the ſuperior extremity of the poſterior arch, and at the other with the baſe of the cranium ; the ſuperior extremities of the three anterior arches of each ſide terminate upon two flattened bones, which are called the *ſuperior pharyngeal bones* ; from the upper edge of which a ſecond footſtalk goes off, and is attached to the cranium, on the inner ſide of the one firſt mentioned.

In conſequence of this ſort of connection between the branchial arches and the cranium, two additional joints are created, by which the flexion of the arches, and the approximation of the ſuperior pharyngeal bones to each other, and to the inferior pharyngeal bones, are more completely performed ; the muſcles likewiſe which move theſe parts gain conſiderable power by their whole force operating upon the points at which they are inſerted.

Cuvier ſtates the connection between the branchial arches and the cranium of oſſeous fiſhes in a manner ſomewhat differently than we have deſcribed it above. He ſays the ſuperior extremities of all the four arches are attached to the ſuperior pharyngeal bones, when theſe exiſt ; the two poſterior arches by an articulation, which admits of a ſee-ſaw motion ; and the two anterior arches more looſely : for this purpoſe, the firſt arch bifurcates and ſends to the pharyngeal bone a ſtrong ligament from one of its branches, while the other is immediately joined to the cranium.

In the *ſilurus anguillaris*, which has but one large pharyngeal plate faſtened under the ſuperior extremity of the laſt arch, this extremity unites with that of the third arch, and converges with thoſe of the two firſt towards the baſe of the cranium.

In the *pike* (*eſox lucius*) the two laſt arches unite at their ſuperior extremities to the ſecond, which, as well as the firſt, is articulated with the cranium.

In the *carp*, (*cyprinus*.) which has not moveable ſuperior pharyngeal bones, the ſuperior extremities of the four arches are approximated and articulated with a common piece, which is united to the cranium.

In the *trout* (*ſalmo fario*) the ſuperior extremities of the ſix arches are united by ſeveral pieces, the poſterior of which bears a ſmall plate covered with teeth, at the place where it is joined with the extremity of the laſt arch.

The bones which form the *operculum* are generally two. The principal one has a triangular figure ; it is very thin at every part, except at the ſuperior angle, at which place it forms a ſort of neck, and a little prominence or head, in which there is a depreſſion that is joined to a correſponding proceſs, on the back of the ſuperior end of the articular bone. This bone of the operculum has a degree of rotatory motion, in addition to thoſe of elevation and depreſſion. The other bone of the operculum is long, narrow, and thin, and reſembles the blade of a knife; it lies poſterior to, and nearly parallel with, the articular bone; it is not joined to any bone by articulation, but is connected by ligaments poſteriorly, with the triangular bone of the operculum, and the back part of the os hyoides, and anteriorly to the angle of the lower jaw. The uſe of this bone ſeems to be chiefly to ſuſtain the integuments which are extended over this place.

The *oſſeous rays* which ſupport the *membrana branchioſtega* are attached to the poſterior margin of the broad bones of the os hyoides; they increaſe in ſize from before backwards. There is an interval between the origin of the firſt three rays, and that of the four poſterior rays, which, however, does not, cauſe any material irregularity in the ſucceſſion of the points of the rays. Theſe bones are capable of being elevated and lowered, of being approximated and expanded. The elevation and expanſion of the poſterior rays are oppoſed, beyond a certain extent, by a proceſs from their roots.

The *vertebræ* are divided by Cuvier into two claſſes; the firſt are the *abdominal* or *dorſal*, which have ſpinous proceſſes from the ſuperior ſide of the ſpine only; the ſecond are the *caudal* vertebræ, which have ſpinous proceſſes from both the upper and lower ſides of the ſpine: but this diſtinction is not quite correct, as the poſterior abdominal vertebræ furniſh ſhort ſpinous proceſſes inferiorly; the caudal vertebræ may, however, be reckoned with propriety from the large bone, which forms the poſterior boundary of the abdominal cavity.

The bodies of the vertebræ vary with reſpect to figure in different fiſhes, being cylindric in ſome inſtances, and angular or compreſſed in others; they are all, however, diſtinguiſhed by having the ſurfaces by which they are conjoined hollowed out to form a ſemi-ſpherical or conical cavity: theſe cavities are oppoſed to each other, and thus produce, throughout the whole ſpine, a chain of cavities, each of which is nearly of a ſpherical figure, and alternates in ſucceſſion with the vertebræ; theſe cavities are furniſhed with concentric layers of cartilage, or rather a peculiar intervertebral ſubſtance, which ſomewhat reſembles ligament, but is highly elaſtic: theſe concentric layers complete the form of each cavity, and conſtitute the bond of union between one vertebra and another. The interior part of the cavities is actually filled by fluid.

The centre of each vertebra, which is very thin, is perforated with a ſmall hole, which is lined by the ſame ſubſtance that inveſts the cavities; a communication is therefore eſtabliſhed between the cavities, the whole length of the ſpine, which is probably deſigned to obviate the compreſſion of the fluid in the different cells or cavities during the motions of the ſpine.

By this ſpecies of articulation of the vertebræ with each other ſeveral advantages are obtained; ſtrength and lightneſs are beſtowed on the ſpine, and a great facility of motion, as every vertebra rolls upon a globe compoſed of an elaſtic ſubſtance, and of fluid. The firſt vertebra is articulated with the occiput in the ſame manner as thoſe of the ſpine are with each other.

The external ſurface of the vertebræ are very generally marked by a number of depreſſions or little cavities, in the longitudinal direction of the ſpine, which give to the circumference of each vertebra very much the appearance of being conſtructed of ſhort pillars, with regular ſpaces between them. This ſtructure diminiſhes very conſiderably the weight of the ſpine, without ſubtracting from its ſtrength.

The ſpinous proceſſes of the vertebræ are commonly long, ſlender, ſharp-pointed bones; they ariſe from the ſuperior ſides of the bodies of all the vertebræ, and from the inferior ſides of the caudal, and ſome of the laſt dorſal or abdominal vertebræ. They originate in the lower ſurface of the caudal vertebræ we believe always as two proceſſes, which coaleſce, and form a triangular ſpace, in which the blood-veſſels of the tail paſs along the ſpine. They are double at their roots in the *pleuronectes* and other fiſhes, along the ſuperior part of the ſpine alſo.

The inferior ſpinous proceſſes of the laſt dorſal vertebræ are ſhort, imperfectly formed, and have their extremities applied and faſtened to each other, in order to ſuſtain the large bone that forms the boundary of the abdominal cavity, of which more hereafter.

The laſt vertebra of the tail has its extremity ſpread out in the figure of a fan, which appears to be compoſed of a number of oſſeous rays united to each other.

The *ribs* are ſometimes wanting in fiſhes, and, when they do exiſt, are uſually very ſmall.

The genera *ſilurus*, *cyprinus*, and *chetodon*, however, furniſh examples of fiſhes with ſtrong ribs, which ſurround the abdominal cavity almoſt to its top.

In the *herring* genus (*clupea*), the *zeus vomer*, &c. they unite in a ſort of ſternum.

In many fiſhes the ribs divide at their extremities into two branches; it is very common alſo to meet with a ſecond row of ribs, which ariſe above the others; theſe are uſually fewer in number than the proper abdominal ribs, and paſs between the portions of the lateral muſcles.

The *ſternum* but rarely exiſts in this claſs of animals, as the ribs ſeldom extend as far as the inferior part of the body.

In the *dory* (*zeus faber*) there is a ſpecies of ſternum formed by a number of irregularly ſhaped oſſeous pieces, which appear to be only connected with each other by ligament, and the common integuments. They are furniſhed with ſharp ſpines externally, and are hollow next the cavity of the body.

The members which correſpond in fiſhes to the anterior and poſterior extremities of other animals are the *pectoral* and *abdominal fins*.

The *pectoral fin* is ſuſtained by a very conſiderable bone, which, with the correſponding one, ſurrounds the body immediately behind the aperture of the gills. Cuvier has, from hence, called them the *girdle-formed bones*; he likewiſe conſiders them as analogous to the *ſcapulæ*, in which he is juſtified by their poſition, and ſome circumſtances in their formation. Theſe bones are articulated with the inferior and poſterior part of the cranium; they paſs backwards and outwards, as far as the middle line of the body of the fiſh, during which courſe they are narrow, flat on the external ſurface, and have a round ridge along their internal ſurface. They then make a turn forwards and inwards, and meet each other a ſhort diſtance behind the os hyoides. At the place they turn forwards, they ſend a thin, ſharp proceſs backwards, and ſoon after they receive, in articular depreſſions, the ends of two long, ſlender, three-ſided bones, which paſs from below upwards, acroſs the muſcular parietes of the abdominal cavity. Some anatomiſts conſider theſe bones as being analogous to the *clavicles*; Cuvier does not allow it, but without ſtating the grounds of his objection. It is ſufficiently plain, however, from their poſition and connections, that there are no other bones, except the clavicles, or the fork-ſhaped bones of birds, with which they can be compared.

It is the inferior half of the ſcapula that properly correſponds with the bone which bears that name in other animals; the other portion ſeems to be a part added in fiſhes, in order to give firmneſs to the whole member, by connecting it with the head, and likewiſe to carry the pectoral fin farther down upon the body. The inferior portion is broad and thin, and furniſhed with a thin, ſpinous proceſs, or rather plate, which runs along each ſide of the bone, near the anterior edge, which may be compared with the ſpine that divides the ſurface of the ſcapula in mammalia.

The *oſſeous rays* which compoſe the pectoral fin are connected to the poſterior edge of the ſcapulæ by means of a number of ſmall bones, that ſeem to perform the office of a *carpus*, and with which it ſhould perhaps be conſidered to correſpond. Each oſſeous ray, towards the extremity in particular, conſiſts of a ſucceſſion of minute bones, cloſely united to each other: theſe might be compared to the joints of the fingers.

The above deſcription of the pectoral member has been taken from the *dory* (*zeus faber*); it is neceſſary, therefore, to mention ſome varieties of ſtructure that exiſt in other fiſhes.

The pectoral fin does not exiſt in ſome fiſhes, as the genera *murena* and *cecilia*.

The angle, which is formed by the union of the two inferior extremities of the ſcapulæ, is very acute in thoſe fiſhes that have the body compreſſed vertically; but in thoſe with a depreſſed or flattened body, the ſcapulæ turn inwards, and meet each other nearly in a ſtraight line.

The number of carpal bones varies; Cuvier ſtates, that there are four large bones of this kind in the *wolf fiſh* (*anarrhichas lupus*), the *red gurnard* (*trigla cuculus*), and in the *armed* and *flying triglæ* (*trigla cataphracta* and *trigla volitans*); four ſmall bones in the genus *pleuronectes*, and the *whiting* (*gadus merlangus*); eight ſmall bones, in two rows, are found in the *dory* (*zeus faber*); three ſmall cylindric bones in the *ſilurus*, and five in the *chetodons*, *perches*, &c.

When the firſt rays of the pectoral fin are ſpinous, they are compoſed of ſingle ſharp-pointed bones; they are attached immediately to the ſcapulæ.

In ſome of the genera *ſilurus* and *gaſteroſteus* the articulation with the ſcapula is ſo contrived, that the fiſh can at pleaſure lay the ſpine cloſe to the body, or place it erect, and keep it fixed in that poſition: there is a cylindric tubercle formed on the ſcapula, in the front of which there is a hole. The ſpine of the fin is articulated with this cylinder by a depreſſion, which has a projecting proceſs before and behind it. When the ſpine is extended, the anterior proceſs, which has the figure of a hook, enters the above-mentioned hole, and the ſpine turning a little on its axis, the proceſs is hooked upon the edge of the hole in ſuch a manner, that the ſpine cannot be inflected until it makes a turn upon its axis in a direction oppoſite to the former.

The ventral fins which correſpond in fiſhes to the poſterior extremities are ſometimes wanting, or ſituated at different parts of the inferior ſurface of the body. They do not exiſt amongſt the cartilaginous fiſhes, in the genera *petromyzon* and *ſygnathus*; and in ſome ſpecies of *baliſtes*, *oſtracion*, *tetraodon*, &c.

The orders of the oſſeous fiſhes are determined by naturaliſts from the abſence or poſition of theſe fins; thus all the *apodal* order want the ventral fins. The *jugulares* have them ſituated under the throat, and before the pectoral fins. In the *thoracici* they are placed below the pectoral fins, and in the *abdominal* order of fiſhes the ventral fins are found under the belly, which is their proper ſituation, or that which their name implies.

The bones analogous to the *pelvis*, and which ſuſtain the rays of the ventral fins, are various in their figure and poſition, with reſpect to each other. They are moſt commonly flat, and have the internal edges applied to one another in the jugular and thoracic fiſhes; but their inner ſurfaces and external or inferior edges are more or leſs ſeparated, in order to accommodate the muſcles which approximate and retract the rays of the fin.

In the *dory* (*zeus faber*), the pelvic bones are triangular plates, ſlightly concave on the ſurfaces next each other, and furniſhed with a ſpinous ridge on both the ſurfaces; one angle, which is very acute, is directed obliquely inwards and forwards, towards the cavity of the body; the poſterior angle produces a long ſtyloid proceſs, and the anterior angle is blunt or a little rounded: both the anterior and poſterior angles are connected by a ligament to the chain of bones forming the ſternum in this fiſh. The rays of the fin are articulated to the middle of the inferior ſurface, and not to the anterior angle, as ſtated by Cuvier.

We are indebted to this anatomiſt for ſome details of the ſtructure of the ventral fins in ſeveral fiſhes.

In the *weaver* (*trachinus*), and the *ſtar-gazer* (*uranoſcopus*), the pelvic bones are ſoldered together at their internal edge; their inferior ſurfaces are oppoſed to each other, and leave between them an oval ſpace. The angle of their junction projects within the cavity of the abdomen.

In the genera *cottus*, *ſciena*, *chetodon*, and *perca*, the bones of the pelvis are alſo united at their internal edge; they are flat and long, and their external edges are directed downwards, ſo as to form a foſſa.

In ſome of the *ſticklebacks* (*gaſteroſteus*) the pelvic bones are ſeparate, extremely long, and receive near their middle a moveable ſpine, which occupies the place of the fin.

The *zeus vomer* has theſe bones ſmall and cylindrical.

The pelvic bones are not connected to the inferior points of the ſcapulæ in the abdominales, as they are in the jugular and thoracic fiſhes.

In this order of fiſhes the bones of the pelvis are alſo, according to Cuvier, generally unconnected with each other, and are preſerved in their ſituation by ligaments.

In the *carps* (*cyprinus*) they are long, and only touch about one-third from their lower end.

In the *herrings* (*clupea*) they are very ſmall, cloſe together, and form an addition to the little bones that ſupply the place of the ſternum.

The pelvic bones in the *pike* (*eſox lucius*) are broad and triangular; they are cloſe together at the anterior extremity, but diverge at the poſterior end, which is broader and receives the rays of the fin.

In the *anableps* theſe bones are very far aſunder, and bear upon their external border a very long ſpine, which aſcends towards the vertebral column, and is inflected in the direction of the ribs.

In the genus *ſilurus* the pelvic bones are united to each other; they have the ſhape of an eſcutcheon, round in the middle, and often ſpinous in front. The rays of the fin are attached to their external and poſterior edge.

Theſe bones are oſſified into one piece in the genus *loricaria*. The fins are conjoined to the outward edge.

The oſſeous rays of the ventral fins are ſimilar to thoſe of the pectoral fin, but in general ſhorter; the ventral fins are capable of being moved forwards or upwards, and of having their rays expanded, and of being brought backwards, cloſer together, and of having their rays approximated and folded.

The *dorſal*, *caudal*, and *anal* fins are members ſuperadded to fiſhes, to aſſiſt in the motions of ſwimming; they vary in number and extent in different ſpecies, which peculiarities it is the province of the naturaliſt to point out. They conſiſt of a number of oſſeous rays which reſemble thoſe of the pectoral and ventral fins. The firſt rays of the dorſal fin are, however, frequently ſingle ſpinous bones, and thoſe of the tail are generally larger, exhibit more of a jointed appearance, and are more frequently bifurcated at the extremities than the other fins of the body.

The rays of the caudal fin are ſuſtained upon the poſterior edge of the fan-ſhaped extremity of the laſt caudal vertebræ, with the intervention of ſome ſmall bones, which reſemble the carpal bones of the pectoral fin.

The rays of the dorſal and anal fins are ſupported upon the extremities of long, ſlender, ſpine-ſhaped bones: the other extremities of theſe bones alternate with the extremities of the ſuperior and inferior ſpinous proceſſes of the vertebræ, to which they are attached by ligament.

Theſe additional ſpinous bones are intended to increaſe the lateral ſurfaces of fiſhes; we therefore find them, as well as the real ſpinous proceſſes of the vertebræ, long in proportion to the breadth of the body; in the flat fiſhes (*pleuronectes*) they are particularly long.

The additional ſpines, in ſome inſtances, as the *dory* (*zeus faber*), are united to each other by thin cartilaginous laminæ, and ſuſtain ſimilar laminæ in a vertical poſition with reſpect to the ſpines, by which means regular ſheaths are produced on each ſide for the muſcles of the poſterior part of the dorſal and the anal fins.

It remains, to complete the account of the ſkeleton of oſſeous fiſhes, to deſcribe the bone which forms the boundary of the abdominal cavity: this bone is not unuſually the ſtrongeſt in the whole body; it is of an elongated ſhape, and ſlightly bent, rounded, and very ſmooth on the ſide next the cavity of the abdomen; it appears in many fiſhes like a large inferior ſpinous proceſs of the vertebræ, but it is in reality a bone interpoſed between ſome of the ſpinous proceſſes of the dorſal vertebræ, and ſome of the additional ſpines of the anal fin, with both of which it is united by a ſort of ſquamous ſuture, which appears like an anchyloſis.

This bone is extremely uſeful in binding together and giving firmneſs to the oſſeous fabric of the tail, which otherwiſe would not be able to ſuſtain the impulſe of the water during the actions of ſwimming. It likewiſe affords a ſmooth and ſecure boundary to the abdominal cavity.

The ſkeleton of the *flat cartilaginous* fiſhes differs ſo much from thoſe above deſcribed, that it is almoſt impoſſible to diſcover any analogy between many of theſe parts.

The ſubjects we ſhall chuſe as examples of this genus of fiſhes are the *thornback* and *ſkate* (*raja clavata* and *raja batis.*)

The cartilaginous pieces which compoſe the cranium are ſo intimately united, that it is difficult to recognize them: ſutures, however, are diſcoverable, which mark out pieces that correſpond to the temporal, occipital, and parietal bones.

The *form* of the cranium is nearly that of an oblong ſquare, ſomewhat enlarged, and irregular poſteriorly.

The internal ſurface correſponds with the external form, except where the organs of hearing are contained, at which places the cavity of the cranium is proportionally diminiſhed.

The cavity of the cranium is alſo prolonged anteriorly, or, more properly ſpeaking, is continuous with the cavity of the ſnout, which renders the diſproportion between it and the brain even greater than in other fiſhes.

The foramina for tranſmitting the olfactory and optic nerves are at oppoſite ſides of the cranium.

The *parts compoſing the face* in the flat chondropterygii are few, and very unlike the bones of the face in other animals.

The cranium, as before obſerved, is continued anteriorly into a long, taper, hollow cartilage, which forms the central part of the ſnout.

Where this cartilage commences from the cranium, there is placed on each ſide of it a hollow cartilage or box, nearly of an oval figure, which contains the organ of ſmelling. The cartilages of the ſnout and organs of ſmelling might be conſidered as analogous to the *naſal* and *ethmoidal* bones, the *vomer*, and *oſſa palati*, united together.

Upon the external parts of the bones holding the organs of ſmelling, there is articulated a ſmall irregular ſpur-ſhaped cartilage, which is bent backwards: this appears to ſupply the place of the malar and zygomatic bones.

Both the *jaws* are ſituated under the cranium, and are ſuſtained upon two elongated cartilaginous pieces, which correſpond in office, though not in figure, with the *articular bones*: theſe pieces are connected by one of their extremities with the lower jaw, cloſe to the articulation; and by the other extremity with the parts of the cranium which correſpond to the temporal bones. The jaws are two cartilaginous rims, nearly of the ſame ſize at every part: each jaw has a moveable articulation at the ſymphiſis, by which means they can be protruded, and the figures of the mouth altered. The jaws are articulated with each other, by a round tubercle of the ſuperior jaw being received into a ſocket in the inferior.

The tongue is wanting, as before obſerved, in the *ray* genus. There is, however, a rim of cartilage extended between the two firſt branchial arches and under the membrane, lining the lower part of the mouth, which takes the place of the *lingual bone*, and when the mouth is widely opened forms a projection, which has been miſtaken for a tongue in theſe fiſhes.

The part correſponding to the intermediate bones which ſuſtain the inferior extremities of the branchiæ, are two thin pieces of cartilage, which are united in the middle, at the poſterior part have a pointed ſhape, and terminate before in two horn-like proceſſes.

The cartilages which appear moſt analogous to the *hyoides* are two branches which ariſe from the external edges of the thin pieces juſt deſcribed, and two other branches which are attached to the ſide of the cervical ſpine immediately behind the laſt branchial arches: the branches from the intermediate cartilage aſcend backwards and outwards: thoſe from the ſpine deſcend in the ſame direction: they are united to each other on the anterior part of the ſcapula, to which alſo they are connected at their point of union.

The *branchial arches* are very ſtrong in this genus, and the joints have a freer motion than in other fiſhes, by which the extremities of the arches can be brought cloſer to each other: a number of cartilaginous rays alſo ariſe from the convex ſide of each arch, which paſs between the rows of the membranous laminæ, as already mentioned. The ſuperior extremities of the arches are articulated with the cartilage, which takes the place of the cervical vertebræ, and not with the cranium, as in other fiſhes.

The ſpine is articulated with the cranium by two condyles, between which the ſpinal canal projects a little, and is received into a deficiency of an arched figure formed on the ſuperior and inferior ſides of the foramen magnum.

The *cervical* vertebræ are conſolidated into one piece; on the ſuperior and lateral parts of which cartilaginous plates are produced, which correſpond to tranſverſe and ſpinous proceſſes.

The *dorſal* and *caudal* vertebræ are diſtinct, as in other fiſhes. The former furniſh from the ſuperior part of their bodies ſmall, thin, ſquare plates, which are connected to each other by ligament. The laſt have their lateral ſurfaces encreaſed by ſimilar proceſſes on their ſuperior part, and ſome projections alſo inferiorly; they, however, gradually decline, and towards the extremity of the tail are ſcarcely to be diſcerned. In the *thornback* (*raja clavata*), the ſuperior proceſſes ſuſtain, beſides the dorſal fin, a row of hook-ſhaped bones, which have their points turned backwards.

The bodies of all the vertebræ, except the cervical, which form but a ſingle piece, are united by elaſtic ligament; the inter-vertebral joints contain a fluid, and each vertebra is perforated in the centre by a ſmall hole, in the ſame manner as in fiſhes generally.

A favourable opportunity for examining the nature of the inter-vertebral articulation occurred to Mr. Home in the diſſection of the *baſking ſhark* (*ſqualus maximus*). "Four days after the fiſh was brought on ſhore, the inter-vertebral ſubſtance being cut into, a limpid fluid ruſhed out with ſo much velocity that it roſe to the height of four feet. At the end of twelve days a portion of the ſpine was examined, the inter-vertebral joints of which had been preſerved entire: upon ſawing through two of the vertebræ a fluid was met with, of the conſiſtence of liquid jelly, with clots of different ſizes floating in it; ſo that in eight days a conſiderable tendency to coagulation had taken place, although the fluid was entirely excluded from the air."

"The cavity betweeen every two vertebræ was found to contain, in the *baſking ſhark*, about three pints of liquid. When this fluid was evacuated, the elaſtic ligamentous ſubſtance which united together the concave ſurfaces of the two contiguous vertebræ, brought the ends of the vertebræ within an inch and one-half of each other, in which ſtate the inner layers of the ligaments, which are leſs firm in their texture than the outer, project into the cavity, and may be miſtaken for a part of its natural contents: this portion, when ſoaked in water, ſwells out to a conſiderable ſize, the water readily inſinuating itſelf between the layers of which it is compoſed."

"The whole thickneſs of the ligaments is about one inch, the external half of which is compact and elaſtic; the other appears to poſſeſs a very high degree of elaſticity."

Mr. Home ſtates that the gelatinous ſubſtance which fills the inter-vertebral joints of other fiſhes is fluid during life, which fact was aſcertained in the *ſkate* (*raja batis*).

Mr. Brodie found that in the *hog* and *rabbit* the central part of the inter-vertebral joints contains a cavity with a ſmooth internal ſurface, of the extent of half the diameter of the vertebræ, which is filled with a thick gelatinous fluid; and we have obſerved the ſame fact in other quadrupeds, from which it would appear that the mode of articulation in the ſpine of fiſhes is not abſolutely peculiar to them.

Mr. Home deſcribes the ſtructure in the ſpine of the *ſturgeon* (*acipenſer ſturio*) as being different from that of other fiſhes. "There is," he ſays, "externally, the common appearance of regular vertebræ; but theſe prove to be only cartilaginous rings, the edges of which are nearly in contact, and are united together by elaſtic ligaments, forming a tube the whole length of the ſpine. This is lined, throughout its internal ſurface, with a firm, compact, elaſtic ſubſtance; within this is a ſoft, flexible ſubſtance, in a ſmall degree elaſtic; in the centre there is a chain of cavities in the form of lozenges, containing a fluid, and communicating with one another by very ſmall apertures. The ſpine of the *lamprey eel* (*petromyzon marinus*) is found to reſemble that of the *ſturgeon*."

The above ſtructure is not ſo different from that of the ſpine of fiſhes in general, as it would at firſt ſeem to be; ſince we have diſcovered the communication between the inter-vertebral cavities to exiſt both in the cartilaginous and oſſeous tribes of fiſhes.

Cuvier ſtates that there are no *ribs* in the *chondropterygii*; but we find on the ſides of the bodies of the dorſal vertebræ a number of ſhort-pointed proceſſes, which might be conſidered as rudiments of theſe parts.

The pectoral member of the *ray* genus is peculiar in its form and direction, and is of prodigious magnitude. The pieces which ſuſtain the rays of the fin are analogous to the *ſcapulæ*; they are connected with the back part of the dorſal ſpine by means of two thin, flat cartilages. They paſs outwards, enlarge, and form two wide foramina on each ſide, through which the nerves and veſſels paſs to the fin. The ſcapula next produces two branches, one of which paſſes backwards nearly parallel with the ſpine, and the other goes forwards as far as the anterior part of the head; theſe branches have ſeveral joints in them, by which they can be moved nearer and farther from the body.

The ſcapulæ are united on the under part of the fiſh by a ſtrong cartilaginous bar, which ſupplies the place both of *ſternum* and *clavicles*.

The rays of the fin ariſe from the external ſide of the branches, which is ſlightly concave; they are exceedingly long, particularly in the middle of the fin, and each compoſed evidently of many joints. It is upon the great number and extent of the rays of the pectoral fin that the peculiar ſquare figure of the *flat chondropterygii* depends.

The pectoral fins of the *ſharks* are conſtructed upon the ſame plan as in the genus *raja*, but are much ſmaller, and are not connected to the ſpine.

The *ventral* fins are ſupported upon the extremities of a tranſverſe piece of cartilage in the *chondropterygii*, which is ſituated at the poſterior part of the abdomen; it is not attached to the ſpine, but held in its place by its connection with the muſcles.

The external rays of the ventral fin in theſe fiſhes are ſtronger than the others, and are compoſed of ſome pieces articulated to each other in ſucceſſion, which very much reſemble the joints of the digiti in other animals, and which, therefore, form the analogy which exiſts between the rays of the fins of fiſhes in general, and the fingers or toes of digitated animals.

Fig. 1. *Plate* XII. *of the Anatomy of Fiſhes*, exhibits a lateral view of the ſkeleton of the *dory* (*zeus faber*); *a* is the cranium; *b*, the vacancy left between the two orbits; *c*, the zygoma; *d*, the part correſponding to the lacrymal bone; *e*, the piece which appears analogous to the ethmoidal bone; *f*, the naſal bone; *g*, the oſſeous ſtalk which comes from the occiput to join the vomer; *h*, the bone analogous to the malar, or the palatine; *i*, the ſuperior maxillary bone; *k*, the inter-maxillary bone; *l*, the inferior jaw; *m*, the articular bone by which the lower jaw is connected to the head; *n*, the os hyoides, on the edge of which are ſeen the rays of the membrana branchioſtega; *o*, the lingual bone; *p* the principal bone of the operculum; *q*, the other bone of the gill-cover; 1, the ſuperior pharyngeal bone; 2, the branchial arches; 3, the inferior pharyngeal bones; 4, the cordiform bone. As theſe laſt parts are ſituated internally, they are ſeen but imperfectly; *r r*, the ſcapula; *s*, the bone analogous to the clavicle; *t*, the carpus, on which are arranged the rays of the pectoral fin; *u u*, the chain of bones formed under the integuments, in the manner of a ſternum; *v*, the pelvis, on which are ſeen the rays of the ventral fin; *x*, *x*, *x*, the cervical, dorſal, and caudal diviſions of the ſpine; from the two firſt of which long, ſpinous proceſſes are ſeen to proceed upwards, and to ſuſtain the additional ſpinous bones on which the dorſal fins are articulated. From the inferior part of the caudal, and ſome of the laſt dorſal vertebræ, ſpinous proceſſes are ſeen to ariſe, which become connected with the additional ſpines ſupporting the anal fin, and of which ſome are united to the extremity of the bone that bounds the abdominal cavity. The extremity of the tail produces the fan-ſhaped bone, which bears the caudal fin; *y*, the true or abdominal ribs; *z*, ſome ſupernumerary ribs which are deſigned to paſs amongſt the muſcles of the ſpine.

Fig. 2. of the ſame plate, ſhews the cavity which exiſts between the vertebræ of an oſſeous fiſh; *a*, *a*, two of the vertebræ of the *turbot* (*pleuronectes maximus*), divided longitudinally; *b b*, ligamentous ſubſtance by which they are united; *c*, the inter-vertebral cavity.

Fig. 3. of *Plate* XII. *of the Anatomy of Fiſhes*, gives a view of the cavity in one vertebræ; *a*, the body of the bone; *b*, ſpinous proceſs partly cut away; *c*, the canal for holding the ſpinal marrow; *d*, the concavity of the inter-vertebral joint; *e*, the foramen, or rather ſhort canal, by which the inter-vertebral cavities communicate with each other.

Fig. 1. of *Plate* XIII. *of the Anatomy of Fiſhes*, repreſents the inferior parts of the ſkeleton of the *thornback* (*raja clavata*); *a*, the cranium; *b*, the cartilage which forms the middle of the ſnout; *c*, *c*, the ovular cavities for containing the organs of ſmelling, *d*, *d*, the branches articulated upon the external part of theſe cavities; *e*, *e*, the two jaws; *f*, *f*, the cartilages analogous to the articular bones by which the jaws are connected to the cranium; *g*, the rim of cartilage that ſupplies the place of the lingual bone; *h*, the intermediate cartilage to which the lower extremities of the branchial arches are united; *i*, *i*, the inferior branches which ſeem to ſupply the place of the os hyoides; *k*, *k*, the ſuperior branches of the ſame; *l*, *l*, the branchial arches; *m*, the cervical portion of the ſpine, conſolidated into one piece; *n*, the dorſal portion of the ſpine; *o*, the caudal diviſion; *p*, *p*, ſhort proceſſes from the ſides of the dorſal vertebræ, that correſpond to the ribs; *q*, the tranſverſe bar that anſwers for clavicles and ſternum; *r*, *r*, *r*, *r*, the branches of the ſcapulæ; the bodies of the ſcapulæ, and the connection of theſe parts with the ſpine, are in a great meaſure concealed from view; *s*, *s*, *s*, *s*, the rays of the pectoral fins; *t*, the tranſverſe cartilage which bears the ventral fins, laid acroſs the ſpine in its proper ſituation; *u*, *u*, the rays of the fin which more particularly reſemble, in their figure and mode of articulation, the digiti of other animals; *v*, *v*, the ſmaller rays of the ſame fins. The rays of the other fins, having no peculiarity of ſtructure, are indicated by their poſition.

Fig. 2. of *Plate* XIII. exhibits a view of the articular ſurface of one of the dorſal vertebræ of the *thornback*; *a*, the body of the vertebræ; *b*, the canal for lodging the medulla ſpinalis; *c*, the ſpinous proceſs; *d*, the concavity oppoſed to that of the adjoining vertebræ; *e*, the perforation in the centre of the vertebræ, by which the inter-articular cavities communicate with each other.

Muſcles.

The muſcles which move the jaws of fiſhes are commonly large, and calculated for powerful and extenſive action.

They are more numerous and complicated in the *cartilaginous* than the *oſſeous* fiſhes. We ſhall firſt deſcribe them in the *ray* genus.

The principal depreſſor of the poſterior jaw is a ſingle, flat, ſquare muſcle, which ariſes from the tranſverſe bar that is analogous to clavicles, and is inſerted into the poſterior margin of the jaw. Cuvier alſo deſcribes two ſmall muſcles, one on each ſide of that juſt mentioned, which contribute to the depreſſion of the jaw: they ariſe from the tranſverſe bar and the ſkin, and are inſerted near the commiſſure of the lips. Theſe three muſcles retract the mouth, as well as depreſs the lower jaw.

Three muſcles cloſe the jaws: the firſt ariſes from the external part of the baſe of the cranium; it paſſes over the ſuperior jaw, and is loſt in the aponeuroſis which covers the principal muſcle, at the external part of the mouth. The ſecond muſcle is a thinner ſlip; it ariſes from the fore-part of the lower jaw, paſſes in a circular manner round the angles of the mouth, ſomewhat like the *orbicularis oris*; then over the upper jaw, to the ſuperior part of the end of which it is inſerted. Both theſe muſcles ſeem to have the power of bringing the jaws forwards on the head, as well as of ſhutting them. The third muſcle is a large round-ſhaped maſs, which encompaſſes the articulation and the ends of the two jaws: it appears externally like one muſcle, but conſiſts internally of three parts; one is inſerted into the ring-like proceſs at the end of the lower jaw; another into the external parts of both jaws, at their joint; and the third paſſes round the upper jaw, and is inſerted by a tendon into the crucial ligament which goes to the lower jaw.

There are two very long muſcles which come from the ſpine, and paſs between the palate and the cranium, in order to be inſerted into the ſuperior jaw. Theſe ſerve to bring the mouth forwards, as both jaws, from their connection with each other and the neighbouring parts, are protruded and retracted together.

A pair of very thick muſcles ariſe from each ſide of the ſternum; their fibres are directed obliquely forwards and outwards, and unite upon a ſtrong tendon, which is inſerted into the inferior extremity of the articular cartilage that ſuſtains the jaw. They draw that extremity backwards and inwards, and conſequently enlarge the angle this cartilage forms anteriorly with the baſe of the cranium: they carry both jaws downwards, and by bringing their extremities nearer to each other, thruſt out or protrude the middle parts of the mouth. Theſe muſcles likewiſe maintain the articular cartilages in the above-mentioned poſition, and furniſh fixed points for the jaws to move upon, when they are projected from the head.

Two other muſcles, which are ſmall, commence by tendon from the middle of the articular cartilage; proceed backwards, inwards, and downwards, in order to ſpread their fleſhy fibres on the aponeuroſes behind the lower jaw. They aſſiſt the preceding muſcles in bringing the articular cartilage inwards and downwards.

The muſcles of the jaws in the *ſhark* (*ſqualus*) reſemble thoſe of the *ray* genus.

In the *ſturgeon* (*acipenſer ſturio*) the muſcles for protruding and retracting the jaws are very ſimple. The one which brings the mouth forwards comes from behind the eye: it is very ſtrong, and paſſes backwards to be attached to the articular cartilage. The retractor is a much ſmaller muſcle: it is ſituated between the cranium and the ſuperior part of the articular cartilage.

The other muſcles of the jaws of the *ſturgeon* reſemble thoſe of the *ray* and *ſhark* genera.

The muſcles of the jaws in the genera *baliſtes*, *tetraodon*, *diodon*, and *ſygnathus*, are deſcribed by Cuvier as having a complicated action. The bones of the face are extremely prolonged in theſe fiſhes, in order to form a prominent muzzle, at the extremity of which the two jaws are placed, and perform their movements.

One muſcle, which fills the ſuperior part of the foſſa on the ſide of the muzzle, ariſes from a ligament which completes the anterior border of the orbit: its fleſhy fibres, in paſſing from behind forwards, terminate in part upon the poſterior border of the deſcending branch of the ſuperior jaw, but are chiefly loſt on a tendon which ſurrounds the extremity of that branch, and proceeds to the lower jaw, on which it is inſerted above the articulation. This muſcle moves the two jaws in oppoſite directions, and approximates the one to the other. In drawing backwards and upwards the extremity of the deſcending branch of the ſuperior jaw, it depreſſes the portion of that jaw which is beyond the point of ſupport. The ſame muſcle likewiſe raiſes the lower jaw.

A ſecond muſcle fills the inferior portion of the foſſa that is on the ſide of the muzzle, from the ſurface of which its fibres ariſe: they proceed obliquely forwards and inwards to an aponeuroſis, which extends along the internal edge of the foſſa, and of which the extremity goes to be affixed to the internal ſurface of the lower jaw. This muſcle has the ſame action as the firſt.

The preceding muſcle covers a third, which is ſmaller. It ariſes likewiſe from the ſurface of the foſſa, and ſends a ſlender tendon near to the poſterior edge of the deſcending branch of the ſuperior jaw. This muſcle co-operates with the two others.

The inferior jaw is depreſſed, in theſe genera, by three muſcles. The firſt is a ſingle muſcle, which is analogous to the *mylo-hyoideus*: it ariſes from the ſide of the hyoides, between the rays of the operculum, and is inſerted into the inferior border of the lower jaw; the fibres converge, and go forwards to be inſerted into the inferior edge of the lower jaw. The next two muſcles are ſmall: they ariſe from a foſſa under the orbit; their tendons are inſerted into the poſterior edge of a cartilaginous plate, which is connected to the baſe of the cranium, behind the articular bone. This plate is attached to a long cartilaginous filament, which advances on the inſide of the articular bone or cartilage, as far as the inferior and internal part of the lower jaw. In drawing the plate upwards and backwards, theſe muſcles alſo bring the filament backwards, and thus depreſs the lower jaw.

The *moon fiſh* (*tetraodon mola*) has three muſcles, ſimilar to thoſe laſt deſcribed, and a ſecond cartilaginous plate.

In the genus *baliſtes* there is a muſcle which ſerves to elevate and draw backwards the piece analogous to the articular bones; it ariſes from the lower edge of the vomer, or the vault of the palate, and deſcends obliquely forwards to be inſerted into the upper edge of that piece.

In *oſſeous* fiſhes, the lower jaw is depreſſed by a long ſlender muſcle, but which, nevertheleſs, from its attachments and uſe, muſt be conſidered analogous to the *mylo-hyoideus*: it ariſes from both ſides of the os hyoides and rays of the gill-cover, in two broad, thin, fleſhy ſlips; theſe unite under the throat, and are inſerted at the ſymphiſis of the lower jaw; it ſpreads the membrance of the gill-cover when the jaw is fixed.

The lower jaw is elevated by two very ſtrong portions of muſcle, which in a degree overlap and intermix with each other; they occupy all the ſpace correſponding to the articular bone, from which, and from the cranium at the back of the orbit, they ariſe: theſe two portions, which Cuvier conſiders as but one muſcle, are inſerted into the coronoid proceſs of the lower jaw, into the ligament which paſſes from one jaw to the other, and in ſome fiſhes we have obſerved into a ligament which goes forwards to the inter-maxillary bones: beſides, therefore, raiſing the lower jaw, theſe muſcles depreſs the ſuperior maxillary bones, and depreſs and retract the inter-maxillary bones, which form the ſuperior margin of the mouth, or what is called the upper lip in fiſhes.

Cuvier deſcribes in the *eel* (*murena anguilla*) two layers of muſcle which lie under the preceding, and are nearly inſerted into the ſame point of the lower jaw: they ariſe from the orbitar foſſa. He detected ſimilar muſcles in the *carp*, but did not find them in the *pike* (*eſox lucius*), the *trout* (*ſalmo fario*), or the *ſalmon* (*ſalmo ſalar*); we have not obſerved them in any other fiſh.

There is a ſmall muſcle which is attached to almoſt the whole of the internal ſurface of the ſide of the lower jaw, and covers the vacancy which exiſts in the maxillary bone; it furniſhes a ſtrong tendon, which is fixed internally to the lower and anterior part of the articular bone; it aſſiſts the other muſcles in raiſing the lower jaw, but if the mouth be previouſly opened widely, it ſeems to have the power of keeping the lower jaw in the depreſſed poſition.

The articular bone is moved by two muſcles on each ſide; one ariſes from the cranium at the back and upper part of the orbit; its fibres paſs obliquely downwards and forwards, and are affixed upon the external ſurface of the thin part of the articular bone, near its upper edge: the effect of its action is to elevate the articular bones and bring them outwards, by which the capacity of the mouth is encreaſed, and the jaws retracted. The other muſcle ariſes from the vomer, membranous ſeptum of the orbit, and the middle line of the cranium: its fibres deſcend in a direct manner to the upper part of the thin portion of the articular bone, which it has the power of bringing inwards, and thereby abridges the cavity of the mouth, and protrudes the jaws.

Cuvier deſcribes two muſcles in the *carp* (*cyprinus carpio*), intended to retract the lips in this ſpecies, which has the bones of the face formed for carrying the mouth farther forwards than other fiſhes. The firſt of theſe muſcles is ſhorter than the ſecond; it ariſes partly from the anterior extremity of the articular bone, and in part from the poſterior end of the maxillary bone: it aſcends a little obliquely to be inſerted into the moſt elevated point of the inter-maxillary bone by a ſlender round tendon, which croſſes the tendon of the next muſcle. The ſecond retractor of the lips is much larger than the preceding: it is ſituated nearly horizontally, in the ſpace compriſed between the inferior edge of the orbit, and the concavity of the articular bone, from which it ariſes: it is inſerted by a long flat tendon to the middle and poſterior proceſs of the inter-maxillary bone, which it draws directly backwards.

From the preceding deſcription it will be perceived, that in addition to the motions of the jaws, by which the mouth is ſhut and opened, they are alſo ſuſceptible of projection and retraction, and that the cavity of the mouth is altered with reſpect to its width or its length in the performance of theſe motions. Theſe effects are not only convenient to fiſhes in the act of taking their food, but are neceſſary alſo for conveying it into the œſophagus. The muſcles, however, moſt immediately concerned in deglutition, are thoſe which move the branchial arches and pharyngeal bones, as will appear when theſe muſcles come to be deſcribed.

The tongue of fiſhes ſcarcely appears to perform any motions diſtinct from the other parietes of the mouth. Cuvier, it is true, has deſcribed two muſcles on the tongue of the *conger* (*murena conger*), which are analogous to the *hyo-gloſſi*; they ariſe from the extremities of the os hyoides, and go forwards upon each ſide of the lingual bone, to which they are inſerted: if theſe muſcles act in conjunction they depreſs the tongue, but, if ſeparately, the tongue is drawn to either ſide. Cuvier likewiſe ſtates that the tongue of the *conger* is contracted in its breadth by ſome tranverſe fibres, which paſs from the edges to the middle part: we have not obſerved any muſcles for moving the tongue in thoſe ſpecies we have diſſected, but we have often ſeen tendinous fibres paſs from the os hyoides to the ſides of the lingual bone.

The *muſcles* intended to move the *branchial arches* and the *pharyngeal bones* in *oſſeous* fiſhes are ſo numerous and complicated, that we almoſt deſpair of giving the reader a clear conception of them.

They may be divided into three ſets or orders, beſides ſome diſtinct muſcles; the firſt is compoſed of a cluſter of muſcles, which connect the ſuperior ends or abutments of the branchial arches, and the ſuperior pharyngeal bones to the baſis of the cranium. The ſecond ſet conſiſts of ſome muſcles placed over the joints of the inferior ends of the arches, and the inferior pharyngeal bones, with the intermediate bones that are continued from the lingual bone; the third ſet is made by muſcles which ſurround the poſterior ſide of the laſt branchial arches, the pharyngeal bones, and the origin of the œſophagus.

In the firſt ſet there are ſeven muſcles; all theſe, except one, ariſe together from the ſide of the head, immediately behind the orbit, at the joint of the articular bone.

The firſt muſcle comes from the common origin already mentioned, and is inſerted into the poſterior ſide of the baſe of the ſhort branch of the firſt branchial arch; it bends the joint of the arch, and brings the whole arch forwards.

The ſecond ariſes from the ſame point, and goes to be attached to the poſterior ſide of the ſhort branch of the ſecond branchial arch. It has the ſame effect as the preceding.

The third muſcle ariſes from the baſe of the cranium, between the articulations of the ſcapula and articular bone, and is inſerted into the poſterior edge of the ſhort branch of the laſt arch. It elevates the laſt arch, and thereby aſſiſts in opening the œſophagus.

The fourth comes from the common point of attachment, and terminates upon the footſtalk of the three laſt branchial arches, and the ſmall anterior pharyngeal bone; it tends to draw theſe bones outwards, and thus dilate the opening into the œſophagus.

The fifth muſcle ariſes with the others, and proceeds to be affixed to the external edge of the principal pharyngeal bone. Its operation is ſimilar to that of the laſt mentioned muſcle.

The ſixth ariſes from the common footſtalk of the three laſt arches, and goes on to the external edge of the ſhort branch of the ſecond arch near its baſe. It contracts the arches, by bending the joint at the concavity or top of the arch, and that at the footſtalk; it therefore tends to cloſe the gills.

The ſeventh muſcle has the ſame origin as the preceding; it is a ſtronger muſcle, and is ſpread equally upon the anterior ſurfaces of the two laſt branchial arches; it concurs to produce the effect aſcribed to the laſt mentioned muſcle.

The ſecond ſet of branchial muſcles is made up of four pair, or eight ſlips on each ſide; four of theſe are longer than the others, and ſituated more obliquely and ſuperficially.

The firſt ariſes from the ligament which connects the conjoined proceſſes of the two poſterior arches to the lower end of the firſt intermediate bone; it proceeds obliquely backwards, and is affixed to the inferior end or abutment of the ſecond branchial arch. The next three ariſe together from the conjoined proceſſes of the two laſt arches already mentioned, one goes to be implanted into the inferior end of the third branchial arch, the next is inſerted into the fourth branchial arch, and the fourth ſlip of muſcle paſſes acroſs the poſterior ſurface of the laſt arch, and is inſerted into the inferior pharyngeal bone.

The four other muſcles of this ſet are ſhort, lie in an obliquely tranſverſe direction, and are in a great meaſure concealed by the preceding muſcles; they are extended from the inferior ends of the branchial arches to the adjoining parts of the intermediate bones.

The effect of the action of each of theſe muſcles is the ſame; they all tend to depreſs the lower part of the mouth, if the branchial arches be rendered fixed; and if not, they ſeparate the arches from each other, and lower them, thus opening the gills, and widening the aperture of the œſophagus.

The circle which is made round the entrance into the œſophagus by the laſt branchial-arches and the pharyngeal bones of each ſide, has on its poſterior ſurface a chain of ſmall muſcles.

The two firſt ariſe from the junction of the footſtalks of the inferior pharyngeal bones, and are inſerted into the moſt external points of theſe bones. They approximate the pharyngeal bones, and bring them downwards.

The next pair ariſe from the outſide of the termination of the preceding muſcles, and are inſerted near the middle of the poſterior ſurface of the laſt arch. They approximate the two laſt arches by means of their connection with the inferior pharyngeal bones.

The third pair of muſcles are extended acroſs the joint of the laſt arches, and conſequently, when they act, bring the branches of the arch more together.

The fourth muſcles ariſe from the footſtalks of the ſuperior pharyngeal bones, and are inſerted into the points of the ſuperior abutments of the laſt arches. They make theſe abutments approach the ſuperior pharyngeal bones, by which the arch is cloſed.

Beſides theſe four pairs, there are ſingle ſlips of muſcle, which paſs from the pharyngeal bones of one ſide to the other. The muſcle connecting the ſuperior pharyngeal bones is very ſtrong. Theſe complete the circle, and diminiſh it by approximating theſe bones.

There are further, a number of muſcular faſciculi ſurrounding the orifice of the œſophagus in the manner of a ſphincter. Theſe faſciculi are ſtrongeſt upon the ſides, where they have alſo nearly a ſtraight direction, by which they have the effect of contracting the joint of the laſt arch. There are likewiſe ſome fibres extended from the muſcle that lies between the ſuperior pharyngeal bones, to the ſphincter of the œſophagus.

When all the muſcles of this ſet co-operate, the opening into the œſophagus is abridged; or, if the animal wiſh it, entirely cloſed; from the connection between the laſt arch and the others, they are all brought cloſe together, and the denticulated ſurfaces of the inſide of the arches, and of the pharyngeal bones, are made to approach ſo nearly, as to prevent the eſcape of the prey which the fiſh may be in the act of ſwallowing.

There are four diſtinct and remarkable muſcles on each ſide, which are materially concerned in the motions of the gills and pharynx.

The firſt are very thick and maſſy: they take their origin from the anterior edge of nearly the lower half of the ſcapulæ, and are inſerted upon the ſides of the broad, thin, heart-ſhaped bone which is ſituated under the throat of the fiſh. By means of the connection of this bone with the hyoidean branches, intermediate bones, &c. thoſe muſcles will open the pharynx, by depreſſing the tongue and branchial arches. If theſe parts, however, be kept fixed, they will bring the pectoral member forwards; they will alſo depreſs the lower jaw, in conſequence of the connection the heart-ſhaped bone has with that part. Cuvier conſiders theſe muſcles as analogous to the *ſterno-hyoidei*.

The ſecond muſcles ariſe on each ſide from the anterior edge of the ſcapula, oppoſite to the middle of the muſcles for raiſing the pectoral fins. They are thin ſlips; they paſs through the ſubſtance of the muſcles laſt deſcribed, and go to be inſerted in the loweſt part of the inferior pharyngeal bone. They depreſs the branchial arches, and thereby widen the pharynx.

The third pair of muſcles ariſe by a ſmall tendon from the anterior part of the ſcapula, oppoſite to the articulation of the clavicle with that bone, and proceed for ſome way before they reach the point of their inſertion, which is the loweſt part of junction of the inferior pharyngeal bones. They draw the pharyngeal bones downwards and backwards, and thereby contribute, with thoſe laſt deſcribed, to open the pharynx, and render it of a round ſhape.

The fourth muſcles ariſe from the ſecond vertebra from the head, diverging a little in their courſe, as they proceed a conſiderable way forward, and are attached to the inſide of the ſuperior pharyngeal bones. They have the power of retracting theſe bones, and thus co-operate with the other muſcles which dilate the entrance into the œſophagus. They likewiſe turn the ſuperior pharyngeal bones, ſo as to oppoſe to each other their rough or denticulated ſurfaces. Theſe muſcles are ſtrong, and remarkable alſo on account of their length: they ariſe as far back, in the *whiting* (*gadus merlangus*), as the fifth vertebra from the cranium.

The preceding deſcription of the branchial and pharyngeal muſcles contains what we have obſerved in the *dory* (*zeus faber*). The ſtructure of other *oſſeous* fiſhes, in this reſpect, does not appear to be materially different. In ſome of them, the bundle of muſcles, by which the branchial arches and the pharyngeal bones are ſuſpended to the cranium, is compoſed of a fewer number; and thoſe for contracting the paſſage into the œſophagus are leſs diſtinct and ſtrong. The moſt remarkable variation is met with in the *carp* (*cyprinus carpio*), in which the pharyngeal bones are conſtructed for breaking and dividing the food. In this fiſh, the inferior pharyngeal bones are not, as uſual, attached to the laſt branchial arches, but are elevated behind theſe near to the cranium, to which they are ſuſpended by a number of muſcles, of which Cuvier has given the following deſcription.

There are firſt two exceedingly ſtrong muſcles attached to the ſides of the baſe of the cranium, behind the adductor of the operculum, and inſerted into the ſuperior extremity of theſe bones. They elevate the bones, and draw them a little outwards.

Two other muſcles ariſe from the external angle of the glenoid cavity, which receives the ſuperior pharyngeal bone, and go to be inſerted along with the firſt muſcles. They bring the ſuperior extremity of the pharyngeal bone inwards.

Two ſtrong muſcles are affixed by their anterior extremity to the middle part of the pharyngeal bones, and proceed obliquely backwards and inwards to be inſerted into the occipital apophyſis. They draw the pharyngeal bones backwards.

The pharyngeal bones are approximated by a very ſtrong ſingle muſcle, which Cuvier, both from conſidering its ſtructure and uſe, calls the *digaſtric adductor*. The two bellies of which it is compoſed ariſe from the middle part of each of theſe bones, and are inſerted into a common tendon, placed in the interval of the anterior portion of thoſe bones, and is there connected to the aponeurotic fibres which fill up that interval, aſſiſted by ſome tranſverſe fibres of the pharynx, which go from one pharyngeal bone to the other. This muſcle is able to approximate the bones with much force, and to urge their teeth againſt the ſuperior plate. The operation of theſe muſcles belongs rather to the functions of maſtication and deglutition than to thoſe of the gills.

Two ſtrong muſcles ariſe from the internal ſurface of the ſcapula, and are inſerted by a very ſtrong tendon to the anterior extremity of the pharyngeal bones. Theſe may bring the ſcapula forwards and inwards; or if it be fixed, they bring the two pharyngeal bones at the ſame time backwards and downwards.

Two other muſcles, attached at one part to the inferior ſide of the anterior part of the pharyngeal bones, and at the other to the internal ſurface of the ſcapula, may likewiſe approximate the inferior extremities of the ſcapula from the middle line; but they can more eaſily ſeparate the pharyngeal bones the one from the other.

Finally, there are two long ſlender muſcles, which are extended from the inferior and anterior extremity of the pharyngeal bones to a proceſs, which correſponds to the intermediate bone of the laſt arch. Theſe bring the pharyngeal bones forwards.

The branchial muſcles in the flat *chondropterygii*, and, as it would appear, in all the fiſhes with *fixed branchiæ*, are few and ſimply arranged. The cluſter of muſcles which connects the branchiæ with the head, and the ſmall muſcles which go from the branchial arches to the intermediate bone, do not exiſt in theſe fiſhes.

The ſlender muſcles which go from the clavicle to the arches, in oſſeous fiſhes, are ſupplied in the *rays* by two very ſtrong muſcles, which ariſe poſteriorly by two thick tendons from the tranſverſe cartilage, and proceed obliquely forwards and inwards, under the middle cartilage of the branchiæ, into which they are inſerted. In drawing this cartilage downwards and backwards, they will open all the branchial arches.

There are other muſcles conſtructed to open and ſhut the branchiæ, which are peculiar to the *rays* and *ſhark* kind.

Between the anterior ſeries of laminæ and the rays of the branchiæ, a muſcle is found, the fibres of which ſeem to ſeparate on each ſide from the middle ray, being directed towards the others, but particularly towards their extremity, ſo that the effect of their action is to approximate the extremities of the rays, and conſequently to ſeparate and open the two ends of the arch. The action of this muſcle is limited by ſeveral ligaments, which go from the baſe of the ray, neareſt the extremity of the arch, towards the extremity of the ſucceeding ray.

This arch is cloſed by another muſcle, which is ſhort, thick, and cylindric. It is ſituated tranſverſely on the angle that is formed by the two pieces of the arch, where there are depreſſions of ſome depth, in which the two extremities of the muſcle are implanted.

There is further, in theſe genera, a very ſtrong muſcle, which envelopes the gills, covering every part of them except that next the mouth: it has the effect of compreſſing or approximating the whole at once. The fibres are parallel, and have an oblique direction from before backwards. Five tendinous interſections are to be ſeen, which correſpond to the external ſurface of the muſcles already deſcribed, which lie between the laminæ and rays of the branchiæ. The contraction of this ſac-like muſcle has the effect of expelling the water from the gills with conſiderable force.

The branchiæ of the *moon-fiſh* (*tetraodon mola*) are incloſed between two muſcles; the one upon the external, and the other upon the internal ſide. Theſe are analogous to the muſcular ſac of the *ray* and *ſhark* kind.

The operculum of the gills in *oſſeous* fiſhes is raiſed by one pair of muſcles, and brought down upon the branchial aperture by two muſcles on each ſide, and one common to both ſides.

The elevator or abductor of the opercule ariſes from the external part of the baſe of the cranium, at the root or joint of the articular bone: it is a ſhort, taper muſcle, and is inſerted into the head of the triangular bone of the gill-cover, which is joined to the articular bone. This muſcle acts under the diſadvantage of being inſerted as far as poſſible from the edge of the bone that is to be raiſed: it muſt, however, be aided in producing its effects by the elevation of the articular bone.

The two muſcles which ſhut the operculum are deſcribed by Cuvier as only one: they ariſe from the baſe of the cranium, almoſt immediately behind the preceding muſcle, than which they form a thicker maſs; they are inſerted into the neck, or anterior part of the ſuperior edge of the triangular bone.

The common muſcle is attached internally to the rays and oſſeous plates of each gill-cover, between which the fibres croſs from one ſide to the other. The effects of this muſcle's motion are the approximation of the rays and the ſhutting down of both opercules.

The rays of the gill-covers are expanded, and the membranæ branchioſtegæ raiſed and ſpread out, by the mylohyoideus muſcle which is attached to the oſſeous rays, and by a muſcle compoſed of two portions, which Cuvier deſcribes as being particularly plain in the *trout* (*ſalmo fario*): one portion ariſes from the lower edge of the poſterior part of the os hyoides; the other ariſes from the internal ſurface of the five anterior rays, and is attached to the other rays by long tendinous filaments. Both portions unite in one tendon, which paſſes under the anterior extremity of the oppoſite branch of the hyoides, and is expanded under the lingual bone.

Beſides theſe muſcles, the *moon-fiſh* (*tetraodon mola*) has the operculum itſelf compoſed of ſeveral muſcles. The principal one, which forms almoſt the whole of the opercule, is made by ſeveral layers of parallel fibres, which paſs from one part of the ſcapula to another, and become very thin towards the free edge of the opercule. Two ſmall muſcles ariſe from each ſide of the thin edge of the opercule: they aſcend upon the internal ſurface of the ſcapula, the one before and the other behind. Theſe ſerve to lay down the gill-cover.

The very limited motions of the head, upon the ſpine of *oſſeous* fiſhes, are effected chiefly by the great lateral muſcles; but the *flat chondropterygii* have muſcles excluſively deſtined to raiſe and depreſs the head.

The principal elevator of the head is a long ſmall muſcle, which ariſes from the back of the ſhoulder, on the top of the cartilage which correſponds to the ſcapula, and the adjoining tranſverſe proceſs of the cervical ſpine: it ſends a long tendon through a pulley on the ſide of the eye, which is loſt in the anterior part of the ſnout.

On the lower part of the head there is a pair of muſcles, ſimilar to thoſe for raiſing the head: they ariſe from the tranſverſe cartilage, analogous to clavicles and ſternum, at which place the muſcle of each ſide is united; they proceed forwards on each ſide of the mouth, and furniſh tendons which paſs in the gelatinous ſubſtance of the ſnout, at the anterior extremity of which they terminate. Theſe muſcles depreſs the head. Cuvier gives a ſomewhat different deſcription than we have given of the foregoing muſcles.

A third pair of muſcles ariſe from the ſpinal column, and the anterior portion of the arch which ſuſtains the large wings, and are inſerted into the poſterior extremity of the head. They raiſe the head.

The ſpinal muſcles, except in the flat chondropterygii, are the moſt remarkable in the fiſh's body, whether we view them with reſpect to their bulk or their ſtructure.

Theſe muſcles are analogous to thoſe which lie along the ſpine of other animals; but, from the form of the ſkeleton in fiſhes, they are ſituated upon the ſides of the body, and have conſequently received the name of *lateral muſcles*.

The ſize of the lateral or ſpinal muſcles exceeds, in an extraordinary proportion, that of all the other muſcles of a fiſh: they make the principal bulk of the animal, as they conſtitute, with the oſſeous fabric which ſuſtains them, almoſt the whole of the organs of motion.

It is almoſt impoſſible to convey a clear idea of the compoſition of theſe muſcles by deſcription alone, it is ſo extremely complicated, and ſo different from the ordinary ſtructure of the muſcles in other animals.

The great ſpinal muſcles of fiſhes in general conſiſt of three portions, which, from their ſituation, deſerve to be diſtinguiſhed into the *ſuperior* or *dorſal*, the *middle* or *vertebral*, and the *inferior* or *ventral*, portions.

The muſcular fibres of which each of theſe maſſes is compoſed, are formed into ſucceſſive *layers* or *rows*, by means of the interpoſition of thin aponeuroſes. Theſe tendinous interſections merely exhibit, on the external ſurface of the lateral muſcles, the appearance of lines placed at ſhort and determined diſtances from each other, and thus ſubdividing each portion into a number of regular compartments. The ſubdiviſions or compartments have different forms or directions in each portion, which will be afterwards pointed out. The ſhort rows of muſcle that fill up the compartments appear, when viewed upon the external ſurface, to be all arranged in a longitudinal direction, or to follow one another in the line of the fiſh's body; but if accurately examined, they will be found to conſiſt of flakes or pieces of muſcle, which partake of the figure of a wedge and the bowl of a ſpoon, being thick at one edge and thin at the other, and concave on one ſide and convex on the other. The figure of the flakes is well exhibited by the application of heat, particularly in the genus *gadus*: in cooking the *whiting* (*gadus merlangus*) ſome attention and dexterity are neceſſary to prevent the muſcular ſubſtance of the fiſh breaking into its primary flakes. The flakes are generally placed obliquely with reſpect to the line of the fiſh's body; that is, with their convex ſide next the head, and their thin edge next the ſpine; they overlap, or are received into each other; the muſcular fibres compoſing the flakes appear, however, to be diſpoſed in a longitudinal direction.

From the above account it will be ſeen, that the ultimate fibres of the great ſpinal muſcles of fiſhes are extremely ſhort and infinitely multiplied.

The lateral muſcles are further diſtinguiſhed from the others by being almoſt entirely deprived of red blood: this circumſtance ſeems to depend entirely upon their limited action; as at their attachments to the head and tail, where the parts have a more extenſive motion, the ſubſtance of the lateral muſcles receives more red blood than at any other part.

The attachments of the ſuperior or dorſal portion of the lateral muſcles, are fixed at the anterior extremity to the baſis of the cranium; ſecondly in the middle, to the ſuperior ſpines of the vertebræ, and the additional ſpines that ſuſtain the dorſal fins; and laſtly, at the poſterior extremity, to the ſuperior part of the root of the caudal fin. The layers of muſcle which compoſe this portion are narrower than thoſe of the other portions; they form gentle curves, or S like plexuſes, in the longitudinal direction, which nearly coinciding with the courſe of their muſcular fibres, gives them a good deal the appearance of common muſcular faſciculi in other animals. The dorſal portion of the lateral muſcles is unconnected along its ſuperior margin, but the lower edge is ſlightly joined next the ſkin to the vertebral portion; and towards the tail theſe two portions become intimately connected, and concur to produce the tendons which are inſerted into the baſe of the caudal fin.

The dorſal portion operates upon the tail in conjunction with the other lateral muſcles of the body; it alſo moves the head backwards and upwards with its fellow of the oppoſite ſide.

The middle or vertebral portion of the lateral muſcles lies a little obliquely along the ſide of the ſpine; it is attached below the laſt-mentioned muſcle to the back of the cranium; it then winds along the vertebræ of the trunk, to the bodies of which it is ſlightly connected, but firmly to their ſuperior ſpines: it is next attached to the bodies and inferior ſpines of the caudal vertebræ, and then paſſes over eight or nine of the laſt caudal vertebræ, to which it is connected by aponeuroſes, and becomes confounded with the dorſal portion, and with it is inſerted into the ſuperior half of the baſe of the caudal fin.

The aponeurotic interſections of the vertebral portion of the lateral muſcles are diſpoſed in waving or curved lines, which tend obliquely backwards, and meet the correſponding interſections of the dorſal portion, with which they form angles that have their points directed backwards, and become more acute towards the tail, at the extreme part of which the interſections become parallel, and form diſtinct tendons, which are inſerted into the caudal fin.

Where the vertebral portion ariſes from the cranium, there are ſome thin ſtripes of muſcular faſciculi, which run backwards, croſſing therefore the rows of the lateral muſcle which they cover.

The effect of the action of the vertebral portion is nearly the ſame with that of the dorſal. The former muſcle is, however, from its greater connection with the vertebræ, more immediately concerned in the flexion of the ſpine. The ſmall longitudinal ſtripes of muſcle from the cranium have but little power; they aſſiſt the principal parts of the lateral muſcle in bending the head towards the ſide.

The ventral portion of the lateral muſcle covers the one-half of the ſide of the fiſh, and with the correſponding portion of the other ſide entirely encompaſſes the cavity of the body. It is attached anteriorly to the back of the cranium under the ſcapula; to this bone itſelf; it is connected to both ſides of the clavicle; it is attached inferiorly to the ligament or bones which ſupply the place of the ſternum, and poſteriorly to the large ſpine which forms the poſterior boundary of the ventral cavity. The edge that lies over the row of bones which ſuſtain the anal fin is unattached on the ſide of the ſpine; but the muſcle is attached to the ribs which paſs in the courſe of its interſection; therefore this part of the ventral portion is analogous to the intercoſtal muſcles: it is then attached to the inferior ſpines of ſome of the caudal vertebræ next the ventral cavity, and to the bodies of about eight or nine of the moſt poſterior caudal vertebræ; and laſtly it produces a number of tendons, which are inſerted into the lower half of the bones of the caudal fin.

The interſections of the ventral portions of the lateral muſcle deſcribe very faint curves on the fore part of the body, at which place alſo they are rather indiſtinct, but towards the tail they form V ſtriped lines, which come gradually cloſer to each other, until at length they compoſe parallel tendons, in the ſame manner as the conjoined vertebral and dorſal portions.

This portion of the lateral muſcle, beſides being a powerful flexor of the tail, compreſſes the ventral and branchial cavities, and is therefore analogous to the intercoſtal and abdominal muſcle of other animals.

The preceding deſcription is taken from the *dory* (*zeus faber*); a fiſh which has the lateral muſcles particularly diſtinct and ſtrong. In the other ſpecies we have diſſected, we have found the ſtructure ſo ſimilar, that the *dory* may be given as a general example of the claſs.

In ſome of the *flat fiſhes* (*pleuronectes*), the ventral portion of the lateral muſcle appears to be double, or to be compoſed of two parts which join each other in the line of the angle of the interſections, and therefore correſpond to the dorſal and vertebral portions. Mr. Carliſle, in the Croonian lecture for 1806, deſcribes the ventral portions as being always of two maſſes, which he calls the ventral and abdominal ſeries.

In the *mackarel* (*ſcomber ſcombrus*), the *herring* (*clupea harengus*), and ſome others, we have obſerved a layer of muſcle of a dark colour, extended along the middle line of the body; if this layer be cut tranſverſely, it exhibits the figure of a compreſſed triangle. It is lodged in a correſponding vacancy, which is formed along the junction of the other portions of the lateral muſcle over the ſpine of the fiſh: this long ſtripe of muſcle has probably no peculiar action, as the interſections of the adjoining parts are continued through it in the ſame direction as in other fiſhes.

The lateral muſcles of the genus *oſtracion* differ in ſome circumſtances from thoſe of other fiſhes. As the *oſtracions* have the body rendered immoveable by being incloſed in a hard horny ſhell or caſe, theſe muſcles are not connected to the ſpine, but to the head and the tail only. Their texture alſo is not ſo complicated as in other inſtances, their fibres being principally longitudinal.

The internal ſurface of the caſe of the *oſtracions* is lined with an aponeuroſis only.

Cuvier deſcribes an additional pair of muſcles that are peculiar to the tail of theſe fiſhes; they are of a pyramidal figure; they ariſe from the inner ſide of the caſe, on the lower or abdominal ſide of the body, and are inſerted by ſmall tendons into the inferior part of the ſides of the three laſt caudal vertebræ. They carry the tail to either ſide, and depreſs it.

The motion of ſwimming conſiſts almoſt entirely in the flexion and ſubſequent extenſion of the ſpine of fiſhes; in the production of both which effects, the lateral muſcles are the ſole agents, by the one ſide or part acting alternately, or in oppoſition with another. The peculiar compoſition and arrangement of theſe muſcles are deſigned to beſtow extraordinary power and velocity of action, combined with a limited operation as to extent and duration. The weight of the column of water diſplaced by every impulſe of a fiſh, during the act of ſwimming, and the celerity with which ſome ſpecies move through water, (not even exceeded by that of the flight of birds in ſo rare a medium as air,) prove the powerful and rapid operation of the ſpinal muſcles, while the limited capacity of flexion of the tail of fiſhes, and the exhauſtion theſe animals experience when their muſcular efforts are protracted, ſhew that the ſpinal muſcles are incapable of an extenſive or long continued action. Mr. Carliſle has very ingeniouſly attributed the phyſiological properties of the lateral muſcles to the arrangement of their fibres, and the minute ramification of their blood-veſſels, which do not admit the red particles; and he contraſts this ſtructure, and the kind of muſcular power conſequent upon it, with the organization and functions of the muſcles of tardigrade animals. See Phil. Tranſ. part 1. 1806.

It has been already obſerved that the ſpinal muſcles of the *flat chondropterygii*, or the *ray* genus, are excepted from the deſcription of the general ſtructure of theſe parts in other fiſhes. They are formed more upon the plan of the muſcles of the tail of certain quadrupeds, than like thoſe of their own claſs.

Cuvier deſcribes the lateral muſcles of the *ray* genus as being compoſed of two layers, and each layer conſiſting of two muſcles. As we have not particularly diſſected them, we ſhall adopt his deſcription.

The ſuperior lateral muſcles ariſe from the middle of the vertebral column above the abdomen, by a fleſhy head, covered with ſtrong aponeuroſes: this portion extends as far as the pelvis, and then detaches little tendinous branches, which paſs through parallel ſheaths, and proceed ſucceſſively towards the middle line, where they are inſerted into the upper part of each of the vertebræ of the tail. Fleſhy fibres accompany theſe tendons to ſome diſtance, after their ſeparations from the common faſciculus.

In the inferior part of the tail the ſuperior lateral muſcles receive acceſſaries from each ſide, but theſe are ſimple tendons, which ſeem only intended to guard againſt too violent an extenſion, either to one ſide or the other.

Each tendon of the ſuperior lateral muſcles pulls the vertebra of the tail, to which it is attached, in the direction of its own action, and the flexion, or general curvature of the tail upwards, is the reſult of their common contraction.

The inferior lateral muſcles ariſe alſo from the lumbar vertebræ, like the preceding, but more externally. Their arrangement alſo is ſimilar, with this difference, that their tendons make a kind of turn, and run under the tail, where they are inſerted into each of the vertebræ. They alſo receive acceſſary tendons. They produce motions in an oppoſite direction to thoſe of the ſuperior muſcles, that is to ſay, they bend the tail downwards. Their tendons are more ſlender than thoſe of the former. They divide into two branches at their extremities, and each bifurcation affords a paſſage for that of the next vertebra, ſo that they mutually ſerve as ſheaths; and are all, except the laſt, both perforating and perforated.

The ſpinal muſcles conſiſt of flakes, and are pale, as in the oſſeous fiſhes, although their form is different in this genus.

The dorſal, anal, and caudal fins are moved by a great number of ſmall muſcles. In the interval left between the dorſal portions of the lateral muſcles, along the back, there are found ſome long ſlender muſcles, extended from the neck to the firſt ray of the dorſal fin, and between the dorſal fins, where there exiſt more than one, and from the dorſal to the caudal fin. By means of the inſertion of theſe muſcles into the firſt ray of each of the fins they tend to raiſe and ſpread them.

The number of theſe muſcles varies according to the exiſtence or number of the dorſal fins. In the *gymnotus*, and ſome others which want the dorſal fin, there is only a ſingle pair, which extends from the neck to the caudal fin. In the ſpecies which poſſeſs one dorſal fin, there are two pairs, and in thoſe that have two dorſal fins there are three pairs.

There are muſcles correſponding to the above, placed upon the lower or ventral edge of fiſhes, intended for the expanſion of the anal and caudal fins. Cuvier deſcribes two pair of theſe in the *carp* (*cyprinus carpio*). The one ariſes from the junction of the bones which ſuſtain the pectoral fins, and is inſerted on each ſide into the ligamentous tiſſue, which unites the two ventral fins; the little fleſhy bellies, of which this pair of muſcles is compoſed, are four or five in number, in form reſembling beads, and placed at ſome diſtance from each other.

The other pair extend from the anal fins to the firſt rays of the caudal fin. Theſe fleſhy portions are ſtill thinner, and their tendons much longer than thoſe of the former pair.

The other motions of the dorſal and anal fins are accompliſhed by means of a number of ſlender muſcles, reſembling in their form and poſition the interoſſei of the hand. They lie upon theſe ſpinous bones, which are added to the ſpinous proceſſes of the dorſal and caudal vertebræ, for the purpoſe of ſuſtaining the dorſal and anal fins. There are two ſets or ſeries of theſe muſcles, a ſuperficial and a deep-ſeated; the firſt ariſes from an aponeuroſis which lines the ſkin, and furniſhes ſepta to form a ſort of ſheath to each of theſe muſcles, and which, by adhering along the roots of the additional vertebral ſpines, makes a degree of ſheath alſo for the free margins of the lateral muſcles; theſe muſcles are inſerted into the baſes of each of the radii of the fins. The immediate effect of their action is to bend the rays of the fin laterally, if thoſe of one ſide only are employed; but, if both ſides act, the rays are brought cloſer to the body; if already inclined that way, but if ſtanding in a right angle with the body, theſe muſcles may ſerve to ſuſtain them, or keep them fixed in that poſition.

The ſecond ſet lie under the preceding muſcles, and are encloſed in the ſame ſheath with them; they are each attached to two of the additional ſpinous bones for almoſt their whole length, and at their roots to the inter-muſcular aponeuroſis, already mentioned: their tendons are inſerted into the ſides of the baſes of each ray, by which means they draw the rays of the fin out of a right line, and thus tend to expand the fins as well as bring them to either ſide of the body.

Cuvier deſcribes a ſet of ſhort oblique muſcles for cloſing the rays of the fin, which we have not ſeen except on the caudal fins.

The flexion of the caudal fin is effected at the ſame time with that of the whole tail, by means of the great lateral muſcles already deſcribed; but the rays of the caudal fin are expanded and contracted by particular muſcles for the purpoſe.

Thoſe that ſpread the caudal fin are concealed by the lateral muſcles; they ariſe from ſome of the laſt vertebræ, ſpread in a fan-like manner, and are inſerted into the roots of the rays: the outermoſt faſciculi come from the three vertebræ preceding the laſt, and terminate upon the five or ſix of the external or longeſt rays; thoſe of the intermediate rays ariſe from the two laſt vertebræ.

The muſcles which ſerve to approximate the rays of the caudal fin appear like a row of beads or barley-corns, lying obliquely over the joints of the rays and inter-articular bones, with the broad, thin termination of the laſt vertebra. Theſe muſcles of one ſide of the tail appear to paſs in a different direction from thoſe of the other ſide, or to decuſſate each other.

The ſingle fins are evidently intended to increaſe the lateral ſurfaces of fiſhes, during the act of ſwimming, and thereby communicate a greater impulſe to the water. They are alſo uſeful in turning the fiſh, and particularly the caudal fin muſt act like the helm of a ſhip. Mr. Carliſle made the experiment of cutting off the different fins of living fiſhes in ſucceſſion, with the view of determining their ſeparate offices ; he obſerved, that after the removal of the ſingle fins there was an evident tendency in the fiſh to turn round, and the pectoral fins were kept conſtantly extended to obviate that motion.

The ſingle fins may alſo be conſidered as inſtruments of defence to fiſhes, more eſpecially when the rays of the dorſal fins terminate in ſharp ſpines, which they do in a great number of ſpecies, and in thoſe caſes the muſcles for erecting the rays are peculiarly ſtrong.

In *oſſeous* fiſhes, the great lateral muſcles ſupply the place of the abdominal muſcles, as well as thoſe which ariſe from the ſpine ; but in the *ray* genus we find ſome muſcles, which correſpond a good deal with the abdominal muſcles. The inferior parietes of the abdomen in thoſe fiſhes are compoſed of ſome layers of muſcles which are attached to the tranſverſe cartilages and the poſterior branches of the ſcapulæ, and to the pieces compoſing the pelvis ; theſe fibres take a ſimilar direction to that of the ſtraight and oblique muſcles of the belly, and thoſe of each ſide are diſtinguiſhed by an aponeurotic line, analogous to the linea alba. They tend to depreſs the wings, and bring the pelvis forwards and downwards.

The ſuperior parietes of the abdomen are formed by two thin, broad muſcles ; one ariſes from the aponeuroſis, under the ſkin of the back, and is inſerted into the back of the poſterior branch of the ſcapula ; the other ariſes from the aponeuroſis of the muſcles of the dorſal ſpine, and the back of the pelvis, and is inſerted along the middle of the poſterior branch of the ſcapula ; theſe muſcles are concerned in the elevation of the wings.

The muſcles of the pectoral fin are ſimple in both the cartilaginous and the oſſeous fiſhes.

In the oſſeous fiſhes there is, in ſome ſpecies, a ſmall, ſhort muſcle, ſituated on the internal and back part of the portion of the ſcapula, where that bone is connected to the cranium. It has the effect of bringing the ſcapula cloſer to the head.

There is likewiſe a ſmall taper muſcle which ariſes from the front of the clavicle, and is inſerted into the poſterior ſharp proceſs of the ſcapula ; it brings the ſcapula backwards, and the clavicle forwards and inwards.

There are two ſets of muſcles ſituated upon the broad and thin portion of the ſcapula for moving the rays of the pectoral fin. The external ſet conſiſts of three muſcles, two of theſe are partially covered by the other ; the two uppermoſt may be divided into a great number of faſciculi, which ſend tendons to the baſes of the rays of the fin ; the moſt inferior of the external ſet ſends tendons only to ſome of the moſt inferior or external rays of the fin. The internal ſet conſiſts of two muſcles much reſembling the two firſt that are placed externally ; they ſend tendons into the roots of the rays on the inſide. By all theſe muſcles the rays of the fin are raiſed from the body and brought cloſer to it, turned forwards, and the edge preſented to the water.

In the genus *ray*, beſides the muſcles already mentioned in deſcribing other parts, which act upon the pectoral member, there is a very ſhort muſcle which goes from the laſt tranſverſe proceſs of the cervical ſpine to the top of the ſhoulder ; it appears to raiſe the ſcapula. There is alſo a muſcle extended along the concave ſide of the poſterior branch of the ſcapula ; its fibres ariſe from a tendon which is ſtretched from above the joint to the point of that branch ; they are inſerted into the edge of the fin. The uſe of this laſt appears to be to bring the poſterior branch of the ſcapula nearer the body ; this motion is attended with the expanſion of the rays of the fin.

The muſcles which act immediately upon the rays of the wings in the flat *chondropterygii* are as numerous as the rays themſelves ; they altogether compoſe two great layers of faſciculi, ſomewhat reſembling the muſcles of the ſingle fins of oſſeous fiſhes ; one layer is placed upon the ſuperior ſurface of the wings, the other upon the inferior ; they thus cover the whole fin, ariſing from the external ſide of the ſcapula, and extended to almoſt the very edge of the fin. Their office is to raiſe and depreſs the wings.

The muſcles which move the rays of the ventral fin in oſſeous fiſhes are ſituated upon the external and internal ſurfaces of the pelvic bones. On the external ſurface there are three or more faſciculi, which in approaching the baſes of the rays form leſſer faſciculi, one of which is inſerted into each ray ; the external muſcles elevate the fin, and from their oblique direction and mode of attachment they alſo tend to cloſe the rays. There is but one muſcle uſually on the internal ſurface of the pelvic bone ; with its fellow, it fills up all the ſpace left between the two flat ſurfaces of the bones of the pelvis. Theſe muſcles have the effect of depreſſing the rays of the ventral fin, and at the ſame time of expanding them, ſo as to preſent a broader ſurface to the water.

In the *chondropterygii* the external rays of the ventral fin, more eſpecially the outermoſt, have their muſcles in diſtinct faſciculi, which are capable of drawing the rays in all directions. Theſe muſcles might be compared with thoſe that act upon the lower extremities of mammalia : the ſmall rays of the ventral fins have faſciculi cloſely applied to them in the ſame manner as thoſe of the pectoral fin in theſe fiſhes.

The chief uſes of the pectoral and ventral fins are to turn and ſtop in ſwimming, and to preſerve the poſition of the fiſh ; therefore we obſerve, they are always employed when the animal wiſhes to continue nearly in one place. When the motion of the fiſh alſo is very gradual through the water theſe fins are ſometimes the only inſtrument employed in ſwimming. From the experiments made by Mr. Carliſle of cutting off the fins in a living fiſh, it would appear that the pectoral fins are uſeful in aſcending, and that they ſerve to keep the head uppermoſt : when both the pectoral and abdominal fins were removed, he found that the fiſh had a tendency to roll and could not aſcend at all.

Air Bladder.

This ſingular organ is peculiar to the claſs of fiſhes. Anatomiſts have aſcribed various functions to it ; we have, however, choſen to place it amongſt the inſtruments of motion, for reaſons which will be given hereafter.

The air bag is wanting in ſeveral ſpecies of fiſhes, and has been ſuppoſed to be abſent in ſome others, in which it really exiſts. It is not met with in any of the *chondropterygii*, in the genus *lophius*, in the *moon-fiſh* (*tetraodon mola*) ; it is ſuppoſed to be wanting in the *ammodytes tobianus*, the *ſtromateus paru*, the *callionymus dracunculus*, the *blennius ſupercilioſus*, and *blennius viviparus*, &c. ; in the genera *cepola*, *echeneis*, and *cottus*. It is abſent in the *flat* fiſhes (*pleuronectes*), and in the *mackarel* (*ſcomber ſcombrus*) ; we have not found it in the *weaver* (*trachinus draco*). Bloch appears to have extended the liſt of fiſhes in which this organ is abſent farther than is right ; he denies its exiſtence in the *electrical eel* (*gymnotus electricus*), although Mr. Hunter deſcribed it in that fiſh. Redi alſo ſtated it to be wanting in the *uranoſcopus ſcaber*, in which Cuvier has found an air-bag reſembling that of the *carp* (*cyprinus carpio*.)

The air-bag is always ſituated upon the inferior ſurface of the dorſal vertebræ; ſometimes, as in the genus *gadus*, it adheres firmly and intimate to the ſpine. At other times, as in the genera *ſalmo*, *eſox*, &c. it ſends proceſſes to the ribs and the ſpaces between them.

In the *dory* (*zeus faber*) it is connected to the ſpine by ligaments which ariſe from the bag, but is not continuous with it.

In the *carp* (*cyprinus*) the anterior portion of the bag only is attached to a deſcending proceſs of the ſecond dorſal vertebræ. In the *ſturgeon* (*acipenſer ſturio*), the *eel* (*murena*), the *herring* (*clupea*), and many other fiſhes, the bag is unconnected with the ſpine, and preſerved in its proper poſition by its peritoneal coat, and the duct which communicates with the œſophagus or ſtomach.

The ſtructure of the parietes of the air-bladder is extremely curious. It has two proper coats and a peritoneal covering; the internal proper coat is in general a fine delicate membrane, which, in many caſes, is not cloſely adherent at every part to the other coat; it appears to be double, and the innermoſt layer to be, in ſome places, looſe, and capable of being moved upon the ſurface of the other.

The *external proper coat* is in many caſes incomplete or wanting in ſome parts of the air-bag: thus, in the genus *gadus* there is only the membranous tunic along the upper ſurface of the bladder, which correſponds to the bodies of the vertebræ; the intimate connection with the external parts of the ſpine rendering a ſtronger integument in this place unneceſſary; this coat alſo appears to be wanting in the poſterior bladder of the *carp* (*cyprinus carpio*). It is abſent alſo upon the poſterior end of the air-bag in the *dory* (*zeus faber*), but in this inſtance it is ſupplied by a thick, ſoft, fleſhy-looking tunic, which has conſiderable ſtrength.

The external proper coat has a moſt peculiar ſtructure: it is very cloſe in its texture, reſembling, when cut through, the ligamentum nuchæ of mammalia; it is of a beautiful ſilvery white colour, and the inner ſurface gliſtens like poliſhed metal; from theſe characters we ſhould wiſh to give it the name of the *argentine coat*; it is tough, but poſſeſſes very little elaſticity, which it appears to loſe entirely upon being ſtretched. This coat is generally thick, but does not ſeem to be ſtrong in proportion; it tears with the application of a much ſlighter force than would be required to rupture a tendon or ligament of the ſame degree of thickneſs. Cuvier ſtates its conſiſtence to be ſo conſiderable in the *oſtracions* as not to ſhrink when the bag is emptied of its air; it is alſo very ſtrong in the genera *ſilurus* and *gadus*; in other inſtances, as in the *pike*, *herring*, *eels*, *carp*, &c. it is as thin as a membrane: in the *bichir* (*polypterus niloticus*) this coat exhibits ſome oblique fibres, which Cuvier is diſpoſed to conſider muſcular; it is the argentine coat which is ſo intimately united to the external parts of the vertebræ in the *cod*.

An opinion prevails that it is unwholeſome or dangerous to eat the air bag of fiſhes, which probably ariſes from the indigeſtible nature of the external coat.

The *cobitis foſſilis* is diſtinguiſhed by having the parietes of the air bag compoſed of bone; the oſſeous covering appears to ſupply the place of the external proper coat in this fiſh, and is lined like it by membrane.

The *peritoneal* coat does not always entirely cover the air-bladder; in thoſe inſtances, when the latter adheres to the ſpine, it only paſſes over the inferior ſurface of it.

In certain fiſhes the air-bladder contains a remarkable vaſcular apparatus; this is always ſituated on the inner ſide of the inferior or abdominal parietes of the bladder, it appears to be incloſed between the duplicatures of the internal proper coat of the bag, the innermoſt of which is extremely thin where it covers the ſurface of the vaſcular apparatus.

There is great variety in the figure of the vaſcular organ in the *cod* (*gadus morbua*); it is a broad patch, ſomewhat of a heart-ſhape, compoſed of a number of ſhort foliated proceſſes ſtanding cloſe to each other. In the *whiting* (*gadus merlangus*) theſe proceſſes are finer, leſs regular, and not ſo cloſe together, and look like the vaſcular ſhreddy membrane produced by the depoſition of lymph on an inflamed ſurface.

In the *mullet* (*mugil cephalus*) there are a number of granular vaſcular bodies ſpread over an oval ſurface, about two inches long and one inch and a half broad; theſe are fed by an artery of ſome ſize, which, after entering the bag, ſends branches to each of theſe little maſſes.

In the *eel* and *conger* (*murena anguilla* and *murena conger*) there are two ſpheroidal vaſcular bodies placed at a little diſtance from each other.

In the *dory* (*zeus faber*) there are four vaſcular bodies, ſituated nearly at equal diſtances from each other; they are narrow, rounded upon the ſurface, and are compoſed of ſmaller irregular-ſhaped maſſes, which give them a granular appearance; each body is coiled or twiſted like a piece of inteſtine, and they are all connected together by the blood-veſſels which paſs through a hole formed in the lower parietes of the bag for the purpoſe, and on entering the bag branch off regularly to ſupply each of the vaſcular bodies.

In the *gadus polachius*, Cuvier ſtates that the inner ſurface is entirely covered with long and numerous vaſcular filaments.

Whatever may be the form and arrangement of the vaſcular bodies, they agree in one circumſtance: they receive ſo great a ſupply of red blood that every point is coloured, the whole appearing of an uniform crimſon colour, as if it were dyed. There is no other organ of the animal body, with which we are acquainted, that poſſeſſes the ſame ſpecies of vaſcularity, except the *choroid gland* of the eye of fiſhes; but even this part falls ſhort in the degree of vaſcularity.

It may be ſtated in a general way, that in thoſe fiſhes which want a diſtinct vaſcular apparatus, there is either a communication between the air-bladder and the ſtomach or œſophagus, or the internal membrane of the bag receives a conſiderable number of blood-veſſels. In ſome caſes, however, when theſe proviſions exiſt, the inner ſurface of the air-bladder is abundantly ſupplied with blood-veſſels. In the *bichir* (*polypterus niloticus*), for inſtance, the veſſels form innumerable ſtriæ, which colour a great part of the ſurface of the bag.

It has been commonly ſuppoſed that the vaſcular bodies, and the veſſels diſtributed upon the inner ſurface of the bladder, are deſtined to ſecrete the air with which it is filled. This fact, which has been called in queſtion by ſome phyſiologiſts, is fully proved by the ſtructure obſerved in the vaſcular bodies of *eels* (*murena*), and the *ſea perch* (*perca labrax*). In the former, the vaſcular bodies exhibit on their ſurface a fine net-work of veſſels containing air; and in the *ſea perch*, beſides the uſual vaſcular body on the inner part of the bag, there are two others placed externally on each ſide, and extended from the baſe to the point of the cone-ſhaped bladder of this fiſh. There ariſe from theſe a great number of little air-veſſels, which unite into ſeveral principal trunks that penetrate the parietes of the bladder, and open into its cavity by thirty or forty orifices on each ſide, arranged in a line.

As the offices of theſe ſingular organs are ſo ſatisfactorily demonſtrated, they might with propriety be called *air-glands*. The circumſtance of the vaſcular bodies ſecreting air is a moſt intereſting fact in phyſiology, and ſerves to explain the production of gaſeous matter from the ſecreting ſurfaces in other claſſes of animals.

The communication which the air-bladder has, in ſeveral fiſhes, with the ſtomach is one of the moſt curious circumſtances in the hiſtory of this organ. It has been ſuppoſed, by ſome anatomiſts, to be intended to diſcharge the contents of the bag; but we are more diſpoſed to think that it is deſigned to admit air, which is furniſhed by the ſurface of the alimentary canal. In no inſtance has any fiſh been obſerved to expel air by the mouth or anus; and if it were retained in the ſtomach, the ſpecific gravity of the animal would remain the ſame, and conſequently the ſuppoſed purpoſe would not be anſwered. On the other hand, the ſecretion of air from the ſurface of the ſtomach is a well aſcertained fact, with reſpect to many other animals, and may be preſumed by fair analogy to take place alſo in fiſhes. Another argument may be drawn from the ſurface of the air-bag being commonly found leſs vaſcular in thoſe inſtances where this communication exiſts.

The duct, which ſerves to convey the air from the alimentary canal into the bladder, has been obſerved to exiſt in certain ſpecies of the genera *acipenſer*, *murena*, *perca*, *ſalmo*, *eſox*, *cyprinus*, *clupea*, *ſilurus*, and *polypterus*. It varies with reſpect to its ſize and figure, and the places at which it ariſes and terminates. In the *eel* (*murena anguilla*), the *conger* (*murena conger*), and the *murena helena*, it paſſes from the anterior part of the ſtomach to the middle of the bladder, between the two air-glands: it becomes wider as it approaches the bladder. In the *pike* (*eſox lucius*), the *trout* (*ſalmo fario*), the *ſalmon* (*ſalmo ſalar*), and the *ſturgeon* (*acipenſer ſturio*), the opening into the bag is ſituated near its anterior extremity. In theſe fiſhes it is ſhort and wide, particularly in the *pike* and *ſturgeon:* in the latter it is ſo wide, that a finger will paſs through it; and ſo ſhort, that it appears like a ring rather than a duct. It ariſes from the œſophagus in the *ſalmon*, and from the beginning of the ſtomach in the *ſturgeon*. It opens into the anterior third of the bag in the *ſilurus*. The duct is extremely long and ſmall in the *carp* (*cyprinus carpio*), and paſſes from the termination of the œſophagus to the anterior part of the poſterior portion of the air-bag. In the *herring* (*clupea harengus*) the poſterior or funnel-ſhaped extremity of the ſtomach gives origin to a ſlender duct, which enters the air-bag at about one-third from its poſterior extremity.

The orifice into the œſophagus is not furniſhed with any valves to prevent the admiſſion of extraneous ſubſtances; but when it is wide, it is encompaſſed by ſome muſcular fibres, which perform the office of a ſpincter. This ſtructure is well ſeen in the *ſturgeon* and the *bichir* (*polypterus niloticus*): in the former, the ſhort duct has a muſcular coat of circular fibres; and in the latter, the orifice is ſurrounded by a ſphincter. When the duct is very ſmall, the contraction of the ordinary muſcular fibres of the alimentary canal ſeems to be adequate to the ſhutting of the orifice.

In whatever manner the orifice of the air-duct be conſtructed, its opening or cloſing is unqueſtionably regulated by the will of the animal.

Having ſtated the general ſtructure of the air-bag, and the parts connected with it, we ſhall enumerate the peculiarities of its form which have been obſerved in different fiſhes.

The air-bladder in ſome inſtances conſiſts of two parts or chambers, communicating with each other. In the *bichir* (*polypterus niloticus*, Geoffroy), it forms two large cylindric ſacs, of which the one is much longer than the other, extending the whole length of the abdomen; they only unite when they communicate with the œſophagus; the *tetraodon oblongus* alſo has the bag of two portions, but of the ſame figure and magnitude; they lie together, and unite at their anterior extremity. In the *gadus polachius* the two portions of the bag are of unequal ſize, they are ſituated parallel to each other, and are conjoined in their middle. In the *carp* (*cyprinus*), and the *uranoſcopus ſcaber*, the bag conſiſts of two ſacs, the one placed behind the other, and ſeparated by a contraction, which leaves a ſmall aperture of communication between them.

The air-bladder is ſingle in all other fiſhes, except the foregoing examples, and exceedingly various with reſpect to its form, even in ſpecies of the ſame genus. It has the figure of an elongated cone, with the baſe turned forwards, in the *ſturgeon* (*acipenſer ſturio*), the *ſalmon* and *trout* (*ſalmo ſalar* and *ſalmo fario*), the *pike* (*eſox*), the *dory* (*zeus faber*), &c.; it is long, conical, and fringed poſteriorly in the *ſalmo eperlanus*; ſhort and oval in the *murena helena*, narrow and more elongated in the *common eel*, the *conger*, and the *ſygnathus acus;* it is long and pointed at both ends in the *herring*, (*clupea harengus*). In the *cod* (*gadus morhua*), it is pointed poſteriorly, notched or divided into a number of lobules along the ſides, ſtraight at the anterior part, from the corners of which two vermiform proceſſes go off, which are conſiderably convoluted. Cuvier deſcribes theſe proceſſes as two ducts, leading into the œſophagus, but they terminate in blind extremities; it is bifurcated anteriorly in the *ling* (*gadus molva*), long and ſlender in the *hake* (*gadus merlucius*): it is oval in many of the genus *labrus*. In the *anableps tetropthalmus* it is ſmall anteriorly, and enlarged behind; in the *oſtracion cubicus*, it is irregular, ſlightly notched before, and a little contracted in the middle; the *oſtracion quadricornis* has the ſame figure, with two proceſſes on the ſides. In the genus *ſilurus* the air-bag has the form of a heart, and contains internally a number of tranſverſe ſepta, which are incomplete upon the ſides. In many of the genus *diodon* alſo ſimilar partitions have been obſerved to exiſt.

The air bag in ſome fiſhes poſſeſſes two muſcles; they are ſhort thick layers, which paſs downwards on each ſide of the anterior part of the bag. In the *dory* (*zeus faber*) they have an oval form, and have no foreign attachments, but belong entirely to the parietes of the bag. In the *cod* (*gadus morhua*) there are two muſcles on each ſide, which are affixed to the two firſt lobules, or ſacculated portions of the air bladder, and have their ſuperior extremities inſerted into the ſpine. Cuvier ſtates that theſe muſcles exiſt in the *mormyrus labiatus*, and in the *oſtracion cubicus*, in which laſt ſpecies they are extremely thick. He ſuppoſes that the uſe of the muſcles is to compreſs the air-bag, and, by diminiſhing the bulk of the air it contains, encreaſe the ſpecific gravity of the fiſh. They appear, however, to be incompetent to ſuch an effect, as they can only act upon the anterior portion of the bag; they are, therefore, probably deſtined to urge the air from the fore-part of the bladder, when the animal has occaſion to deſcend in the water.

It is to be regretted that the different experiments, which have been inſtituted to aſcertain the chemical properties of the air contained in this organ, have afforded ſuch contradictory reſults: ſcarcely any two of them coincide with each other. Thus, La Cepede has ſtated that he diſcovered hydrogen gas in the air-bag of the *tench* (*cyprinus tinca*). Fourcroy found azotic gas in that of the *common carp* (*cyprinus carpio*). Ficher met with carbonic acid gas. Dr. Broadbelt, in examining the air-bag of the *ſword fiſh* (*xi-*

phias gladius), ſometimes found it to contain oxygen, and at others fixed air. Others have ſtated that the air-bag of the *carp*, &c. is filled with atmoſpheric air. Some later experiments on the ſubject have been communicated to the French National Inſtitute by M. Biot. He aſcertained that the contents of this organ varied from pure azote to $\frac{87}{100}$ths of oxygen; but there exiſted no hydrogen. He ſtated that freſh-water fiſh, which frequently ſwim near the ſurface, afforded the leaſt proportion of oxygen; and he thought that this gas was in greater quantity, according to the depth of water from which the fiſh came.

Biot's experiments are very intereſting, as they go ſome way towards reconciling the contradictory accounts of other phyſiologiſts, and may perhaps be conſidered as explaining the different degrees of purity obſerved at different times in the air of the bag in the ſame individual.

Anatomiſts are as much at variance with reſpect to the uſes of the air-bag, as they differ in their accounts of its contents. Needham ſuppoſed that the air produced in the blood was depoſited in the bladder, and afterwards carried into the ſtomach, in order to aſſiſt digeſtion. Vicq d'Azyr adopted a ſimilar opinion: he thought the bladder was ſubſervient to digeſtion, and that it received the finer kinds of food. Ficher imagined this organ an acceſſory one to the gills, beſides forwarding the motion of the animal in its element: he conceived that the fiſh came to the ſurface for the purpoſe of ſwallowing atmoſpheric air, which afterwards paſſed through the pneumatic duct into the bladder, and, when ſpoiled by remaining in contact with the vaſcular bodies or blood-veſſels, was expelled through the ſame channel.

It is impoſſible to conceive ſpeculations more abſurd or more eaſily overturned, than the preceding. Each of theſe opinions ſuppoſes that there is always a communication between the air-bag and the alimentary canal, which, as before ſtated, is aſcertained to exiſt in but a ſmall number of fiſhes: but if this obſtacle did not exiſt, both the theories of Needham and Vicq d'Azyr are ſtill extremely improbable. The admixture of air with the alimentary ſubſtances would interrupt, inſtead of promoting their digeſtion. It would be utterly impoſſible for any proceſs ſimilar to reſpiration to be carried on in a cloſe ſac; as the air could not be renovated, its operation would ceaſe, and to ſuppoſe the ſecretion of oxygen into the air-bag, and the abſorption of the carbonic acid gas produced there, is perfectly prepoſterous; as well might an animal reſpire in a cloſe veſſel.

The true and only uſe of the air-bladder appears to be to diminiſh the gravity of the fiſh in relation to its bulk, and thereby enable it to continue buoyant, or aſcend in the water with little or no muſcular effort: this is the popular notion; and hence the common name of *ſwimming bladder* or *ſwim* are uſed; in confirmation of which opinion it may be remarked, that thoſe fiſhes have the largeſt air-bags which ſwim rapidly, and frequently aſcend and deſcend in the water; that when it is wanting we can almoſt always diſcover ſome other modification or conditions in the organs of locomotion which are adapted to fulfil the ſame purpoſes, and that when ſuch proviſions do not exiſt, the fiſh commonly grovels at the bottom of the water. Thus the *ſhark* genus is furniſhed with a long and powerful tail, and the pectoral fins are in general of ſome ſize. In the *mackarel* (*ſcomber ſcombrus*) the ſkeleton and muſcular ſubſtance are both light, and the tail is particlarly ſtrong; the *gar fiſh* (*eſox lucius*), which has a light ſkeleton, and muſcular ſubſtance very like the *mackarel*, has an extremely ſmall air-bag. The flat fiſhes ſwim by means of a continual beating or flapping of the water with their broad ſurfaces, in a manner exactly analogous to flying. Laſtly, the *lamprey* (*petromyzon*), which wants the air-bag and has a tail badly formed for ſwimming, generally lies buried in the mud at the bottom of the water.

To theſe obſervations we ſhall add ſome experiments we made upon one occaſion on living fiſhes, the *goach* and *gudgeon* (*cyprinus rutilus* and *cyprinus gobio*), which, in our opinion, put it beyond all doubt that the air-bladder is an organ of motion. A knife was plunged paſt the ſpine into the air-bladder; upon the air ruſhing out, the fiſhes deſcended to the bottom of the veſſel of water, and there remained. In order to aſcertain whether the infliction of ſuch a wound could have any effect, a ſimilar one was made upon other living fiſhes, taking care not to penetrate the air-bladder, but they afterwards aſcended and deſcended as uſual: an air-bladder was next removed from the body of one fiſh, and attached to the external part of the body of another fiſh, which had previouſly ſunk to the bottom in conſequence of the air being extracted from its bag by a wound; it now became as unable to deſcend in the water as it was before to riſe, and was detained at the ſurface in deſpite of all its efforts to eſcape to the bottom of the veſſel.

Two concluſions are to be drawn from the foregoing experiments: 1ſt, that the air-bag is abſolutely neceſſary to the locomotion of thoſe fiſhes, to which it naturally belongs; 2dly, that in the body of the living fiſh ſome change is produced in the bulk or quantity of the air contained in the bag to enable the fiſh to deſcend.

Some anatomiſts have accounted for the diminution of the volume of air in the bag, by ſuppoſing it to be carried into the ſtomach or œſophagus, and thence expelled, but this could only take place in thoſe few fiſhes which have a duct of communication between thoſe parts.

Others have ſuppoſed that the air-bag is diminiſhed by being compreſſed at the will of the animal, either by the great lateral muſcles, or thoſe ſituated at the anterior part of the bag: it ſeems, however, very doubtful whether the action of either of theſe muſcles can materially affect the whole bag; but if this were granted, it might be ſtill objected, that in ſome inſtances the air-bag is ſo thin as not to be able to ſuſtain much compreſſion without danger of being ruptured, and that in other inſtances its parietes are ſo thick as to reſiſt a moderate degree of compreſſion, and in the *cobitis foſſilis*, it being an oſſeous ſac, it is incompreſſible.

Shall we ſuppoſe that the gaſeous contents of the bag are encreaſed and diminiſhed, as occaſion may require, by ſecretion and abſorption? There appears but one objection to this ſuppoſition, which is the rapidity that would be neceſſary in effecting thoſe changes in the quantity of the air. It may be remarked, however, that air is ſecreted, under ſome circumſtances, in the human ſtomach almoſt inſtantaneouſly; the ſecretion of ſaliva and the tears is, perhaps, equally rapid: the vaſcular action which conveys the fluſh to the cheeks ſurpaſſes in velocity any of the voluntary motions of animals; it is, therefore, not inconſiſtent with ſome of the well known phenomena of the vaſcular ſyſtem to ſuppoſe that the volume of air in the ſwimming bladder of fiſhes may be regulated according to neceſſity, by the veſſels diſtributed to the parietes of the bag, or, perhaps, by thoſe of the ſtomach, when theſe two parts communicate. It would be improper, however, to adopt this opinion upon the mere ground of its being poſſible: future experiments muſt determine what really are the means employed by fiſhes to alter their gravity.

Plate XIV. *of the Anatomy of Fiſhes*, contains the illuſtrations of the ſtructure of the air bag. *Fig.* 1. repreſents the air-bladder of the *dory*, (*zeus faber*) turned inſide out, in order to bring into view the internal coat and air glands, &c.; *a*, the anterior part of the bag; *b*, the poſterior part: the argentine coat is ſeen through the internal membrane, and at *b* the fleſhy looking coat which ſupplies its place; the inner membrane adheres moſt looſely at this part; *c, c, c, c.* the four air-glands or vaſcular bodies; *d*, the blood-veſſel which is diſtributed to them with the accompanying vein; *e, e*, the muſcles ſeen through the inner coat.

Fig. 2. exhibits the air-gland of the *cod* (*gadus morhua*); *a*, the ſurface preſented to the cavity of the bag.

Fig. 3. ſhews the air bladder of the *eel*, (*murena anguilla*) divided longitudinally, and the parietes ſpread out; *a*, the argentine coat; *b b b b*, the internal membrane with its blood-veſſels; *c, c*, the two air-glands; on the left ſide the inner membrane is raiſed to uncover the gland, and bring into view the network of the air veſſels upon it at *d*; *e e*, portion of the duct which goes to the ſtomach.

Fig. 4. repreſents a portion of the œſophagus and ſtomach of the *ſturgeon* (*acipenſer ſturio*) laid open, with a part of the air-bag attached to it; *a*, the œſophagus; *b*, the ſtomach; *c*, the air-bladder; *d*, the duct leading from one into the other, ſurrounded by an annular muſcle; *e*, the orifice of the duct.

Fig. 5. is the double air-bag, with its duct in the *carp* (*cyprinus carpio*) inflated and dried; *a*, the anterior portion of the bag; *b*, the poſterior chamber with thinner parietes; *c*, the duct paſſing ſome diſtance before it terminates in the alimentary canal, a portion of which is preſerved at *d*.

Fig 6. exhibits the ſtomach and air-bag of the *herring* (*clupea harengus*); *a*, the anterior part of the ſtomach; *b*, the poſterior or infundibular portion; from the extremity of which a duct is ſeen going off to the air-bag *c*, which is long and pointed at both ends.

Fig. 7. is a view of the air-bag in the *ſilurus felis*, cut open to ſhew the partitions of the interior, which produce a cellular appearance.

Electric Organs.

Theſe parts, and the very ſingular faculty they beſtow, have been obſerved to exiſt but in a very ſmall number of ſpecies; there are only five fiſhes which are at preſent known to poſſeſs the electric property. The *torpedo* (*raja torpedo*), the *electrical eel* (*gymnotus electricus*), the *ſilurus electricus*, the *Indian eel* (*trichiurus indicus*), and the *tetraodon electricus*.

The parts which produce the electric phenomena have been deſcribed by ſeveral naturaliſts in the *torpedo* and *gymnotus*, but moſt minutely and correctly by the late Mr. Hunter; and the electric apparatus of the *ſilurus electricus* has been deſcribed and delineated within theſe late years by M. Geoffroy the French naturaliſt, but no account has yet been given, as far as we know, of theſe organs in the electric ſpecies of *trichiurus* and *tetraodon*.

Before entering upon the conſideration of the phenomena exhibited by the electric fiſhes, we ſhall give a deſcription of the organs by which they are produced in the *torpedo*, the *electric eel*, and the *ſilurus electricus*; and with reſpect to the two firſt, as the ſubject is peculiarly intereſting, we ſhall copy the detailed and accurate account publiſhed by Mr. Hunter in the Philoſophical Tranſactions.

"The electric organs of the *torpedo* are placed on each ſide of the cranium and gills, reaching from thence to the ſemi-circular cartilages of each great fin, and extending longitudinally from the anterior extremity of the animal, to the tranſverſe cartilage which divides the thorax from the abdomen; and within theſe limits they occupy the whole ſpace between the ſkin of the upper and of the under ſurfaces; they are thickeſt at the edges near the centre of the fiſh, and become gradually thinner towards the extremities.

"Each electric organ, at its inner longitudinal edge, is unequally hollowed, being exactly fitted to the irregular projections of the cranium and gills. The outer longitudinal edge is a convex elliptic curve. The anterior extremity of each organ makes the ſection of a ſmall circle; and the poſterior extremity makes nearly a right angle with the inner edge.

"Each organ is attached to the ſurrounding parts by a cloſe cellular membrane, and alſo by ſhort and ſtrong tendinous fibres, which paſs directly acroſs, from its outer edge, to the ſemi-circular cartilages.

"They are covered, above and below, by the common ſkin of the animal; under which there is a thin faſcia ſpread over the whole organ. This is compoſed of fibres, which run longitudinally, or in the direction of the body of the animal. Theſe fibres appear to be perforated in innumerable places; which gives the faſcia the appearance of being faſciculated; its edges all around are cloſely connected to the ſkin, and at laſt appear to be loſt, or to degenerate into the common cellular membrane of the ſkin.

"Immediately under this is another membrane, exactly of the ſame kind, the fibres of which in ſome meaſure decuſſate thoſe of the former, paſſing from the middle line of the body outwards and backwards. The inner edge of this is loſt with the firſt deſcribed; the anterior, outer, and poſterior edges are partly attached to the ſemi-circular cartilages, and partly loſt in the common cellular membrane.

"This inner faſcia appears to be continued into the electric organ by ſo many proceſſes, and thereby makes the membranous ſides or ſheaths of the columns, which are preſently to be deſcribed; and between theſe proceſſes the faſcia covers the end of each column, making the outermoſt or firſt partition.

"Each organ of the fiſh under conſideration is about five inches in length, and at the anterior end three in breadth, though it is but little more than half as broad at the poſterior extremity.

"Each conſiſts wholly of perpendicular columns, reaching from the upper to the under ſurface of the body, and varying in their lengths, according to the thickneſs of the parts of the body where they are placed, the longeſt column being about an inch and an half, the ſhorteſt about one-fourth of an inch in length, and their diameters about two tenths of an inch.

"The figures of the columns are very irregular, varying according to ſituation and other circumſtances. The greateſt number of them are either irregular hexagons, or irregular pentagons; but, from the irregularity of ſome of them, it happens that a pretty regular quadrangular column is ſometimes formed. Thoſe of the exterior row are either quadrangular or hexagonal; having one ſide external, two lateral, and either one or two internal. In the ſecond row they are moſtly pentagons.

"Their coats are very thin, and ſeem tranſparent, cloſely connected with each other, having a kind of looſe net-work of tendinous fibres, paſſing tranſverſely and obliquely between the columns, and uniting them more firmly together. Theſe are moſtly obſervable where the large trunks of the nerve paſs. The columns are alſo attached by ſtrong inelaſtic fibres, paſſing directly from the one to the other.

"The number of columns in different torpedos of the ſize of that now offered to the ſociety, appeared to be about 470 in each organ, but the number varies according to the ſize of the fiſh. Theſe columns increaſe, not only in ſize, but in number, during the growth of the animal, new ones forming perhaps every year, on the exterior edges, as there they are much the ſmalleſt. This proceſs may be ſimilar to the formation of new teeth, in the human jaw, as it increaſes.

"Each column is divided by horizontal partitions, placed over each other, at very ſmall diſtances, and forming numerous interſtices, which appear to contain a fluid. Theſe partitions conſiſt of a very thin membrane, conſiderably tranſparent. Their edges appear to be attached to one another, and the whole is attached by a fine cellular membrane to the inſide of the columns. They are not totally detached from one another; I have found them adhering, at different places, by blood veſſels paſſing from one to another.

"The number of partitions contained in a column of one inch in length, of a torpedo which had been preſerved in proof ſpirits, appeared, upon a careful examination, to be one hundred and fifty; and this number in a given length of column appears to be common to all ſizes in the ſame ſtate of humidity, for by drying they may be greatly altered; whence it appears probable that the increaſe in the length of a column, during the growth of the animal, does not enlarge the diſtance between each partition in proportion to that growth; but that new partitions are formed, and added to the extremity of the column from the faſcia.

"The partitions are very vaſcular; the arteries are branches from the veins of the gills, which convey the blood that has received the influence of reſpiration. They paſs along with the nerves to the electric organ, and enter with them; then they ramify, in every direction, into innumerable ſmall branches upon the ſides of the columns, ſending in from the circumference all around upon each partition ſmall arteries, which ramify and anaſtomoſe upon it; and paſſing alſo from one partition to another, anaſtomoſe with the veſſels of the adjacent partitions.

"The veins of the electric organ paſs out, cloſe to the nerves, and run between the gills, to the auricle of the heart.

"The nerves inſerted into each electric organ, ariſe by three very large trunks from the lateral and poſterior part of the brain. The firſt of theſe, in its paſſage outwards, turns round a cartilage of the cranium, and ſends a few branches to the firſt gill, and to the anterior part of the head, and then paſſes into the organ towards its anterior extremity. The ſecond trunk enters the gills between the firſt and ſecond openings, and, after furniſhing it with ſmall branches, paſſes into the organ near its middle. The third trunk, after leaving the ſkull, divides itſelf into two branches which paſs to the electric organ through the gills; one between the ſecond and third openings, the other between the third and fourth, giving ſmall branches to the gill itſelf. Theſe nerves having entered the organs, ramify in every direction between the columns, and ſend in ſmall branches upon each partition where they are loſt." Phil. Tranſ. vol. 63, p. 481.

Plate XV. of the *Anatomy of Fiſhes*, exhibits a view of the upper or back ſurface of the *torpedo*, on which the electric organ of each ſide is uncovered by raiſing the integuments, in order to ſhew the extenſive portion of the body of the fiſh, which theſe parts occupy: *a*, *a*, the integuments turned back, diſplaying on their inſide an hexagonal net-work, which was the continuation of the columns into the ſkin; *b*, *b*, *b*, *b*, the ends of the column applied to the integuments. An exactly ſimilar appearance preſents itſelf on raiſing the ſkin of the inferior or oppoſite ſurface of the body of the fiſh.

In *Plate* XVI. of the *Anatomy of Fiſhes*, *fig.* 1. ſhews the electric organ of the *torpedo* on the right ſide, divided horizontally into nearly two equal parts at the place where the nerves enter; the upper half being turned outwards.

a a, *b b*, *c c*, *d d*, the correſponding parts of trunks of the nerves as they emerge from the gills, and ramify in the electric organ.

a a, the firſt or anterior trunk ariſing juſt before the gills.

b b, the ſecond or middle trunk, ariſing behind the firſt gill.

c c, the anterior branch of the third trunk, ariſing behind the ſecond gill.

d d, the poſterior branch of the third trunk, ariſing behind the third gill.

Fig. 2. of the ſame plate, exhibits a perpendicular ſection of the *torpedo*, a little behind its inſpiratory openings.

a a, the upper ſurface of the fiſh.

b, *b*, the muſcles of the back, as divided by the ſection.

c, the medulla ſpinalis.

d, the œſophagus.

e, the left gill, ſplit to expoſe the courſe of a trunk of a nerve through it.

f, the breathing ſurface of the right gill.

g, *g*, the fins.

h, *h*, the perpendicular columns which compoſe the electric organ, with a repreſentation of their horizontal poſitions.

i, one of the trunks of the nerves, with its ramifications.

"The *gymnotus electricus* may be conſidered, both anatomically and phyſiologically, as divided into two parts; *viz.* the common animal part; and a part which is ſuperadded, *viz.* the *peculiar organ*. I ſhall at preſent conſider it only with reſpect to the laſt; as the firſt explains nothing relating to the other, nor any thing relating to the economy of fiſh in general.

"The firſt, or common animal part, is ſo contrived as to exceed what was neceſſary for itſelf, in order to give ſituation, nouriſhment, and moſt probably the peculiar property to the ſecond. The laſt part, or peculiar organ, has an immediate connection with the firſt, the body affording it a ſituation; the heart, nouriſhment; and the brain, nerves, probably its peculiar powers. For the firſt of theſe purpoſes, the body is extended in length, being much longer than would be ſufficient for what may be called its progreſſive motion. For the real body, or that part where the viſcera and parts of generation are ſituated, with reſpect to the head, as in other fiſh, is extremely ſhort; ſo that, according to the ordinary proportions, this ſhould be a very ſhort fiſh. Its great length, therefore, ſeems chiefly intended to afford a ſurface for the ſupport of the peculiar organ; however, the tail part is likewiſe adapted to the progreſſive motion of the whole, and to preſerve the ſpecific gravity; for the ſpine, medulla ſpinalis, muſcles, fin, air-bladder, are continued through its whole length,

"Beſides which parts, there is a membrane paſſing from the ſpine to that fin which runs along the belly or lower edge of the animal. This membrane is broad at the end next to the head, terminating in a point at the tail. It is a ſupport for the abdominal fin, gives a greater ſurface of ſupport for the organ, and makes a partition between the organs of the two oppoſite ſides.

"The *organs* which produce the peculiar effect in the *electric eel* conſtitute nearly one-half of that part of the fleſh in which they are placed, and perhaps make more than one-third of the whole animal. There are two pair of theſe organs, a *larger* and a *ſmaller*; one being placed on each ſide. The large pair occupy the whole lower or anterior, and alſo the lateral part of the body, making the thickneſs of the fore or lower parts of the animal, and run almoſt through its whole length; *viz.* from the abdomen to near the end of the tail. It is broadeſt on the ſides of the fiſh at the anterior end, where it incloſes more of the lateral parts of the body, becomes narroweſt towards the end of the tail, occupying leſs and leſs of the ſides of the animal, till at laſt it ends almoſt in a point.

"Theſe two organs are ſeparated from one another at the upper part by the muſcles of the back, which keep their upper or poſterior edges at a conſiderable diſtance; below that, and towards the middle, they are ſeparated by the air-bag, and at their lower parts they are ſeparated by the middle partition.

"They begin forwards, by a pretty regular edge, almoſt at right angles with the longitudinal axis of the body, ſituated on the lower and lateral parts of the abdomen. Their upper edge is a pretty ſtraight line, with ſmall indentations made by the nerves and blood-veſſels, which paſs round it to the ſkin. At the anterior end they go as far towards the back as the middle line of the animal: but in their approach towards the tail they gradually leave that line, coming nearer to the lower ſurface of the animal.

"The general ſhape of the organ, on an external or ſide view, is broad at the end next to the head of the animal, becoming gradually narrower towards the tail, and ending there almoſt in a point. The other ſurfaces of the organ are fitted to the ſhape of the parts with which they come in contact; therefore, in the upper and inner ſurface it is hollowed, to receive the muſcles of the back.

"There is alſo a longitudinal depreſſion on its lower edge, where a ſubſtance lies, which divides it from the ſmall organ, and which gives a kind of fixed point for the lateral muſcles of the fin. Its moſt internal ſurface is a plane adapted to the partition which divides the two organs from one another. The edge next to the muſcles of the back is very thin, but the organ becomes thicker and thicker towards its middle, where it approaches the centre of the animal. It becomes thinner again towards the lower ſurface, or belly; but that edge is not ſo thin as the other.

"Its union with the parts to which it is attached is in general by a looſe, but pretty ſtrong cellular membrane, except at the partition, to which it is joined ſo cloſe, as to be almoſt inſeparable.

"The ſmall organ lies along the lower edge of the animal nearly to the ſame extent as the other. Its ſituation is marked externally by the muſcles which move the fin under which it lies. Its anterior end begins nearly in the ſame line with the large organ, and juſt where the fin begins. It terminates almoſt inſenſibly near the end of the tail, where the large organ alſo terminates.

"It is of a triangular figure, adapting itſelf to the part in which it lies. Its anterior end is the narroweſt part; towards the tail it becomes broader; in the middle of the organ it is thickeſt; and from thence becomes gradually thinner to the tail, where it is very thin.

"The two ſmall organs are ſeparated from one another by the middle muſcles, and by the bones upon which the bones of the fins are articulated.

"The large and the ſmall organ on each ſide are ſeparated from one another by a membrane, the inner edge of which is attached to the middle partition, and its outer edge is loſt on the ſkin of the animal.

"To expoſe the large organ to view, nothing more is neceſſary than to remove the ſkin which adheres to it by a looſe cellular membrane. But to expoſe the ſmall organ it is neceſſary to remove the long row of ſmall muſcles which move the fin.

"The *ſtructure* of theſe organs is extremely ſimple and regular, conſiſting of two parts; *viz.* flat partitions or ſepta, and croſs diviſions between them. The outer edge of theſe ſepta appear externally in parallel lines nearly in the direction of the longitudinal axis of the body.

"Theſe ſepta are thin membranes, placed nearly parallel to one another. Their lengths are nearly in the direction of the long axis, and their breadth is nearly the ſemidiameter of the body of the animal. They are of different lengths, ſome being as long as the whole organ. I ſhall deſcribe them as beginning principally at the anterior end of the organ, although a few begin along the upper edge, and the whole, paſſing towards the tail, gradually terminate on the lower ſurface of the organ; the lowermoſt at their origin terminating ſooneſt. Their breadths differ in different parts of the organ.

"They are in general broadeſt near the anterior end, anſwering to the thickeſt part of the organ, and become gradually narrower towards the tail; however, they are very narrow at their beginnings or anterior ends. Thoſe neareſt to the muſcles of the back are the broadeſt, owing to their curved or oblique ſituation upon theſe muſcles, and grow gradually narrower towards the lower part, which is in a great meaſure owing to their becoming more tranſverſe, and alſo to the organ becoming thinner at that place.

"They have an outer and an inner edge. The outer is attached to the ſkin of the animal, to the lateral muſcles of the fin, and to the membrane which divides the great organ from the ſmall; and the whole of their inner edges are fixed to the middle partition formerly deſcribed, alſo to the air-bladder, and three or four terminate on that ſurface which incloſe the muſcles of the back. Theſe ſepta are at the greateſt diſtance from one another at their exterior edges near the ſkin, to which they are united; and as they paſs from the ſkin towards their inner attachments they approach one another. Sometimes we find two uniting into one. On that ſide next to the muſcles of the back, they are hollow from edge to edge, anſwering to the ſhape of thoſe muſcles; but become leſs and leſs ſo towards the middle of the organ, and from that, towards the lower part of the organ, they become curved in the other direction. At the anterior part of the large organ, where it is nearly of an equal breadth, they run pretty parallel to one another, and alſo pretty ſtraight; but where the organ becomes narrower, it may be obſerved, in ſome places, that two join or unite into one; eſpecially where a nerve paſſes acroſs. The termination of this organ at the tail is ſo very ſmall, that I could not determine whether it conſiſted of one ſeptum or more.

"The diſtances between theſe ſepta will differ in fiſhes of different ſizes. In a fiſh of two feet four inches in length, I found them $\frac{1}{17}$th of an inch diſtant from one another; and the breadth of the whole organ, at the broadeſt part, about an inch and a quarter, in which ſpace were thirty-four ſepta.

"The ſmall organ has the ſame kind of ſepta, in length paſſing from end to end of the organ, and in breadth paſſing quite acroſs: they run ſomewhat ſerpentine, not exactly in ſtraight lines. Their outer edges terminate on the outer ſurface of the organ, which is in contact with the inner ſurface of the external muſcle of the fin; and their inner edges are in contact with the centre muſcles. They differ very much in breadth from one another; the broadeſt being equal to one ſide of the triangle, and the narroweſt ſcarcely broader than the point or edge. They are pretty nearly at equal diſtances from one another; but much nearer than thoſe of the large organ, being only about $\frac{1}{50}$th part of an inch aſunder: but they are at a greater diſtance from one another towards the tail, in proportion to the increaſe of breadth of the organ.

"The organ is about half an inch in breadth, and has fourteen ſepta. Theſe ſepta, in both organs, are very tender in conſiſtence, being eaſily torn. They appear to anſwer the ſame purpoſe with the columns in the torpedo, making walls or butments for the ſubdiviſions, and are to be conſidered as making ſo many diſtinct organs.

"Theſe ſepta are interſected tranſverſely by very thin plates or membranes, whoſe breadth is the diſtance between any two ſepta, and therefore of different breadths in different parts; broadeſt at that edge which is next to the ſkin; narroweſt at that next to the centre of the body, or to the middle partition which divides the two organs from one another.

"Their lengths are equal to the breadths of the ſepta, between which they are ſituated. There is a regular ſeries of them continued from one end of any two ſepta to the other. They appear to be ſo cloſe as even to touch. In an inch in length there are about 240, which multiplies the ſurface in the whole to a vaſt extent.

"The nerves in this animal may be divided into two kinds; the firſt, appropriated to the general purpoſes of life; the ſecond, for the management of this peculiar function, and very probably for its exiſtence. They ariſe in general from the brain and medulla ſpinalis, as in other fiſh; but thoſe from the medulla are much larger than in fiſh of equal ſize, and larger than is neceſſary for the common operations of life.

"The nerve which ariſes from the brain, and paſſes down the whole length of the animal, (which, I believe, exiſts in all fiſh,) is larger in this than in others of the ſame ſize, and paſſes nearer to the ſpine. In the *common eel* it runs in the muſcles of the back, about midway between the ſkin and ſpine. In the *cod*, it paſſes immediately under the ſkin. From its being larger in this fiſh than in others of the ſame ſize, one might ſuſpect that it was intended for ſupplying the organ in ſome degree; but this ſeems not to be the caſe, as I was not able to trace any nerves going from it to join thoſe from the medulla ſpinalis, which run to the organ.

"This nerve is as ſingular an appearance as any in this claſs of animals; for ſurely it muſt appear extraordinary, that a nerve ſhould ariſe from the brain to be loſt in common parts, while there is a medulla ſpinalis giving nerves to the ſame parts. It muſt ſtill remain one of the inexplicable circumſtances of the nervous ſyſtem.

"The organ is ſupplied with nerves from the *medulla ſpinalis*, from which they come out in pairs between all the vertebræ of the ſpine. In their paſſage from the ſpine, they give nerves to the muſcles of the back, &c. They bend forwards and outwards upon the ſpine, between it and the muſcles, and ſend out ſmall nerves to the external ſurface, which join the ſkin near to the lateral lines. Theſe ramify upon the ſkin, but are principally bent forwards between it and the organ, into which they ſend ſmall branches as they paſs along. They ſeem to be loſt in theſe two parts. The trunks get upon the air-bladder, or rather dip between it and the muſcles of the back, and continuing their courſe forwards upon that bag, they dip in between it and the organ, where they divide into ſmaller branches; then they get upon the middle partition, on which they continue to divide into ſtill ſmaller branches; after which they paſs on, and get upon the ſmall bones and muſcles which are the baſes for the under-fin, and at laſt they are loſt on that fin. After having got between the organ and the above-mentioned parts, they are conſtantly ſending ſmall nerves into the organs: firſt into the great organ, and then into the ſmall one; alſo into the muſcles of the fin, and at laſt into the fin itſelf. Theſe branches, which are ſent into the organ as the trunk paſſes along, are ſo ſmall, that I could not trace their ramifications in the organs.

"In this fiſh, as well as in the *torpedo*, the nerves which ſupply the organ are much larger than thoſe beſtowed on any other part for the purpoſes of ſenſation and action; but it appears to me, that the organ of the *torpedo* is ſupplied with much the larger proportion. If all the nerves which go to it were united together, they would make a vaſtly greater chord than all thoſe which go to the organ of this eel. Perhaps when experiments have been made upon this fiſh, equally accurate with thoſe made upon the *torpedo*, the reaſon for this difference may be aſſigned.

"How far this organ is vaſcular I cannot poſitively determine; but from the quantities of ſmall arteries going to it, I am inclined to believe that it is not deficient in veſſels.

"The arteries ariſe from the large artery which paſſes down the ſpine; they go off in ſmall branches like the intercoſtals in the human ſubject, paſs around the air-bladder, and get upon the partition together with the nerves, and diſtribute their branches in the ſame manner.

"The veins take the ſame courſe backwards, and enter the large vein which runs parallel with the artery." Phil. Tranſ. vol. lxv. p. 395.

Plate XVII. *fig*. 1. of the *Anatomy of Fiſhes*, exhibits the whole of the two organs in the *gymnotus electricus* on each ſide, the ſkin being removed as far as theſe organs extend: *a*, the lower ſurface of the head of the animal; *b*, the cavity of the belly; *c*, the anus; *d*, the fin; *e*, the back of the fiſh where the ſkin has not been removed; *f f*, the fin which runs along the lower edge of the fiſh; *g g g*, the ſkin turned back; *h*, *h*, *h*, the lateral muſcles of the above fin removed and carried back with the ſkin, to expoſe the ſmall organ; *i*, part of the muſcle left in its place; *k k k*, the large organ; *l l l*, the ſmall organ; *m m m m*, the ſubſtance which divides the large organ from the ſmall; *n*, at this place the above ſubſtance is removed.

In *Plate* XVIII. of the *Anatomy of Fiſhes*, *fig*. 1. ſhews a ſection of the whole thickneſs of the *gymnotus electricus*, near the upper part, a little magnified. The ſkin is removed as far back as the poſterior edge of the organ, and the other parts immediately belonging to it, ſuch as the medulla ſpinalis. There are ſeveral pieces or ſections taken out of the organ, which expoſe every thing that has any relation to it. At the upper and lower ends of the figure, *f f*, the organ is entire, the ſkin only being removed; *a a*, the body of the animal near the back, covered by the ſkin; *b b*, the belly-fin covered alſo by the ſkin; *c*, part of the ſkin removed from the organ, and turned back; *d*, *d*, the muſcles which move the fin laterally, and which immediately cover the ſmall organ; *e*, the middle muſcles of the fin, which lay immediately between the two ſmall organs; *f f*, the outer ſurface of the large organ, as it appears when the ſkin is removed; *g*, the ſmall organ, as it appears when the lateral muſcles are removed; *h*, *h*, the cut ends of the muſcles of the back, which have been removed to expoſe the deeper ſeated parts; *h*, the cut ends of the large organ, part of which has alſo been removed to expoſe the deeper ſeated parts; *k*, the cut end of the ſmall organ; *l*, a part of the large organ, the reſt having been removed; *m*, the cut end of the above ſection; *n*, a ſection of the ſmall organ; *o o*, the

the middle partition which divides the two large organs ; *p*, a fatty membrane, which divides the large organ from the ſmall ; *q*, the air-bladder ; *r*, the nerves going to the organ ; *s*, the medulla ſpinalis ; *t*, the ſingular nerve.

Fig. 2. of *Plate* XVIII. of the *Anatomy of Fiſhes*, is a tranſverſe ſection of the *electric eel*, expoſing at one view all the parts of which it is compoſed : *a*, the external ſurface of the ſide of the fiſh ; *b*, the under-fin ; *c, c, c, c*, the cut ends of the muſcles of the back ; *d*, the cavity of the air-bladder ; *e*, the body of the ſpine ; *f*, the medulla ſpinalis ; *g*, the large artery and vein ; *h, h*, the cut ends of the two large organs ; *i, i*, the cut ends of the two ſmall organs ; *k*, the partition between the organs.

The ſtructure of the electric organ is leſs complicated in the *ſilurus electricus* than in the *torpedo* or *gymnotus*. In this fiſh, Geoffroy deſcribes it to be extended all round the body of the animal, immediately below the ſkin : it is formed by a conſiderable collection of cellular tiſſue, ſo thick and compact, that on the firſt view it might be taken for a ſtratum of lard ; but when cloſely inſpected, it is obſerved that this organ is compoſed of real tendinous or aponeurotic fibres interwoven with each other, and which, by their different croſſings, form a reticulation, the meſhes of which are not diſtinctly viſible without the help of a magnifying glaſs. The ſmall cells of this reticulation are filled with an albumino-gelatinous matter, exactly reſembling that met with in the other electric fiſhes. All communication is prevented in the inſide by a very ſtrong aponeuroſis, which extends over the whole electric reticulation, and which adheres to it ſo cloſely that it cannot be ſeparated without tearing it. It is further covered by a thick layer of fat, which alſo contributes to inſulate the organ.

The nerves which are diſtributed to the electric organ of the *ſilurus* differ from thoſe of the *torpedo*, and the *electric eel*.

They proceed from the brain ; and are the ſame which are found in all fiſhes, under the lateral line of the body ; but theſe two nerves of the eighth pair in the *ſilurus electricus* have a direction and volume which are peculiar to that ſpecies : they deſcend, approaching each other, on their iſſuing from the cranium, towards the body of the firſt vertebra, which they traverſe. They firſt introduce themſelves through an orifice, peculiar to each other, and then iſſue on the oppoſite ſide by one aperture : after reaſcending they ſuddenly ſeparate, and proceed under each of the lateral lines. They are then found lodged between the abdominal muſcles, and the aponeuroſis, which extends over the electric reticulation. In the laſt place, they ſend beneath the ſkin large branches, which proceed to the right and left of the principal nerve. Theſe branches are in number twelve to fifteen on each ſide ; they pierce the aponeuroſis, which lines the interior ſurface of the reticular tiſſue, and are loſt in the latter. Bulletin de la ſocieté Philomatique, tom. iii. p. 169 ; and an extract from Annales du Muſeum N° 5, in Phil. Mag. vol. xv. p. 126.

In *Plate* XVII. of the *Anatomy of Fiſhes*, *fig.* 2. repreſents the *ſilurus electricus*, with the organ expoſed, by a large portion of the integuments being raiſed ; *a*, the aponeuroſis, which extends under the whole of the electric organ ; *b*, the thickneſs of the reticulation ; *c c*, the nerve of the eighth pair going to the electric apparatus ; *d, d*, abdominal muſcles.

The *ſubſtance* which is found to fill the columns of the *torpedo*, the interſtices of the *gymnotus*, and the muſcles of the *ſilurus*, is a peculiar combination of albumen and gelatine ; it is of the ſame nature with the contents of what Monroe has improperly called the *mucous* ducts in fiſhes, and that tranſparent ſubſtance which envelopes the ſpawn of frogs ; it does not diſſolve, but becomes more ſolid when immerſed in water, in conſequence of the coagulation of its albuminous part ; we have ſubmitted it to the action of tannin, with which it combines, and forms an inſoluble compound like gelatine.

The *phenomena* exhibited by electric fiſhes are of ſo extraordinary a nature that they have engaged the attention of every phyſiologiſt who has had the opportunity of obſerving them ; but although every occaſion has been embraced to make experiments upon the ſubject, much inveſtigation is ſtill required to arrive at the explanation of the electric faculty, and even to determine diſputed points of fact. The very rare occurrence of procuring any of theſe animals alive in this country prevents us from adding any thing to the ſtock of knowledge already obtained upon the ſubject, we can therefore only quote the obſervations and experiments of other phyſiologiſts.

The preceding deſcription of the electrical apparatus in three ſpecies would ſeem to prove, that a ſimilar ſyſtem of organization belongs to all fiſhes which enjoy the electric property. The effects of this ſtructure are alſo ſimilar, and differ chiefly with reſpect to the degree. All the electric fiſhes are capable of exciting in other animals a ſenſation reſembling that produced from the ſhock of an electrical jar. The *gymnotus* is endowed with the greateſt power of this kind ; the *torpedo* next, and the *ſilurus* the leaſt of the three.

The *gymnotus* is ſaid, by Garden, to grow ſometimes, in Surinam, 20 feet long, and to be able to give ſhocks which prove inſtantaneouſly fatal to any perſon receiving them.

Mr. Humbolt ſtates, that a *torpedo*, about 14 inches long, communicated ſhocks which reached above the elbow, and were difficult to bear even by a perſon accuſtomed to receive ſhocks from an electrical machine ; whilſt, on the other hand, Walſh found, in about 200 ſhocks, that only one was ſtrong enough to paſs beyond the elbow. Much of the force of the ſhock depends upon the natural ſtrength of the animal and its vigour at the moment of the experiment ; it is ſaid to have very little electric power in winter ; it is always much diminiſhed in conſequence of the fiſh remaining for any time out of the water. The ſhocks, however, do not appear to be leſſened in ſtrength by repetition, unleſs the animal be otherwiſe exhauſted. Thus Ingenhouz obſerved, " that when the ſhocks of the *torpedo* followed each other very faſt, they were ſtronger at laſt than in the beginning."

Electric fiſhes are capable of repeating the ſhocks very frequently in a ſhort ſpace of time. Mr. Walſh reckoned fifty in a minute and a half given by the *torpedo* ; and upon another occaſion he calculated, that 100 were delivered in about five minutes.

When the *torpedo* adminiſters a ſhock it is always obſerved to depreſs the eyes and drop the triangular curtain which covers the pupil, and generally to make ſome movement of the lateral fins. The other electric fiſhes do not accompany theſe ſhocks by any viſible muſcular effort.

The *torpedo* alſo differs from the others in ſometimes benumbing the part which touches it. Mr. Walſh accounts for the production of numbneſs by ſuppoſing the ſhocks to be very minute, and ſo cloſely following each other as not to be diſtinguiſhable, which may be effected by a ſucceſſive diſcharge of the numerous columns of the organ, in the manner of a running fire of muſketry. In this continued effort, as well as the inſtantaneous ſhock, the eyes of the *torpedo*, uſually prominent, are withdrawn into their ſockets : it is from the benumbing property of the *torpedo* that it derives its name.

The faculty in theſe fiſhes of exciting by the touch, the ſenſation of a ſhock, or of numbneſs, in other animals, has been naturally and generally referred to the principle of electricity; even the Arabs, (according to Geoffroy) who always diſtinguiſhed every animal by a generic and ſpecific name, conſidering only the extraordinary property of the *torpedo* and *ſilurus electricus*, and comparing it with phyſical electricity, called both fiſhes by the ſame name, *râad* or *raach*, which is alſo employed in the Arabian language to ſignify thunder.

Moſt phyſiologiſts have conſidered the electric organs of fiſhes as reſembling exactly the Leyden jar, or rather a battery of them; they have compared the nerves and albumino-gelatinous ſubſtance to the metals, and the aponeuroſes to the glaſs; thus ſuppoſing the electric organ to conſiſt of conducting and non-conducting ſubſtances, and that when the equilibrium is reſtored between them, the ſhock is produced.

Unqueſtionably there are many circumſtances in which the common electric ſhock, and that obtained from fiſhes agree, but there are other points in which they materially differ.

The ſenſations occaſioned by artificial and animal electricity are ſimilar.

The ſhock from an electric fiſh is only communicable through what are called conducting ſubſtances, and is alſo intercepted by the non-conductors; thus it may be received through the medium of wire of different metals, wood, water, and the animal ſubſtance; while a perſon touching it with glaſs, ſealing-wax, &c. receives no ſhock, notwithſtanding the fiſh gives evidence of the diſcharge by the motion of the eyes, &c.

The ſhock will be tranſmitted to a number of perſons taking hands; thoſe at the extremities completing the ring by touching the fiſh. In this manner Walſh has communicated a ſhock to four or five people at the ſame moment, who experienced exactly the ſenſation of a ſhock from an electric jar, except that it was weaker. Dr. Williamſon gave ſhocks to ten or twelve perſons at once by an *electric eel*.

The effect of the electric fiſhes differs from common electricity in ſeveral circumſtances. However ſtrong the ſhock may be, it never has been ſeen to produce the leaſt noiſe or luminous appearance. Moſt experimentaliſts alſo agree, that the ſhock will not paſs through the ſmalleſt portion of air; the conducting ſubſtances muſt be in actual contact with each other.

Williamſon ſcrewed two pieces of wire in oppoſite directions into a board, leaving an interval between their points of the $\frac{1}{30}$th part of an inch, his aſſiſtant and himſelf held the oppoſite ends of the wire, and eſtabliſhed a communication with the *eel* by means of their other hands, but no ſhock paſſed. On repeating the experiment and ſcrewing the wires ſo as to bring their points within the diſtance of the thickneſs of double poſt paper of each other, the ſhock was felt by both perſons, but ſtill no ſpark was diſcernible, which we conceive renders the accuracy of the experiment doubtful.

Dr. Bancroft indeed aſſerts, that in Guiana the *electric eel* ſhocked his hand at the diſtance of ſome inches from the water; a reſult, however, ſo very different from the obſervation of all other experimentaliſts appears more than queſtionable.

The electricity of fiſhes has not the effect of attracting floating ſubſtances. When a perſon is inſulated, and touches the fiſh, he receives a ſhock as at other times, but gives no appearance of exceſs of electricity, however long he may keep up his communication with the animal. A Leyden phial alſo, being put into contact with an electric fiſh, never becomes charged.

The electric organ differs from the Leyden phial, as Volta has very properly obſerved, by being entirely compoſed of conducting ſubſtances. The aponeuroſes and membranes which form its various ſurfaces are not of an inſulating nature, like glaſs, roſin, ſilk, &c. They cannot be expoſed to friction, nor diſpoſed and charged in the manner of the ſmall plates of Franklin, or electrophores. Volta, therefore, concludes that the electric organs do not act upon the principle of a Leyden jar, or an electrophore or condenſer, but that they entirely reſemble the Galvanic pile, in which conducting ſubſtances become exciters of electricity, by being placed in a particular relation with reſpect to each other.

It would appear that the electric phenomena of fiſhes are produced in a manner differently from every ſpecies of phyſical electricity. The former are not accompanied with any chemical changes, they do not affect our organs of ſenſe, by any diſplay of light, extrication of odour, or exploſive ſound. Their mode of operation is not regular and uniform, or governed by external influence, but depends upon the life, and even upon the volition of the animal; for all experimentaliſts agree in ſtating that the electric fiſhes regulate the ſtrength and frequency of the ſhocks at pleaſure. There is no appearance of accumulation or of diminution of the electric power, except what ariſes from the will of the animal; the laſt ſhocks which one of theſe fiſhes adminiſters being often more ſtrong and frequent than the firſt.

The nerves ſeem to be the principal agents in the exerciſe of the electric faculty, as they are always found larger in the organs than would be required in parts of the ſame magnitude, for any ſpecies of ſenſation or voluntary motion.

The great error of phyſiologiſts has always been to account for the operations of organized beings, upon the principles which regulate the phenomena of inanimate matter. We are led to make this obſervation from comparing the electric faculty of fiſhes, with the property of exhibiting light in ſome animals, and the power of generating heat, which is found in all living bodies; theſe three functions, although producing different reſults, appear to be very ſimilar in their nature, and are equally inexplicable by the laws of phyſical and chemical attractions; the ſtrongeſt proof of which may be found in the want of ſucceſs, which has followed all the attempts that have hitherto been made to explain them upon theſe principles.

Of what uſe is the electric property to thoſe fiſhes which poſſeſs it? Drs. Williamſon and Garden ſtate, that it is employed to kill, or at leaſt ſtupefy other fiſhes, upon which they prey.

The former relates, amongſt his experiments on the *electric eel*, that ſome ſmall fiſhes being thrown into the ſame water where it was ſwimming, it immediately killed and ſwallowed them; but a larger fiſh being thrown in, it was alſo killed, although it was too large for the *eel* to ſwallow; another fiſh was thrown into the water at ſome diſtance from the eel, it ſwam up to the fiſh, but preſently turned away, without offering it any violence. After ſome time it returned, when, ſeeming to view it for a few ſeconds, it gave the fiſh a ſhock, upon which it inſtantly turned up its belly and continued motionleſs; at the ſame inſtant Dr. Williamſon received a ſhock in his hand, which had been previouſly introduced into the water. A third fiſh was thrown into the water, to which the eel gave ſuch a ſhock that it turned on its ſide, but continued to give ſigns of life; the eel ſeeming to obſerve this as it was turning away, immediately returned and ſtruck it quite motionleſs. The *eel* never attempted to ſwallow any of theſe fiſh after the firſt, although he killed many of them. When any of the larger fiſhes that had been ſhocked, although apparently dead, were removed into water in another veſſel, they preſently recovered. Phil. Tranſ. vol. 65. p. 97.

Dr. Garden gives preciſely the ſame account of the electric eel killing or benumbing its prey, and ſtates that it kills, by repeated ſhocks, fiſh which are larger than it can ſwallow.

It ſeems, therefore, that the electric property is not an uſeleſs one to thoſe fiſhes which poſſeſs it: beſides being the means of ſecuring their prey, it muſt alſo form an excellent defence for them againſt the larger fiſhes, who might otherwiſe devour them. For a more detailed account of the torpedo, and gymnotus electricus, we refer the reader to Franc. Redi Exper. Nat. 1666. Obſervazioni interno alle Torpedini, de Steof. Lorenzini, 1678.—Kœmpf. Amœn. Exot. 1712.—A letter from Jno. Walſh, eſq. to Dr. Franklin, on the electric property of the *torpedo*, in Phil. Tranſ. vol. 63. p. 461.—Experiments and obſervations on the *gymnotus electricus*, or *electric eel*, by Dr. Hugh Williamſon, Phil. Tranſ. vol. 65, p. 94.—Account of the *gymnotus electricus*, by Dr. Alex. Garden, Phil. Tranſ. vol 65. p. 102.—Experiments made at Leghorn on the *torpedo*, by Dr. John Ingenhouz, Phil. Tranſ. vol. 65. p. 1.—Bancroft's Natural Hiſtory of Guiana.—Hiſtoire Naturelle des Poiſſons, par Lacepede, tom 2.—A Letter from Profeſſor Volta to ſir Joſeph Banks, on the electricity excited by the appoſition of different conducting ſubſtances, in Phil. Tranſ. for 1800, part. 2.—Memoir on the Comparative Anatomy of the electric organs of the *torpedo*, the *gymnotus electricus*, and the *ſilurus electricus* by E. Geoffroy, in vol. 5 of the Annales de Muſeum National.—Experiments on the *torpedo*, by Meſſrs. Humbolde and Guy Luſſac. in Annales de Chemie, No. 166.

Fish, *Migration of*, denotes their departure from ſome parts of the ocean and their removal to other parts; and alſo to rivers at certain ſeaſons of the year, for the purpoſe of depoſiting their ſpawn, or of obtaining the means of ſubſiſtence.

The migration of certain kinds of fiſh in ſhoals and infinite multitudes, to certain coaſts at certain times of the year, is a thing of great advantage to mankind, as it gives opportunities of taking them with great eaſe, and in vaſt quantities; but the reaſon of theſe periodical returns of the ſeveral kinds does not ſeem much underſtood, though a little obſervation would probably clear it up. There is a ſmall inſect common in many ſeas, but peculiarly plentiful on the coaſts of Normandy in the months of June, July and Auguſt. This is well deſcribed by Rondeletius, under the name of the ſea-caterpillar: and at this time of the year it is ſo frequent in the place before mentioned, that the whole ſurface of the water is covered with it as with a ſcum. This is the ſeaſon of the year when the herrings come alſo in ſuch prodigious ſhoals to thoſe coaſts. The fiſhermen complain much of theſe naſty vermin, which diſturb their fiſheries; but they do not conſider that it is to theſe alone that their fiſheries are owing; for it is evident that the herrings feed on theſe creatures greedily, by the vaſt quantity found in all their ſtomachs: and it is highly probable, nay ſcarcely to be doubted, that the reaſon of thoſe fiſh coming up in ſuch numbers is to feed on them; probably, if obſervation was made, the ſame would be found to be the caſe in all the other places where the herrings come in the ſame ſort of plenty. The mackarel come down in the ſame numbers regularly at certain times of the year, and for the ſame ſort of reaſon. This fiſh is an herb-eater, and is particularly fond of that ſea-plant called by naturaliſts the narrow-leaved purple palmated ſea-wrack; this grows in great abundance on the coaſts of England, and many other places, and is in its greateſt perfection in the beginning of the ſummer, though ſome times later than others, according to the ſeverity or mildneſs of the winter. The whole occaſion of theſe fiſh coming in ſuch quantities is to feed on this plant; and thoſe who would attend to its growing up, would know when to expect the mackarel better than thoſe who liſten for thunder for the ſignal of them. The tunnies come at certain ſeaſons to the coaſts of Provence and Languedoc, in the ſame ſhoals that herrings and mackarel do to other places. This ſeems to be on another occaſion; the fiſh called by the French the emperor, and by the ſame confounded with the ſword-fiſh, is the great enemy of theſe fiſh, and in ſummer is ſo plentiful in thoſe ſeas, that they find no way of ſaving themſelves, but by flying to the ſhallow waters, where the other cannot eaſily follow them; hence they frequent the ſhores. The pilchards caught upon the coaſts of Brittany, and making a conſiderable article of commerce for that province, are yet a ſtronger proof of the natural means that bring fiſh in ſhoals to certain places, than any other. Theſe fiſh evidently come for food, and that not natural to the place, but prepared for them by the inhabitants.

The people of Brittany purchaſe from Norway the offal and entrails of all the large fiſh caught in the northern ſeas; this is of late years become a regular and conſiderable article of trade; they cut theſe to pieces, and ſtrew them in vaſt quantities over the whole ſurface of the ſea along their coaſts, at times when the winds do not ſit ſo as to blow it off. This always brings together the pilchards in as vaſt ſhoal as the herring and mackarel come in other places; and the fiſhermen catch them in ſuch quantities, as to be able to ſupply all the maritime places in the neighbourhood, with them, at a ſmall price. The ſalmon, a fiſh bred in rivers, yet going at certain times to the ſea, is another of thoſe fiſh which come up at times in vaſt ſhoals. See Salmon. We may here add that the deſire of food urges fiſh of one ſpecies to follow thoſe of another, upon which they prey, through immenſe tracts of ocean, even from the vicinity of the pole down to the equator. Thus the cod from the banks of Newfoundland purſues the whiting, which is driven before it even to the ſouthern ſhores of Spain; and the cachalot, a ſpecies of whale, is ſaid, in the ſame manner, to purſue a ſhoal of herrings, and to ſwallow great numbers at a mouthful.

In the Philoſophical Tranſactions, N° 463. ſect. 1. we have a method of preparing ſpecimens of fiſh, by drying their ſkins, as practiſed by Dr. Gronovius.

Fish, *Black.* See Perca *nigra* and Silurus *Anguillaris.*

Fish, *Petrified*, in *Natural Hiſtory.* The remains of ſcabrous or finny fiſh in the ſtrata, are not very commonly found, compared with the vaſt numbers and variety of ſhell-fiſh whoſe remains are found; but ſome very perfect ſpecimens do occur in different ſtrata. Dr. Townſon (Philoſ. of Mineral. p. 106.) ſeems to conſider fiſhes as peculiar to ſome particular kinds of ſtrata; in which, however, he is evidently miſtaken, though often they are found in ſlaty limeſtone, in the quarries of La Bolca and Pappenheim; ſee W. Martin's Outlines, &c. p. 29, and 79. Mr. Kirwan (Geol. Eſſ. pages 234, 235, 239, 245, and 253.) mentions fiſh as having been found in different parts of the world in gypſum, in marlite, in argillite, in ſwine-ſtone, and in argillaceous ſand-ſtone. On the mountains of Caſtravan, great diverſity of fiſhes are found, in a white laminated ſtone. And in the blue nias, or water limeſtone ſtrata of England, beautiful ſpecimens of flattened fiſh are ſaid to be found, at Barrow on Soar, in Leiceſterſhire, (the other Barrow near

Bredon

Bredon in the ſame county has quarries of the yellow or magneſia limeſtone, a circumſtance not always adverted to, in ſpeaking of barrow lime,) and in other places on its range. Mr. Graydon (Iriſh Tranſactions, vol. v. p. 310.) ſuppoſes the monte bolca fiſh to have been ſuddenly interred by being inveloped in a diffuſion of lime, ariſing from immenſe maſſes of calcareous ſtone, ejected in a calcined ſtate, by ſubaqueous volcanoes. To us it ſeems more probable that theſe ſquamal fiſh were deſtroyed by the original creation of the matter which now entombs them, whoſe diffuſion in the water wherein they lived, occaſioned their fall to the bottom and extenſion on their flat ſide when dying, in the poſition in which they now appear on the lamina of the lower ſtone, before the upper one, which entombs them, was produced by the precipitation of the ſtony matter from the fluid that had occaſioned their death; and on ſimilar principles, we think it eaſy to account for all the foſſil reliquia, or relics of the primary creation of organized beings, ſee Reliquia; under which title, we propoſe to give the heads of Mr. W. Martin's excellent mode of arranging extraneous foſſils, from his work above quoted.

Fish, with regard to commerce, is diſtinguiſhed into *dry*, *pickled*, *green*, and *red*. *Dry* or *ſalt* fiſh, is that which is ſalted, and dried either by the heat of the ſun, or by fire. Such principally are the cod, ſtock-fiſh, herring and pilchard. See Fishery. *Green* fiſh, is that lately ſalted, and which yet remains moiſt: as green cod, &c. *Pickled* fiſh, is that boiled and ſteeped in a pickle made of ſalt, vinegar, &c. as ſalmon, cod, herring, mackarel, pilchard, anchovy, and oyſters. *Red* fiſh, is ſome freſh fiſh broiled on the gridiron, then fried in oil of olives, and barrelled up with a proper liquor, as new olive oil, vinegar, ſalt, pepper, cloves, and laurel leaves, or other herbs. The beſt fiſh thus prepared are ſturgeon and tunny.

Fish, conſidered as a food, makes a conſiderable article in the furniture of the table; and the breeding, feeding, catching, &c. of them, conſtitute a peculiar art of no ſmall moment in the economy of a gentleman's houſe and garden. To this relate the ponds, ſtews, &c. deſcribed in their proper places. See Fish-*pond*, Stew, &c.

Fish, *Blowing of*, is a practice ſimilar to that of blowing fleſh, poultry, and pigs, and adopted for the ſame deceitful purpoſes. The method of blowing fiſh, eſpecially cod and whitings, is by placing the end of a quill or tobacco-pipe at the vent, and pricking a hole with a pin under the fin which is next the gill; thereby making the fiſh appear to the eye large and full, which, when dreſſed, will be flabby, and little elſe than ſkin and bones. But this impoſition may be diſcovered by placing the finger and thumb on each ſide of the vent, and ſqueezing it hard; the wind may be perceived to go out, the ſkin will fall in, and the fiſh appear lank and of little value.

Fish, *Breeding of*. See Fish-pond.

Fish, *Caſtration of*, is a method firſt practiſed by Mr. Tull, in order to prevent the exceſſive increaſe of fiſh in ſome of his ponds, where the numbers did not permit any of them to grow to an advantageous ſize. But he afterwards found, that the caſtrated fiſh grew much larger than their uſual ſize, were more fat, and always in ſeaſon. This operation may be performed both on male and female fiſh; and the moſt eligible time for it is when the ovaries of the female have their ova in them, and when the veſſels of the male, analogous to theſe, have their ſeminal matter in them; becauſe at this time, theſe veſſels are more eaſily diſtinguiſhed from the ureters, which convey the urine from the kidneys into the bladder, and are ſituated near the ſeminal veſſels on each ſide of the ſpine; which, without ſufficient attention, may be miſtaken for the ovaries, eſpecially when theſe laſt are empty. The time leaſt proper for this operation, is juſt after they have ſpawned, becauſe the fiſh are then too weak and languid to bear with ſucceſs, ſo ſevere an operation; however, with ſkill and care, it may be performed almoſt at any time. When a fiſh is to be caſtrated, it muſt be held in a wet cloth, with its belly upwards; then with a ſharp pen-knife, having its point bent backwards, the operator cuts through the integuments of the rim of the belly, taking care not to wound any of the inteſtines. As ſoon as a ſmall aperture is made, he carefully inſerts a hooked pen-knife, and with this dilates this aperture from between the two fore-fins, almoſt to the anus. He then, with two ſmall blunt ſilver hooks, five or ſix inches long, and of this form ſ, by the help of an aſſiſtant, holds open the belly of the fiſh; and with a ſpoon or ſpatula, removes carefully the inteſtines from one ſide. When theſe are removed, you ſee the ureter, a ſmall veſſel, nearly in the direction of the ſpine, and alſo the ovary, a larger veſſel, lying before it, nearer the integuments of the belly. This laſt veſſel is taken up with a hook of the ſame kind with thoſe before mentioned, and, after detaching it from the ſide far enough for the purpoſe, divided tranſverſely with a pair of ſharp ſciſſars, care being taken that the inteſtines are not wounded or injured. After one of the ovaries has deen divided, the operator proceeds to divide the other in the ſame manner: and then the divided integuments of the belly are ſewed with ſilk, the ſtitches being inſerted at a ſmall diſtance from one another. Mr. Tull obſerves farther, that the ſpawning time is very various; that trouts are full about Chriſtmas; perch in February; pikes in March, and carp and tench in May; and that allowance muſt be made for climates and ſituation, with regard to the ſpawning of fiſh. When the fiſh are caſtrated, they are put into the water where they are intended to continue; and they take their chance in common with other fiſh, as though they were not caſtrated. With tolerable care, few die of the operation. Phil. Tranſ. vol. xlviii. part ii. art. 106.

Fish, *Eyes of*. See Eyes and *Anatomy* of Fish.

Fish, *Fecundity of*, has been taken notice of by various writers, who have furniſhed inſtances of it in ſome particular ſpecies that have been thought ſurpriſing. M. Petit is ſaid to have found in the carp 342,144 eggs; and Lewenhoeck, in a cod of middling ſize 9,384,000. But Mr. Harmer has lately purſued the inveſtigation of this curious ſubject with peculiar attention and accuracy, and extended his enquiries to a greater variety of ſpecies than any other perſon. The method which he adopted was that of weighing the whole ſpawn very exactly; he then took a piece weighing a certain number of grains, and carefully counted the eggs contained in it; and by dividing the number of eggs by the number of grains, he found, nearly, how many eggs there were in each grain. His computation of the number of eggs extended no farther than to thoſe which he could diſtinguiſh with his naked eye; though by this limitation, he omitted many eggs, diſcoverable by a microſcope, that might juſtly have been counted. The weights he uſed were avoirdupoiſe, and he reckoned 437½ grains to an ounce.

The following table exhibits the general reſult of his enquiries: the firſt column contains the names of the fiſh which he examined; the ſecond, their weight; the third, the weight of their ſpawn; and the fourth their fecundity; and the fifth the time of the year when each ſpecies of fiſh was examined. He has alſo added other columns, exhibiting the portion of ſpawn weighed, and the number of eggs found in a grain, and the reſult of examining ſeveral varieties

ties of the ſame ſpecies of fiſh of different weights, which the curious reader may conſult. See Phil. Tranſ. vol. lvii. for 1767. art. 30. p. 280.

Abſtract of the Table.

Fiſh.	Weight. oz.	dr.	Weight of ſpawn. Grains.	Fecundity. Eggs.	Time.
Carp	25	8	2571	203109	April 4.
Cod-fiſh	——	——	12540	3686760	Dec. 23.
Flounder	24	4	2200	1357400	Mar. 14.
Herring	5	10	480	36960	Oct. 25.
Lobſter	36	0	1671	21699	Aug. 11.
Mackarel	18	0	1223½	546681	June 18.
Perch	8	9	765½	28323	April 5.
Pike	56	4	5100½	49304	April 25.
Prawn	(127 grains)		——	3806	May 12.
Roach	10	6½	361	81586	May 2.
Shrimp	(39 grains)		7	6807	May 3.
Smelt	2	0	149½	38278	Feb. 21.
Soal	14	8	542½	100362	June 13.
Tench	40	0	——	383252*	May 28.

* N. B. Part of the ſpawn of this fiſh was accidentally loſt, and therefore this number is conſiderably too ſmall. Such an amazing increaſe, if allowed to attain maturity, would overſtock nature; and even the ocean itſelf would not be able to contain, much leſs to provide for its inhabitants. But this ſurpriſing fecundity is wiſely directed to two important purpoſes; it preſerves the ſpecies among innumerable enemies, and it ſerves to furniſh the reſt with ſuſtenance adapted to their nature.

Fish, *Feeding of.* 1. In a ſtew, thirty or forty carps may be kept from October to March, without feeding; and by fiſhing with trammels, or flews, in March or April, you may take from your great waters, to recruit the ſtews; but you muſt not fail to feed all ſummer, from March to October again, as conſtantly as cooped chickens are fed; and it will turn to as good an account.

2. The conſtancy and regularity of ſerving the fiſh conduce very much to their well-eating, and thriving.

The care of doing this is beſt committed to the gardener, who is always at hand, and on the ſpot.

3. Any ſort of grain boiled is good to feed with, eſpecially peas and malt coarſe ground; the grains after brewing, while freſh and ſweet, are alſo very proper; but one buſhel of malt, not brewed, will go as far as two of grains; chippings of bread, and orts of a table, ſteeped in tap-droppings of ſtrong beer, or ale, are excellent food for carps. Of theſe the quantity of two quarts to thirty carps, every day, is ſufficient; and to be ſo fed morning and evening, is better than once a day.

There is a ſort of food for fiſh that may be called accidental, and is no leſs improving than the beſt that can be provided; and this is when the pools happen to receive the waſh of commons, where many ſheep have paſture; the water is thus enriched by the ſoil, and will feed a much greater number of carps than otherwiſe it would do; and farther, the dung that falls from cattle ſtanding in water in hot weather, is alſo a very great nouriſhment to fiſh. See farther on the method of feeding carp, and the advantages reſulting from it, under the article Fish-ponds.

The beſt food to raiſe pikes to an extraordinary fatneſs is eels; and without them it is not to be done, but in a long time. Setting theſe aſide, ſmall perches are the beſt meat. Breams put into a pike-pond breed exceedingly; and are fit to maintain pikes; which will take care they do not increaſe over much; the numerous fry of roaches and rudds, which come from the greater pools into the pike quarters, will likewiſe be good diet for them.

Pike in all ſtreams, and carp in hungry ſpring waters, being fed at certain times, will come up and take their meat almoſt from your hand.

The beſt feeding place is towards the mouth of the pond, at the depth of about half a yard; for by that means the deep will be kept clean and neat, the meat thrown into the water, without other trouble, will be picked up by the fiſh, and nothing will be loſt; yet there are ſeveral devices for giving them food, eſpecially peas; as a ſquare board like a trencher, ſupported by four ſtrings, one at each corner, with leads at the bottom for ſinking it, on which the food may be let down into the water.

When fiſh are fed in the larger pools or ponds, where their numbers are great, malt boiled, or freſh grains, is the beſt food. Thus carps may be fed and raiſed like capons, and tench will feed as well; but perch are not for a ſtew in feeding-time.

Fish, *Generation of.* The general opinion of the world as to the generation of fiſh, is, that the female depoſits her ſpawn or eggs, and that the male after this ejects the ſperm or male ſemen upon it in the water, by which it is fecundated. The ſuppoſed want of the organs of generation in fiſh, has given an apparent probability to this; but Linnæus is very decided againſt it. He affirms that there can be no poſſibility of the impregnation of the eggs of any animal out of its body.

To confirm this, the general courſe of nature, not only in birds, quadrupeds, and inſects, but even the vegetable world, has been called in to his aſſiſtance, as proving that all impregnation is performed whilſt the ova are in the body of the parent, and he ſupplies the want of the organs of generation by a very ſtrange proceſs, affirming that the males eject their ſemen always ſome days before the females depoſit their ova or ſpawn, and that the females ſwallow this, and have their eggs by that means impregnated by it. He ſays, that he has often ſeen three or four females at this time frequently gathered about the male, and greedily ſnatching up into their mouth the ſemen he ejects: he mentions ſome of the eſoces, ſome perch, and ſome of the cyprini, in which he had ſeen this proceſs. Mr. Tull aſſerts, that he has frequently ſeen fiſh in actual copulation, and that this is generally done before the ova arrive at maturity. Phil. Tranſ. vol. xlviii. part ii. art. 106. p. 873. See *Anatomy of* Fish.

Fiſhes have different ſeaſons for depoſiting their ſpawn; ſome, that live in the depths of the ocean, are ſaid to chooſe the winter months; but, in general, thoſe with which we are acquainted chooſe the hotteſt months in ſummer, and prefer ſuch water as is ſomewhat warmed by the beams of the ſun. They then leave the deepeſt parts of the ocean, which are the coldeſt, and ſhoal round the coaſts, or ſwim up the freſh water rivers, which are warm, as they are comparatively ſhallow. When they have depoſited their burdens they return to their old ſtations, and leave their progeny to ſhift for themſelves. The ſpawn continues in its egg-ſtate in ſome fiſh longer than in others, and this in proportion to the animal's ſize. *Æ. g.* In the ſalmon, the young animal continues in the egg from the beginning of December till the beginning of April; the carp continues in the egg not above three weeks; the little cree fiſh from China is produced in leſs time. All theſe, when excluded, at firſt eſcape by their minuteneſs and agility. They riſe, ſink, and turn much more readily than grown fiſh, and they can eſcape into ſhallow waters when purſued. But with all theſe advantages, ſcarcely one in a thouſand ſurvives the imminent perils of its youth.

Fish, *Generical names of.* See Generical *Name.*

Fish, *Gilding of.* See Gilding.

Fish, *Hearing of.* See *Anatomy of* Fish.

Fish, *Iſinglaſs.* See Huso.

Fish, *Iſland.* See Island-*fiſh.*

Fish, *Milt of.* See Milt.

Fish, *Needle.* See Needle-*fiſh*

Fish, *Noſtrils of.* See *Anatomy of* Fish.

Fish, *Royal,* See Royal Fishes.

Fish, *Shell.* See Shell and Conchology.

Fish, *Stealing of,* by perſons armed and diſguiſed, is felony without benefit of clergy by 9 Geo. I. cap. 22. See Black *act.* And by 5 Geo. III. cap. 14. the penalty of tranſportation for ſeven years is inflicted on perſons ſtealing or taking fiſh in any water, within a park, paddock, orchard, or yard; and on the receivers, aiders, and abettors; and a forfeiture of five pounds to the owner of the fiſhery is made payable by perſons taking or deſtroying (or attempting ſo to do) any fiſh in any river or other water within any incloſed ground, being private property.

Fish, *Swimming of.* See Swimming *of fiſh,* Air-*bladder,* and *Anatomy of* Fish.

Fish, *Teeth of.* See *Anatomy of* Fish.

Fish, in *Aſtronomy.* See Pisces.

Fish-*days.* See Abstinence.

Fish, in *Heraldry.* See Heraldry.

Fish *Bay,* in *Geography,* a bay on the S. coaſt of Africa. S. lat. 34° 30′. E. long. 22° 30′.—Alſo, a bay on the W. coaſt of Africa. S. lat. 16° 40′.—Alſo, a bay on the N.E. coaſt of the iſland of St. Matthew, in the Mergui Archipelago.

Fish, *Little,* a bay on the W. coaſt of Africa. S. lat 15° 20′.

Fish *Creek,* a river of Virginia, which runs into the Ohio. N. lat. 39° 31′. W. long. 81° 5′.—Alſo, a river of Maryland, which runs into the Cheſapeak. N. lat. 38° 38′. W. long. 76° 40′.

Fish *River,* a river of Weſt Florida, which runs into Mobile bay. N. lat. 30° 30′. W. long. 87° 50′.

Fish *River, Great, Rio l'Infanta* of the Portugueſe, a river of Africa, which riſes in the country of the Hottentots, beyond the Snowy mountains, and, in its long courſe, collects a multitude of ſtreamlets, moſt of which are conſtantly ſupplied with water. On each ſide of its mouth is a rocky and open ſhore, but the projecting cheeks form a ſmall cove or creek, which was frequented by the Portugueſe ſhortly after their diſcovery of the Cape; though from the boiſterous appearance of the ſea upon the bar that evidently croſſes the entrance of the river, it is difficult to conceive how they could truſt their ſhips in ſuch an expoſed ſituation; unleſs, indeed, they were ſo ſmall as to be able, at high water, to croſs the bar, in which caſe they might lie, at all ſeaſons, in perfect ſecurity. Great fiſh river is now conſidered as the eaſtern boundary of the Cape colony.

FISHBORN Creek, a river on the N. ſide of the Iſle of Wight, which runs into the ſea. N. lat. 50° 44′. W. long. 1° 4′

FISHER, John, in *Biography,* a worthy Engliſh Catholic prelate, was born at Beverly in Yorkſhire in the year 1459. His father dying when he was very young, he was placed under the inſtructions of a prieſt of the collegiate church in his native town. In the year 1474 he was entered a ſtudent at Michael houſe, Cambridge, a college that is now incorporated into Trinity-college. He took his degrees in the year 1488 and 1491. In 1495 he was appointed one of the proctors of the univerſity, and in a few months afterwards he was choſen maſter of Michael houſe, and entered into holy orders. He ſoon became diſtinguiſhed on account of his great learning; and attained the high office of vice-chancellor of the univerſity. Scarcely had he performed the duties of chancellor two years, when he was ſelected as chaplain and confeſſor to Margaret counteſs of Richmond, the king's mother. He ſo entirely gained the confidence of this lady that ſhe committed herſelf and family to his government and direction. By his advice ſhe eſtabliſhed a divinity profeſſorſhip at Oxford and one at Cambridge; and founded Chriſt's and St. John's colleges in the latter univerſity. In 1501 he was admitted doctor in divinity, and in the following year the lady Margaret's firſt divinity profeſſor in Cambridge. In 1504 he was raiſed to the biſhopric of Rocheſter, and was afterwards frequently offered more valuable ſees, which he refuſed, obſerving, that "though others have larger revenues, I have fewer ſouls under my care, ſo that when I ſhall have to give an account of both, which muſt be very ſoon, I would not deſire my condition to have been better than it is." Fiſher was now choſen chancellor of the univerſity of Cambridge, and was much engaged in ſuperintending the building of Chriſt's and St. John's college, being the moſt active agent and executor of the late counteſs of Richmond. When St. John's college was finiſhed Fiſher went to Cambridge, and opened it with due ſolemnity, and was commiſſioned to draw up a body of ſtatutes for its government. The biſhop afterwards proved a valuable benefactor to the college, and was the means of the appointment of that illuſtrious man, Eraſmus, to lady Margaret's profeſſorſhip of divinity, and afterwards to the Greek profeſſor's chair. To the innovations propoſed by Luther, biſhop Fiſher was decidedly hoſtile: he not only endeavoured to prevent the propagation of Lutheraniſm in his own dioceſe, and in the univerſity of Cambridge, but wrote and preached with the utmoſt zeal againſt it. He is generally thought to have had a principal ſhare in the compoſition of the work aſcribed to Henry VIII. and publiſhed with his name, in defence of the "ſeven ſacraments," againſt Luther, though Burnet and others are not diſpoſed to give it to the biſhop. Fiſher at this period was very high in favour with the king, and ſo zealous in his oppoſition to the tenets of Luther, that he formed a deſign of going to Rome to concert meaſures with the pope for oppoſing their progreſs; but he was diverted from his deſign by cardinal Wolſey's convocation of a ſynod of the whole clergy of England for the ſame purpoſe. In this aſſembly he appeared in the character of a zealous advocate for reformation in the manners of the clergy; and ſome of his ſpeeches on this and other important occaſions are preſerved in the Biographia Britannica. About the year 1527 the king applied to him for his opinion on the ſubject of his marriage with Catherine, his brother's widow. This was the rock on which he foundered. So long as his ſentiments were congenial with thoſe of the monarch he was in the higheſt eſteem; but now he gave a determination which did not correſpond with his paſſions: he declared honeſtly, and without any reſerve, "that there was no reaſon to queſtion the validity of the marriage, ſince it was good and lawful from the beginning." The biſhop had made up his mind on the buſineſs, and nothing could divert him from an avowal of it on all proper occaſions, though he probably foreſaw that his own ruin would be the conſequence of his unyielding integrity. When the divorce came to be argued before the two legates, Campeggi and Wolſey, biſhop Fiſher, who was one of the queen's council, exerted himſelf with much zeal in her behalf, preſenting the legates with a book which he had written in defence of the marriage. The biſhop did not ſtop here; he oppoſed the king in ſome other of his projects, and reſiſted a motion made for the ſuppreſſing of the ſmaller monaſteries, and granting their revenues to the crown. The ſpeech which he delivered on this occaſion was received with great applauſe by thoſe who adhered to the papal church, and with equal diſapprobation by the advocates of the reformation. Some expreſſions which he uſed ſo much offended the houſe of commons, who complained to the king of the reflections which the biſhop had caſt on the repreſentatives of the people, that the king ſent for the prelate, and having heard his defence, diſmiſſed him with an admonition, "to be more temperate in future." In the year 1530 he was twice in imminent danger of his life. His firſt eſcape was from poiſon which a man by the name of Rouſe threw into ſome gruel preparing for the biſhop's dinner; his ſecond was from a bullet fired into his library where he uſually ſat. After this the biſhop retired to Rocheſter, where he ſpent moſt of his time. In 1531 the queſtion was agitated as to giving Henry VIII. the title of ſupreme head of the church of England: the biſhop took the negative ſide of the queſtion, and oppoſed the project with all his zeal. He next offended his ſovereign by giving credit, or at leaſt liſtening to the enthuſiaſtic viſions of Elizabeth Barton, the pretended holy maid of Kent. This woman, who was only an inſtrument in the hands of deſigning perſons, carried on her impoſtures with a view of alienating the affections of the people from the king, and exciting inſurrections againſt his government. The biſhop, it was very evident, had no ill deſign in the part he took; but finding the propheteſs, as ſhe was then denominated, was devoted to the intereſts of the queen; and having heard much of the ſanctity of her manners, of the viſions which ſhe ſaw, and of the predictions which ſhe uttered, and which were ſaid to be realized, he conceived ſhe was deſigned by providence to diſplay and make triumphant the doctrines and authority of the church of Rome, over the principles of Lutheraniſm, which were rapidly ſpreading in England. Fiſher accordingly liſtened to her prophecies, and concealed one of them which ſeemed to affect the king, or at leaſt to ſtrike a blow at his authority. She announced to her adherents, that if Henry ſhould proceed in his divorce, and marry another wife, he would not be king ſeven months afterwards. The woman was apprehended, and in the hope of pardon confeſſed the particulars of her impoſture, and named all thoſe who had encouraged her deluſions. The biſhop was urged to make ſubmiſſions to the king as the only way of aſſuaging his anger; he refuſed, and in 1534 a bill of attainder was paſſed againſt Elizabeth Barton and her accomplices. Biſhop Fiſher ſtill refuſed to ſubmit, and was adjudged guilty of miſpriſion of treaſon, and condemned to forfeit all his goods and chattels to the king, and to be impriſoned during his majeſty's pleaſure. It is not certain that the act was enforced againſt him; but when the act was paſſed to annul the king's marriage with Catherine of Arragon, and to confirm that with Anne Boleyn, and enjoining all to take the oaths accordingly, biſhop Fiſher, inſtead of uniting with his brethren, left the capital. Opportunity was, however, given him again and again to conſider the oath, till at length he abſolutely refuſed; and was attainted in the parliament which met in 1534, and his biſhopric was declared void. The biſhop was thrown into the Tower, where he was treated with much ſeverity, and, as it ſhould ſeem, from ſome of his letters, ſcarcely allowed the common neceſſaries of life. Here he would probably have been permitted to have ended his days, had not a cardinal's hat been conferred on him by pope Paul III. which ſo enraged the king, that he ſwore it ſhould never be permitted to enter his dominions; and if Fiſher were determined to wear it, it ſhould be on his ſhoulders, for he would not leave him a head for the purpoſe.

From this time his deſtruction was reſolved on, and the tyrant ſent the ſolicitor-general, Rich, whoſe name is rendered infamous by undertaking the buſineſs, to pump out of him his ſecret opinions with regard to the ſupremacy, declaring he had the king's authority to ſay that no ill uſe whatever ſhould be made of the communication, which he ſought merely on account of the high opinion he entertained of his judgment and integrity. The biſhop gave an unreſerved deciſion on the ſubject, which the ſolicitor carried to his maſter; and on the inſtant a ſpecial commiſſion was iſſued for trying him for high treaſon. Rich was the chief and indeed the only evidence that could affect the life of the venerable priſoner, and yet a jury, as infamous as the evidence, found him guilty. The biſhop pathetically appealed to the court on the occaſion, "I pray you, my lords, conſider that by all equity, juſtice, wordly honeſty, and courteous dealing, I cannot be directly charged with treaſon, though I had ſpoken the words indeed, the ſame not being ſpoken maliciouſly, but in the way of advice and counſel, when it was requeſted of me by the king himſelf; and that favour the very words of the ſtatute do give me, being made only againſt ſuch as ſhall maliciouſly gainſay the king's ſupremacy, and none other: wherefore, although by the rigour of the law you may take occaſion to condemn me, yet I hope you cannot find law, except you add rigour to that law to caſt me down, which hereby I hope I have not deſerved." To Rich he addreſſed himſelf, "Mr. Rich, I cannot but mervail to hear you come in to bear witneſs againſt me of theſe words, knowing in what ſecret manner you came to me." He then aſſured the court that he (Rich) had told him, the king wiſhed him to declare, that on the honour of a king, whatever he ſhould ſay by this his ſecret meſſenger, he ſhould reap no peril or danger therefrom, nor ſhould any advantage be taken againſt him for the ſame. Still the court gave ſentence, and, notwithſtanding the honour of a king was oppoſed to it, Henry confirmed the bloody decree, and the worthy prelate was beheaded on Tower Hill on the 22d of June 1535, at the age of ſeventy-ſix. Eraſmus repreſents him as a man of the greateſt integrity, of deep learning, incredible ſweetneſs of temper, and grandeur of ſoul. By friends and by enemies he was regarded as a pious and charitable man, not only learned himſelf, but a great encourager of learning. His chief work was a "Commentary on the ſeven penitential Pſalms." Biog. Brit.

Fisher, in *Zoology*. See Mustela *Zibellina*.

FISHERMAN's Cove, in *Geography*, a harbour on the S. coaſt of Pitt's Archipelago, within Nepean's ſound. N. lat. 53° 18'. E. long. 230° 53'.

FISHERROW, a town of Scotland, in the county of Edinburgh, at the mouth of the Eſk, in the frith of Forth, oppoſite to Muſſelburgh.

FISHER'S Canal, a branch of an inlet leading from Fitzhugh's ſound, on the W. coaſt of North America, ſo called by Capt Vancouver in 1793. At the entrance N. lat. 51° 57'. E. long. 232° 7'.

Fisher's *Iſland*, an iſland in the Atlantic, in Long iſland ſound, near the S. coaſt of Connecticut. It is about ten miles in length and two in breadth, with a good ſoil, favourable for rearing ſheep and producing wheat and other grain. It is annexed to the townſhip of South-hold, in

Suſſex county, on Long iſland. N. lat. 41° 12′. W. long. 72°.

FISHERSFIELD, a townſhip of America, in the ſtate of New Hampſhire and county of Hillſborough, incorporated in 1763, containing 526 inhabitants; about 16 miles eaſterly of Charleſtown.

FISHERY, a commodious place for fiſhing; or a place wherein great quantities of fiſh are caught.

The principal fiſheries of Europe for ſalmon, herring, cod, and mackarel, are along the coaſts of England, Scotland, and Ireland; for cod, on the banks of Newfoundland; for whales, about Greenland; for pearls, in the Eaſt and Weſt Indies, &c.

FISHERY alſo denotes the commerce of fiſh; more eſpecially the catching of them for ſale. The fiſhery makes a principal branch of the Britiſh commerce. A great quantity of veſſels and ſeamen are employed therein; and beſides what is ſpent at home, large ſums are yearly returned, merely for herring, cod, and pilchards, exported to Spain, Italy, and ſeveral parts of the Mediterranean, and the iſlands of the Archipelago.

Yet are our countrymen reproached, and with a good deal of juſtice, for their remiſſneſs in this branch of trade. The advantageous ſituation of our coaſts might be of immenſe benefit to us, did we not let our neighbours overreach us therein. The Dutch, French, Hamburghers, &c. have been accuſtomed to come yearly in large ſhoals, and not only take the fiſh from our own coaſts, but ſell them to us for our money, when they have done.

Scotland ſuffers incredibly on this ſcore: no country in Europe can pretend to rival it in the abundance of the fineſt fiſh, wherewith its numerous harbours, loughs, rivers, &c. are ſtored. In the river Dee, it is ſaid, an hundred and ſeventy head of ſalmon is not very extraordinary for a ſingle draft of a net; and the pickled ſalmon ſent hence is allowed the beſt in Europe. The Scottiſh iſlands, eſpecially thoſe on the weſtern ſide, do certainly lie the moſt commodiouſly for carrying on the fiſhing trade to perfection.

King Charles I. directed his attention to the Scottiſh fiſheries in 1630 and 1633, in conjunction with a company of merchants under his royal commiſſion and patronage, and encouraged by his bounty. With this view he ordered Lent to be more ſtrictly obſerved; prohibited the importation of fiſh taken by foreigners, and agreed to purchaſe from the company his naval ſtores, and the fiſh for his fleets: but the civil wars ſoon ſet this plan aſide. The company had built two ſtorehouſes or magazines; one on the ſmall iſland of Hermetra, on the north ſide of North Uiſt, and the other upon a ſmall iſland in Loch Madie, a celebrated bay of the above-mentioned North Uiſt. King Charles II. in 1661, made a like attempt; and was joined in it by the duke of York, lord Clarendon, and ſeveral other perſons of rank and fortune. In proſecution of the deſign the moſt ſalutary laws were enacted by the parliaments of England and Scotland, in virtue of which all materials uſed in, or depending upon, the fiſheries, were exempted from all duties, exciſes, and other impoſts. In England the company was authorized to ſet up a lottery, and to make a voluntary collection in all pariſh churches; and other encouraging meaſures were adopted. Some Dutch families were invited, or permitted, to ſettle at Stronaway; but whilſt the plan appeared to be judiciouſly formed and likely to ſucceed, the king having a preſſing occaſion for money, was perſuaded to withdraw what he had employed in the fiſhery, at which the merchants joined with him, being diſpleaſed, did the like themſelves. In 1677, a new royal company was eſtabliſhed in England, at the head of which were the duke of York, the earl of Derby, &c. Beſides all the privileges which former companies had enjoyed, the king granted this new company a perpetuity, with power to purchaſe lands; and alſo 20*l.* to be paid them annually out of the cuſtoms of the port of London, for every dogger or buſs they ſhould build and ſend out, for ſeven years to come. A ſtock of 10,980*l.* was immediately advanced, and afterwards 1600*l.* more. This ſmall capital was ſoon exhauſted in purchaſing and fitting out buſſes, and other incidental expences. The company, however, made a ſucceſsful beginning, and one of their buſſes or doggers took and brought home 32,000 cod-fiſh; other veſſels had alſo a favourable fiſhery. But moſt of the buſſes, having been built in Holland, and manned with Dutchmen, the French, then at war with Holland, took ſix out of ſeven veſſels, with their cargoes and fiſhing tackle; and the company, being in debt, ſold, in 1680, the remaining ſtores, &c. A company of merchants raiſed a new ſubſcription of 60,000*l.* under the privileges and immunities of the former charter. But this attempt proved abortive by the king's death and the troubles of the next reign. Soon after the revolution the buſineſs was again reſumed on a more extenſive ſcale, the propoſed capital being 300,000*l.*: but this ſcheme failed. Since the Union, ſeveral efforts have been made to retrieve it; and in 1750 there was a corporation ſettled on that footing by parliament, called "the Society of the Free Britiſh Fiſhery," for the term of twenty-one years, under the direction of a governor, preſident, vice-preſident, council, and other officers, who were empowered to make bye-laws, &c. and to raiſe a capital of 500,000*l.*, and the Scotch fiſhery, encouraged by fiſhing-chambers, erected in ſeveral cities, which eſtabliſhments promiſed a more permanent duration. See *Herring* FISHERY.

FISHERY, *Anchovy*. See ANCHOVY.

FISHERY, *Cod.* The cod is a fiſh of paſſage, pretty large, with a great head, and teeth in the bottom of the throat; its fleſh white; its ſkin browniſh on the back, white under the belly, and covered with a few thin, tranſparent ſcales.

It is excellent food when freſh; and, if well prepared and ſalted, will keep a long time. The fiſh, thus prepared, is commonly eaten among us in Lent, &c. under the denomination of *ſalt-fiſh*, or *ſtock-fiſh*.

There are two kinds of ſalt cod; the one called *green*, or *white*; and the other *dried*, or *cured*; though it is the ſame fiſh, only differently prepared.

They are alſo diſtinguiſhed by the places from whence they are brought, as well as by the manner of curing, into Aberdeen-fiſh, Iceland-fiſh, green-fiſh, ſtock-fiſh, North-ſea cod, poor Jack, and barrelled cod.

Green cod.—The chief fiſheries for green cod are in the bay of Canada, on the Great and Little Bank, near the coaſt of Newfoundland, the iſle of St. Peter, or Pierre, and the iſle of Sable; and thither veſſels are yearly ſent from divers parts both of America and Europe.

The veſſels uſed herein are from a hundred to a hundred and fifty tons burden; and theſe will bring thirty or thirty-five thouſand fiſh a-piece.

The moſt eſſential articles in this fiſhery are the perſons who know how to open the fiſh, to cut off the heads, and to ſalt them; upon the ability of which laſt the ſucceſs of the voyage chiefly depends.

Several authors will have it, that the Biſcayans, in purſuing their whales, made the firſt diſcovery of the Great and Little Banks of cods at Newfoundland, Canada, &c. a hundred years before Columbus's time; and that it was a

Biſcayan Newfoundlander that gave the firſt intimation thereof to Columbus.

Others ſay, that the Great Bank was diſcovered by a native of St. Malo's, named Cartier. England claimed an excluſive right to the North American ſeas, in virtue of the diſcovery of thoſe ſeas by Sebaſtian Cabot, in the ſervice of Henry VII. But be the diſcoverer of what name or nation he may, the diſcovery is certainly highly valuable; there is not a trading nation in Europe but allows the commerce of cod-fiſh to be one of the moſt ſecure and gainful that is known.

The beſt, largeſt, and fatteſt cod are thoſe taken on the ſouthern and weſtern ſides of the Great Bank, which is a kind of ſubmarine mountain, ſtretching from N.E. to S.W., one hundred and fifty miles long, and fifty broad, and at the diſtance of twenty-five leagues from Newfoundland: thoſe on the north ſide are generally much ſmaller. The water on the bank is from 22 to 50 fathoms; on the outſide from 60 to 80; on the leſſer banks much the ſame. A great ſwell and thick fog generally mark the place of this bank. The chain of leſſer banks lies between Newfoundland and Cape Cod in New England; as the Green, French, Porpoiſe, and Sable Banks, and alſo Brown's and St. George's. Beſides theſe banks, the whole coaſt of Newfoundland, New England, Nova Scotia, and Labrador, is one continued fiſhery.

The beſt ſeaſon for this fiſhery is from the beginning of February to the end of April; at which time the cod, which, during the winter had retired to the deepeſt part of the ſea, return to the Bank, and grow very fat.

Thoſe caught from March to June keep well enough; but thoſe taken in July, Auguſt, and September, ſoon ſpoil. The fiſhing is ſometimes done in a month, or ſix weeks; and ſometimes it holds four or five months. As Lent draws on, if the fiſhermen have but half their cargo, they ſtrive who ſhall make homeward the firſt; the market being then the beſt.

Some will thus make a ſecond voyage, before others have got loading for the firſt. Each fiſher only takes one cod at a time; and yet the more experienced will take from three hundred and fifty to four hundred per day; but this is the moſt; for it is very fatiguing work, both on account of the weight of the fiſh, and of the extreme cold which reigns on the Bank.

The wages uſually allowed the captain and ſailors is one third of the cod they bring home ſound.

They ſalt the cod on board. The head being cut off, the belly opened, and the guts taken out, the ſalter ranges them in the bottom of the veſſel, head to tail; and having thus made a layer thereof, a fathom or two ſquare, he covers it with ſalt; over this he lays another layer of fiſh, which he covers as before: and thus he diſpoſes all the fiſh of that day, taking care never to mix the fiſh of different days together.

By that time the cod has lain thus to drain three or four days, they are moved into another part of the veſſel, and ſalted afreſh. After this they are no more to be touched, till the veſſel has its burden.

Sometimes they put them up in barrels, for the conveniency of carriage.

Dry Cod.—In the fiſhing of dry cod, veſſels of all ſizes are uſed; though ſuch are generally choſen as have large holds, becauſe this ſort of fiſh incumbers more than it burdens.

As cod is only to be dried by the ſun, the European veſſels are obliged to put out in March or April, to have the benefit of the ſummer for drying. Indeed, we ſend veſſels for cod in June and July; but thoſe only buy what had been fiſhed and prepared by the inhabitants of Newfoundland, and the neighbouring parts; in exchange for which, we carry them meal, brandies, biſcuits, pulſe, molaſſes, linen, &c.

The principal fiſhery for dry cod is along the coaſt of Placentia, from Cape Roſe to the Bay des Experts; in which compaſs there are divers commodious parts for the fiſh to be dried in.

The fiſh intended for this uſe, though of the ſame kind with the green cod, is yet much ſmaller; whence it is the fitter to keep, as the ſalt more eaſily penetrates it.

The method of fiſhing is much the ſame in both; only this latter is the more expenſive, as it takes up more time, and employs more hands; and yet ſcarce half ſo much ſalt is ſpent in this as in the other.

When ſeveral fiſhing veſſels meet, and intend to fiſh in the ſame port, he whoſe ſhallop firſt touches ground, becomes entitled to the quality and privileges of admiral; he has the choice of his ſtation, and the refuſal of all the wood on the coaſt at his arrival. (10 & 11 W. III. c. 25.)

As faſt as the captains arrive, they unrig all their veſſels, leaving nothing but the ſhrouds to ſuſtain the maſts; and in the mean time the mates provide a tent on ſhore, covered with branches of fir, and ſails over them; with a ſcaffold, fifty or ſixty feet long, and about one-third in breadth.

While the ſcaffold is making ready, the crew are fiſhing; the proceſs of which, as it is deſcribed by Mr. Pennant in his "Arctic Zoology," is as follow:

The boats or ſhallops are 40 feet in the keel, rigged with a main-maſt and fore-maſt, and lug-ſails; furniſhed with four oars, three of which row on one ſide, and the other (which is twice as large) belays the other three, by being rowed ſideways over the ſtern, by a man who ſtands up for that purpoſe, with his face towards the rowers, counteracting them, and ſteering at the ſame time as he gives way to the boat. Each of the men in this boat is furniſhed with two lines, one at each ſide of the boat, each furniſhed with two hooks; ſo that ſixteen hooks are here conſtantly employed, which are thought to make a tolerable good day's work of it, if they bring in from five to ten quintals of fiſh, though they have ſtowage for, and ſometimes bring in thirty. Two hundred quintals are called a ſaving voyage, but not leſs. The bait is ſmall fiſh of all kinds: herring, capaline, lance, tom cod or young cod; the firſt of which they ſalt, and keep for ſome time, in caſe of ſcarcity of the reſt; but theſe are much leſs eagerly taken by the fiſh when ſalted. In caſe ſmall fiſh cannot be gotten, they uſe ſea-fowl, which are eaſily taken in vaſt numbers, by laying nets over the holes in the rocks where they come to rooſt in the night. If neither ſmall fiſh nor birds are to be procured, they are forced to uſe the maws of fiſh which they catch; but this is the worſt bait of any.

When the fiſh are taken they are carried to the ſtage, which is built with one end over the water, for the conveniency of throwing the offals into the ſea, and for their boats being able to come cloſe to diſcharge their fiſh. As ſoon as they come on the ſtage, a boy hands them to the header, who ſtands at the ſide of a table next the water, and whoſe buſineſs it is to gut the fiſh and cut off the head, which he does by preſſing the back of the head againſt the ſide of the table, which is made ſharp for that purpoſe, when both head and guts fall through a hole in the floor into the water. He then ſhoves the fiſh to the ſplitter, who ſtands oppoſite to him; his buſineſs is to ſplit the fiſh, beginning at the head, and opening it down to the tail; at the next cut he takes out the larger part of the back-bone, which falls through the floor into the water. He then ſhoves the fiſh off the table, which drops into a kind of hand barrow, which, as ſoon as it is filled, is carried off to the ſalt-pile. The header alſo flings the liver into a ſeparate baſket, for the making of train oil, uſed by the curriers, which bears a higher price than whale oil.

In the ſalt-pile the fiſh are ſpread upon one another, with a layer of ſalt between them. Thus they remain till they have taken ſalt, and then the ſalt is waſhed from them by throwing them off from ſhore in a kind of float, called a "pound." As ſoon as this is completed, they are removed to the laſt operation of drying them; which is done on ſtanding flakes, made by a ſlight wattle, juſt ſtrong enough to ſupport the men who lay on the fiſh, ſupported by poles, in ſome places as high as twenty feet from the ground; here they are expoſed, with the open ſide to the ſun; and every night, when it is bad weather, piled np five or ſix in a heap, with a large one, his back or ſkinny part uppermoſt, to be a ſhelter to the reſt from rain, which hardly damages him through his ſkin, as he reſts ſlanting each way to ſhoot it off. When they are tolerably dry, which in good weather is in a week's time, they are put in round piles of eight or ten quintals each, covering them on the top with bark. In theſe piles they remain three or four days to ſweat; after which they are again ſpread, and, when dry, put into larger heaps, covered with canvas, and left till they are put on board.

When prepared they are ſent to the Mediterranean, where they fetch a good price; but are not eſteemed in England, for which place another kind of fiſh is prepared, called by them "Mud-fiſh," which, inſtead of being ſplit quite open, like their dry-fiſh, are only opened down to the navel; they are ſalted and lie in ſalt, which is waſhed out of them in the ſame manner with the others; but inſtead of being laid out to dry, are barrelled up in a pickle of ſalt boiled in water.

The train oil is made from the livers; and it is ſo called to diſtinguiſh it from whale or ſeal oil, which they call fat oil, and is ſold at a lower price (being only uſed for lighting of lamps) than the train oil, which is uſed by the curriers. It is thus made: they take a half-tub, and, boring a hole through the bottom, preſs hard down into it a layer of ſpruce boughs, upon which they place the livers, and expoſe the whole apparatus to as ſunny a place as poſſible. As the livers corrupt, the oil runs from them; and, ſtraining itſelf clear through the ſpruce boughs, is caught in a veſſel ſet under the hole in the tub's bottom.

The ſounds and tongues are ſalted at the ſame time with the fiſh, and barrelled up: the roes or eggs, being ſalted and barrelled up, ſerve to caſt into the ſea to draw fiſh together, and particularly pilchards.

By the definitive treaty between Great Britain and France in 1763, the French, who are allowed to fiſh in the gulf of St. Lawrence, are now abſolutely deprived of the powerful fortifications of Cape Breton, and of the poſſeſſion of Canada and all its dependencies; and are entitled to no poſſeſſions contiguous to Newfoundland, except the ſmall iſlands of St. Peter's, or Pierre, and Miquelon, ceded by the ſixth article of the ſaid treaty to his moſt Chriſtian majeſty as a ſhelter for the French fiſhermen; and his moſt Chriſtian majeſty engages not to fortify the ſaid iſlands, to erect no buildings upon them, but merely for the convenience of the fiſhery, and to keep upon them a guard only of fifty men for the police. And by the eighteenth article of the ſame treaty, it is expreſsly ſtipulated between Great Britain and Spain, that his Catholic majeſty deſiſts, as well for himſelf as for his ſucceſſors, from all pretenſions which he may have formed in favour of the Guipuſcoans and other his ſubjects, to the right of fiſhing in the neighbourhood of Newfoundland.

The French, by the treaty of 1783, were to enjoy their fiſheries on the northern and weſtern coaſts; the inhabitants of the United States having the ſame privileges as before their independence: and the preliminaries of October, 1801, confirm the privileges granted to the French.

By 43 Geo. III. c. 154. a bounty of 3*s.* *per* quintal ſhall be paid on the importation of pickled ſalmon and dry cod from the iſland of Newfoundland; the maſter and mate of every ſhip ſo importing making oath, at the port of importation, that ſuch fiſh was taken and cured by Britiſh ſubjects carrying on the fiſhery at Newfoundland or Labrador; and ſuch fiſh may be exported without repayment of the bounty. For other regulations of this fiſhery, ſee 10 & 11 W. III. c. 25; 26 Geo. III. c. 26; 27 Geo. III. c. 19; 29 Geo. III. c. 53.

Of all the migrating fiſhes, herrings excepted, the cod is the moſt valuable to mankind. This fiſh, we may here obſerve, is fond of cold climates, and is ſuppoſed to reſide chiefly between the latitudes of 66° and 45°. Thoſe that are taken north and ſouth of theſe latitudes are either few in number, or bad in quality. They are found as far north as Greenland, but they are ſmall and emaciated. In Europe they chiefly frequent the coaſts of Iceland, Norway, the Baltic, the iſlands and main land of Scotland. After paſſing theſe latitudes, they decreaſe in number. The Engliſh fiſhermen take them on the Dogger-bank, the Well-bank, and the Cromer, lying on the eaſt ſide of the kingdom, oppoſite to Norfolk, Lincoln, and Yorkſhire. Of theſe the Dogger-bank is the moſt extenſive and valuable for white fiſh in general, as we learn from the account tranſmitted to Mr. Pennant by Mr. Travis, ſurgeon in Scarborough. The Dogger-bank lies 12 leagues from Flamborough-Head, and 16½ from Scarborough: the north ſide of the bank ſtretches off E.N.E. between 30 and 40 leagues. The fiſhermen ſeldom find any cod, fry, or other round fiſh upon the bank itſelf, but upon the ſloping edges and hollows contiguous to it. The ſhifting ſand on the top of the bank affords them no ſubſiſtence; and the ſhallow agitated water allows them no reſt. It is in the hollows between the Dogger and the Well-bank that the cod are taken which ſupply the London market. The ſhore along the coaſt on the one hand, and the edges of the Dogger-bank on the other, like the ſides of a decoy, give a direction towards our fiſhing grounds to the ſhoals of cod, and other fiſh, which migrate annually from the northern ocean into our ſeas; and the great variety of fiſhing grounds near Scarborough, extending upwards of 14 leagues from the ſhore, afford ſecure retreats and plenty of proper food for all the various kinds of fiſh, and alſo ſuitable places for each kind to depoſit their ſpawn in.

The beſt bait for all kinds of fiſh is freſh herring cut in pieces of proper ſize; and next to theſe, the leſſer lampreys, ſmall haddocks cut in pieces, ſand-worms, muſcles, and limpets; and, in defect of theſe, bullock's liver. The hooks are ſmaller than thoſe uſed in Iceland and Newfoundland; being 2½ inches long in the ſhank, and near an inch wide between the ſhank and the point. The line is made of ſmall cording, and is always tanned before it is uſed. The beſt weather for ſucceeding in fiſhing is a half calm, when the waves are juſt curled, with a ſilent breeze.

In our ſeas the cod-fiſh begin to ſpawn in January, and depoſit their eggs in rough ground among rocks. Some continue in the roe till the beginning of April. Theſe fiſhes in general recover ſooner after ſpawning than any other; and, therefore, it is common to take ſome good ones all the ſummer. Thoſe of a middling ſize are moſt eſteemed for the table, and are ſelected by their plumpneſs and roundneſs, eſpecially near the tail; by the depth of the pit behind the head, and by the regular cordulated appearance of the ſides, as if they were ribbed. The cod, and other fiſh of this genus, are in higheſt ſeaſon in the winter; but even then, the glutinous parts about the head loſe their delicate flavour after the cod hath been 24 hours out of the water. The general weight of theſe fiſh on the Dogger-bank is from 14 to 40 pounds.

The Scottiſh white fiſhery, comprehending cod, ling, hake, tuſk, coal-fiſh, haddocks, and whitings, and flat fiſh, as turbot, ſkate, ſoals, and flounders, abound ſo univerſally around the Scottiſh ſhore, that the whole northern ſea, from the Dogger-bank in lat. 54° to the northern extremity of Iceland in lat. 67°, and from the coaſt of Norway eaſtward to unknown latitudes on the weſt, may be conſidered as one great fiſhery, in which Scotland, as lying in the centre, has manifeſtly the advantage over all other nations. The white fiſhery may be ſuppoſed to comprehend the eaſtern coaſt fiſhery from Berwick to the Pentland firth, the Shetland or N.E. fiſhery, and the Hebride or N.W. fiſhery. The moſt conſiderable of the banks in the eaſtern fiſhery, called by way of pre-eminence the "Long Fortys," ſtretches in a parallel line with the eaſt coaſt, from the county of Durham to Kinnaird's head, at the entrance of the Murray firth; thus affording an uninterrupted line of fiſheries almoſt from one extreme of the kingdom to the other, and in ſome parts at a very inconſiderable diſtance from the ſhore. The Shetland fiſheries are carried on by two different methods; *viz.* by boats accompanied with decked veſſels, and by boats only. Thoſe of the firſt claſs go out of ſight of land, where, in 90, 100, and 120 fathoms water, they get the largeſt fiſh. When they arrive on the fiſhing grounds, they ſet their long lines, each line of 56 fathoms having 15 hooks; and theſe lines are joined to one another, till the number of hooks amounts to from 600 to 1200. In the fiſhery by boats of 2 tons burden, and 6 men each, they fiſh in ſummer at the diſtance of 7 to 15 leagues from land, and in winter at the diſtance of 3 leagues. The ſummer fiſhery is carried on from the 1ſt of June to the 1ſt of Auguſt: the boats go out three times a week, and continue 24 hours each time. The large boats carry from 100 to 120 lines; each line being from 54 to 60 fathoms in length, and hung with 15 hooks at 20 feet diſtance from one another. In winter they uſe hand lines, when long ones cannot be managed. They bait with a ſmall fiſh called pollocks, when at ſea; and if theſe cannot be procured, they uſe cod, turbot, haddocks, or any other fiſh. The Hebride or N.W. fiſhery extends from the head of the Solway firth to the coaſt of Iceland, lying at the diſtance of 400 miles N.W. from the Long iſland in the Hebrides. The principal bank in the fiſhing grounds, lying between the Hebrides and the main land, begins near the mouth of Gareloch in Roſs-ſhire, and is ſuppoſed to ſtretch in a N.W. direction, towards the Butt of the Lewis, and poſſibly beyond that cape. This abounds in all the varieties of white fiſh. A chain of ſmall banks ſtretches along the eaſt ſide of the Lewis, from 3 to 6 miles off the ſhore, and is carried on by the natives both in ſummer and winter. The whole coaſt of Sky is alſo one continued fiſhery; and the ſeas of the South Hebrides preſent a number of fiſhing banks, which our limits will not allow us to recite. But the moſt extraordinary and valuable bank is called by the old natives the "Mother-bank," and lies between Mull on the eaſt, and Barra and South Uiſt on the weſt. There is a bank between the iſlands of Coll and Colland Tirey, in the direction of the ſmall iſland of Ganna, which lies in the centre. A valuable bank lies between the iſlands of Mull, Coll, and Ardnamurchan, on the main land of Argyleſhire. In the ſound of Mull there is a ſmall bank, which ſtretches from Aros to Scalarda'e bay. There is an inexhauſtible fiſhery along the coaſt of Argyleſhire, called the Inner Sound; a bank lies between Loch Tarbat in Jura, and the iſle of Colonſa, 16 miles long and 1 broad. Another lies in the channel between Jura and Ilay on the weſt, and the main land of Knapdale on the eaſt. Thoſe which we have enumerated are the principal banks of the Hebrides, on the weſt ſide of the Mull of Cantire. On this ſide of the cape, within the firth of Clyde, there is a good fiſhing ground around the craig of Ailſa; from whence a large bank ſtretches from Ballintrae in Ayrſhire, and thence, along the coaſt, to the Mull of Galloway, where it is loſt in the Iriſh channel. Another bank ſtretches in a N.W. direction towards Sunda iſland, and from thence towards Knapdale, off the north ſide of Arran. Such is the immenſe ſcene of improvements, with regard to the Scottiſh white fiſheries, that preſents itſelf to thoſe who are anxious to promote the Britiſh fiſheries. In ſome reſpects the Scottiſh fiſheries have the advantage of thoſe of Newfoundland. The banks of Newfoundland lie at the diſtance of 2500 to 3000 miles from London, Briſtol, Liverpool, Dublin, Cork, and Glaſgow; and can only be frequented during the months of February, March, April, May, and June: whereas the Scottiſh fiſheries, when the propoſed navigations ſhall be opened, will, upon a medium, be within a week's ſailing of theſe commercial emporiums, which they can ſupply in ſeaſons when the Newfoundland fiſhery cannot be carried on.

The Iriſh white fiſheries are chiefly cod, ling, hake, coal-fiſh, and haddock. In theſe fiſheries the Iriſh are very expert, being trained to the buſineſs by their fiſhing on the banks of Newfoundland, as well as the bays of that iſland; to which fiſheries ſome thouſands of Iriſhmen reſort every ſeaſon, and from whence they return with a ſmall pittance to their families. White fiſh abound on the weſt coaſt of Ireland; but no regular fiſhery has yet been eſtabliſhed with ſucceſs. See more on this ſubject in Knox's View of the Britiſh Empire, &c.

FISHERY, *Coral.* See CORAL.

FISHERY, *Herring.* The herring is a ſmall ſalt-water fiſh, with a blueiſh back, and a white ſilvered belly, not unlike a little ſhad fiſh; whence it is called in Latin *aloſa minor.* Rondeletius calls it *harengus.*

It is a popular error to believe the herring to be the *halec* of the Romans. The *halec* was no particular fiſh, but a kind of ſauce, made of any kind of ſalt-fiſh. The modern herring ſeems to have been unknown to the ancients: it is neither the *halec,* nor *halex,* nor *mænis,* nor *lencomeni,* nor the *gerres,* of Pliny. See Rondelet. de Piſcib. Marin. lib. v. cap. 13. and Voſſius de Idolol. See HERRING.

Herrings are chiefly found in the North ſea. In thoſe inacceſſible ſeas, that are covered with ice during a great part of the year, the herrings find a quiet and ſafe retreat from all their numerous enemies: there neither man, nor their ſtill more deſtructive enemy, the ſun-fiſh, or the cachalot, the moſt voracious of the whale kind, dares to purſue them. It is true, there are fiſheries elſewhere, but none ſo copious.

They uſually make two fiſhing ſeaſons for herrings; the firſt in June, July, and Auguſt; the ſecond in autumn. The latter of theſe is the more conſiderable, on account of the fogs, which are very favourable to this kind of fiſhing.

The herrings uſually keep at ſome diſtance from the coaſt in July and Auguſt; and it is at this time only that the fiſhers follow them in the open ſea. About the end of Auguſt, and until the middle of September, they come into ſhallow water, where they remain for ſome time in the bays and inlets of the coaſt; and this is termed the ground draw. It hath been obſerved, that the arrival of the herrings on the coaſt of Shetland is certain, and almoſt to a day, on or before the 22d of June. As they invariably follow a ſouthern courſe, after leaving the Shetland iſlands, they reach the Hebrides in July, and keep preſſing forward till the beginning of September, when they go into deep water.

Freſh ſhoals appear in November, and continue till January; but whether theſe herrings be the remains of the former ſhoals, in their return from the circumnavigation of Britain and Ireland, or a new migration from the frozen regions, is a matter of uncertainty.

It is commonly ſaid, that nobody ever ſaw a herring alive, and that they die the minute they are taken out of the water; but there are inſtances to the contrary.

The herring is a fiſh of paſſage; ſo that it is allowed to catch them on holidays and Sundays: in the Decretal there is an expreſs chapter to this effect. They go chiefly in ſhoals, and are fond of following any fire, or light; and in their paſſage they reſemble a kind of lightning themſelves.

The winter rendezvous of the herrings is probably the icy ſea, within the arctic circle; as this ſea ſwarms with inſect food in greater abundance than in our warmer latitudes. From this ſea the great colony of theſe fiſhes ſets out about the middle of winter; and this colony is compoſed of ſuch numbers as to exceed the power of imagination. But they have no ſooner left their retreats than they have to encounter with a multitude of enemies. The ſun-fiſh and cachalot devour them in great abundance; and beſides, the porpus, the grampus, the ſhark, cod-fiſh, haddocks, pollocks, and the numerous tribe of dog-fiſh find them an eaſy prey, and deſiſt from making war upon one another. To theſe enemies we may add innumerable flocks of ſea-fowl that chiefly inhabit the northern regions towards the pole, which watch the outſet of their perilous migration, and ſpread among them extenſive ruin. In this ſtate of danger, the defenceleſs emigrants crowd cloſer together, as if they could thus ſecure themſelves againſt the attacks of their enemies. The main body begins to ſeparate, at a certain latitude, into two great diviſions; one of which moves to the weſt, and pours down along the coaſts of America, as far ſouth as Carolina, and becomes ſo numerous in the Cheſapeak bay as to be a nuiſance to the ſhores. The other diviſion takes a more eaſtern direction towards Europe, and falls in with the great iſland of Iceland about the beginning of March. Upon their arrival on that coaſt, their phalanx, which hath already ſuffered conſiderable diminution, is nevertheleſs found to be of ſuch extent, depth, and cloſeneſs, as to occupy a ſurface equal to the dimenſions of Great Britain and Ireland; but ſubdivided into columns of 5 or 6 miles in length, and 3 or 4 in breadth; each line or column being led, according to the ideas of fiſhermen, by herrings of more than ordinary ſize. The herrings ſwim near the ſurface, ſinking occaſionally for 10 or 15 minutes. The forerunners of thoſe who viſit the Britiſh kingdoms appear off Shetland in April or May, and the grand body begins to be perceived in June. Their approach is known to the fiſhers by a ſmall rippling of the water, the reflection of their brilliancy, and the number of ſolan geeſe, or gannets, and other aerial perſecutors, who are eager to devour them, and who, with the marine attendants, may ſerve to drive ſhoals of them into bays and creeks, where many thouſands of them are taken every night from June till September. Although the Shetland iſlands break and ſeparate the grand body of the herrings into two diviſions, they ſtill continue their courſe towards the ſouth. One diviſion proceeds along the eaſt ſide of Britain, and pays its tribute to the Orkneys, the Murray firth, the coaſts of Aberdeen, Angus, and Fife, the great river Forth, the coaſt of Scarborough, and particularly the projecting land at Yarmouth, the ancient and only mart of herrings in England, where they appear in October, and are found in conſiderable quantities till Chriſtmas. The other diviſion purſues its courſe from the Shetland iſlands, along the weſt ſide of Britain; and theſe are obſerved to be larger and fatter than thoſe on the eaſt ſide. After paſſing the Shetland and the Orkney iſles, they crowd in amazing quantities into the lakes, bays, and narrow channels of the ſhires of Sutherland, Roſs, and Inverneſs; which, with the Hebride iſles, eſpecially the Long iſland, form the greateſt ſtationary herring fiſhery in Britain; that upon the coaſt of Shetland excepted. Sometimes this ſhoal, in its ſouthern progreſs, edges cloſe upon the extenſive coaſt of Argyleſhire; fills every bay and creek; and viſits, in ſmall detachments, the firth of Clyde, Lochfine, and other lakes within the entrance of that river; the coaſt of Ayrſhire, and of Galloway, to the head of the Solway firth. This ſhoal proceeds from the weſtern ſhores of Scotland towards the north of Ireland; where, meeting with a ſecond interruption, they are again divided into two brigades. One ſhoal paſſes down the Iriſh channel, viſits the iſle of Man, and affords an occaſional ſupply to the eaſt coaſt of Ireland, and the weſt coaſt of England, as far as the Briſtol channel. The other ſhoal ſkirts along the weſt coaſt of Ireland, where, after viſiting the lakes of Donegal, it gradually diſappears, and is finally loſt in the immenſity of the Atlantic. Herrings, it is obſerved, are not ſeen in quantities in any of the ſouthern kingdoms, as Spain, Portugal, or the ſouth parts of France, on the ſide of the ocean, or in the Mediterranean, or on the coaſt of Africa.

"Were we inclined," ſays a well-known writer, "to conſider this partial migration of the herring in a moral light, we might reflect with veneration and awe on the mighty power which originally impreſſed, on this moſt uſeful body of his creatures, the inſtinct that directs and points out their courſe, that bleſſes and enriches theſe iſlands, which cauſes them at certain and invariable times to quit the vaſt polar deeps, and offer themſelves to our expecting fleets."—"This impreſſion was given them, that they might remove for the ſake of depoſiting their ſpawn in warmer ſeas, that would mature and vivify it more aſſuredly than thoſe of the frigid zone. It is not from defect of food that they ſet themſelves in motion, for they come to us full of fat, and on their return are almoſt univerſally obſerved to be lean and miſerable. What their food is near the pole, we are not yet informed; but in our ſeas they feed much on the oniſcus marinus, a cruſtaceous inſect, and ſometimes on their own fry. They are in full roe to the end of June, and continue in perfection till the beginning of winter, when they begin to depoſit their ſpawn. Though we have no particular authority for it, yet, as very few young herrings are found in our ſeas during the winter, it ſeems moſt certain that they return to their parental haunts beneath the ice, to repair the vaſt deſtruction of their race during ſummer, by men, fowl, and fiſh."

It has been generally ſuppoſed that the Hollanders were the firſt who began the herring-fiſhery, and obſerved the ſeveral ſeaſons of their paſſage. Their firſt regular fiſhing is fixed to the year 1165. It is recorded, however, in the Batavian annals, that the Scots ſold their herrings to the inhabitants of the Netherlands as early as the ninth century. This traffic laid the foundation of a commercial alliance between the two countries, which ſubſiſted, to their mutual advantage, during many ages. Although many laws were enacted during the reigns of James III. IV. V. and VI. for recovering the fiſheries of the eaſtern ſide of the kingdom, which the Dutch had engroſſed, greatly to the prejudice of the rightful owners; yet it is well known, that ſince the firſt eſtabliſhment of the herring fiſhery, the Dutch have enjoyed the principal part of it, and it has very much contributed to their advancement and proſperity in former times Our ſeas were their "original mines," as they themſelves have acknowledged.

In the year 1313 we have an account of the ſeizure of a ſhip of Lynn, in the port of Bergen, which had been fiſhing on the Norway coaſt for herrings. (Rymer's Fœd. vol. iii. p. 400.) And as ladings of herrings carried to a diſtance muſt have been ſalted, it is plain that ſalted herrings, either wet or elſe dried, called red herrings, were in thoſe times a merchantable commodity in foreign parts. And in 1338 we have an account of fifty laſts of herrings ſhipped from Portſmouth for the uſe of the army and fleet of Edward III. in Gaſcogny, which muſt have been ſalted, either wet or dried. (Fœd. vol vii. p. 12.) And they were barrelled and ſalted at the port of Whitby in Yorkſhire, in 1394. Fœd. vol. vii. p. 778.

But the preſent method of pickling them was not diſcovered till the year 1416, though others date it from the year 1397. Willughby, in his Hiſtory of Fiſhes, obſerves, that Will. Buekelſz, or Bachalen, a native of Bier Uliet, near Sluys, who died in 1397, rendered his name immortal by the diſcovery of the ſecret of curing and pickling herrings, which he might probably have learned from the people of Yarmouth, and other parts of England, where herrings were not only ſalted and dried for red-herrings, but ſalted and barrelled up wet, at different times, from the year 1306 to 1360. Willughby ſays, that the emperor Charles V. coming to the Low Countries, made a journey to the iſle of Bier Uliet, with the queen of Hungary, on purpoſe to view the tomb of this firſt barreller of herrings. It may be allowed, however, that Bachalen, or Benkelen, might have made ſome improvement in the practice; which his countrymen afterwards contributed to perfect. By their ingenuity and perſeverance they reduced the whole buſineſs of the fiſheries into a regular ſyſtem, which it would be the intereſt of other ſtates to follow. They have likewiſe been wiſely aided from time to time by their reſpective provincial legiſlatures, not only in every privilege and ſupport, but alſo a well digeſted body of laws and regulations, extending to the moſt minute circumſtance, from the commencement of the out-fit to the export of the herrings.

Yarmouth has been long famous for its herring-fair, which was regulated by an act, commonly called the ſtatute of herrings, in the thirty-firſt year of Edward III.

This politic monarch, with a view of promoting the herring trade, became a purchaſer of their fiſh; and, in 1358, fifty laſts of herrings were ſhipped at Portſmouth for the uſe of his army and fleet in France. This practice was adopted by his ſucceſſors down to queen Elizabeth, who alſo enforced the eccleſiaſtical laws reſpecting the obſervance of Lent in favour of the fiſheries. Indeed Yarmouth owed its riſe to the fiſhery, for the place where it now ſtands was only a ſand-bank in the ſea, which in proceſs of time became dry land, and drew thither fiſhermen from various parts of England, and alſo from France and the Low Countries, for the purpoſe of catching herrings. The commencement of this fiſhery appears, from ſeveral concurring circumſtances, to have taken place ſoon after the landing of Cerdic, the Saxon, in 495. (See Yarmouth.) The Yarmouth herrings maintained their reputation, and the inhabitants were reckoned the beſt curers in Europe, ſo that the Dutch were in the number of their foreign cuſtomers. The Yarmouth people have greatly the advantage over the Dutch, in being nearer the herring ſhoals, and alſo in being plentifully ſupplied with wood; whereas the Dutch are obliged to ſmoke their herrings with turf or ſtraw. The fiſhing commences here about the twenty firſt of September, and continues till the twenty-fifth of November. The fiſhing grounds are from 10 leagues N. of Yarmouth to the South Foreland. Their ſmacks or veſſels carry from thirty to fifty tons, and each is equipped with 90 or 100 nets, which are replaced about the middle of the ſeaſon by a freſh ſet, of the ſame quantity and dimenſions. Each veſſel is furniſhed with a well, into which the fiſh are conveyed by a ſort of machine, as ſoon as they are diſengaged from the nets; the bottom of the well being full of holes, through which the blood and water are diſcharged. There are two apartments called wings, one on each ſide of the well, into which the men throw the herrings with ſcoops; a third throws in the ſalt, while a fourth and fifth throw up the herrings to the furtheſt part of the wings. By theſe means they are preſerved till each veſſel hath got in 10 or 12 laſts, when the veſſel returns to Yarmouth road, and the fiſh is removed aſhore in ſmall boats, and conveyed to the fiſh-houſe. Here they are ſalted on the floor, in which ſtate they lie for two days; they are then waſhed in large vats of freſh water, put on the ſpits, and dried with many fires of billet-wood. If the herrings are intended for exportation, they are kept in this ſtate from four to ſix weeks, when they are packed in caſks of 32 gallons; each caſk containing 1000 herrings. One laſt of ſalt cures three laſts of herrings. This ancient fiſhery is now much on the decline; and the town has ſuffered much on this account.

The Dutch began their herring-fiſhery on the twenty-fourth of June, and employed no leſs than ten or eleven hundred veſſels therein. Theſe veſſels are a kind of barks, called *buſſes*, carrying from forty-five to ſixty ton, and two or three ſmall cannon.

Before the eſtabliſhment of the Society of the Free Britiſh Fiſhery, the number of Dutch veſſels employed in this fiſhery was more conſiderable, and amounted to fifteen hundred or two thouſand.

None of them were allowed to ſtir out of port without a convoy, unleſs there were enough of them together to make eighteen or twenty-pieces of cannon; in which caſe they were allowed to go in company. Before they ſat out, they made a verbal convention; which had the ſame force as if it were in writing.

Theſe regulations of the admiralty of Holland were partly followed by the French, and other nations; and partly improved and augmented with new ones; as, that no fiſher ſhould caſt his net within an hundred fathoms of another boat; that while the nets were caſt, a light ſhould be kept on the hind part of the veſſel; that when a boat was by any accident obliged to leave off fiſhing, the light ſhould be caſt into the ſea; that when the greater part of a fleet left off fiſhing, and caſt anchor, the reſt ſhould do the ſame, &c.

By the act for encouraging the Britiſh white herring-fiſhery, in 1750, it is required, that the buſſes employed in this fiſhery, entitled to the bounty of 30*s.* per ton, ſhall be decked veſſels, built in Great Britain, after the commencement of the act; and that each of them ſhall carry twelve Wincheſter buſhels of ſalt, for every laſt of fiſh which ſuch veſſel is capable of holding, and as many more new barrels as ſuch a ſhip is capable of carrying, and two fleets of tanned nets; *i. e.* every veſſel of ſeventy tons ſhall have one fleet of nets, each thirty yards full on the rope, and ſeventeen fathoms deep, and others in proportion; and be provided with one other fleet of fifty like nets, on board a jagger or tender, which is to attend the ſaid fiſhery. Every ſuch buſs properly manned and furniſhed, ſhall proceed either to Braſſey's Sound in Shetland, and be at the rendezvous of the ſaid fiſhery there, on or before the eleventh day of June, but ſhall not ſhoot their net till the thirteenth, and ſhall continue following the ſhoal and fiſhing, as they move ſouthward, to the firſt of October; or to Campbeltown in Argyleſhire, and be at the rendezvous of the ſaid fiſheries on or before the firſt day of December, unleſs they ſhall have ſooner completed their loading of fiſh.

By 26 Geo. III. c. 81. continued by a ſubſequent act, a bounty of 20*s* per ton ſhall be paid annually to the owner of every decked veſſel, not leſs than fifteen tons burden, manned and navigated according to law, employed in the Britiſh white herring-fiſhery under certain regulations, and with the alterations made by 42 Geo. III. c. 79. Every buſs or veſſel to be entitled to the above bounty ſhall be built in Great Britain, and have on board (in new barrels) twelve buſhels of ſalt for every laſt of fiſh, which ſuch ſhip can carry, and alſo 250 ſquare yards of netting, and not leſs than five men for the firſt fifteen tons, and one additional man for every additional five tons; and ſhall clear out from ſome port in Great Britain between June 1ſt and November 20th in the ſame year, and proceed immediately to the ſaid fiſhery, and continue fiſhing three months, unleſs its cargo be completed. On its return the officer of the cuſtoms ſhall examine the condition and lading of the ſhip; and after other documents being produced the commiſſioners of the cuſtoms in England, or the commiſſioners of the cuſtoms or exciſe in Scotland, ſhall cauſe payment to be made to the owner or owners, or his or their aſſigns, the ſum of 20*s.* per ton, according to the admeaſurement of ſuch buſs or veſſels. For every barrel of herrings twice packed and completely cured, which ſhall, during one year, be landed from any veſſel entitled to the aforeſaid bounty of 20*s.* per ton, there ſhall be a bounty of 4*s.* But if the number of barrels of herrings imported ſhall, in one year, exceed the proportion of 2½ barrels of herrings, packed and cured as aforeſaid, for every ton burden of ſuch veſſel, then there ſhall be paid for every barrel ſo exceeding the ſaid proportion a bounty of 1*s.* only. For all herrings which ſhall be landed from any boat or veſſel not entitled to the bounty of 20*s.* per ton, and which ſhall afterwards be properly ſalted and cured, there ſhall be paid a bounty of *s.* per barrel. For the encouragement of the fiſhery, called the Deep ſea fiſhery, over and beſides the bounties before granted, there ſhall be paid the following premiums; *i. e.* for the greateſt quantity of herrings caught by the crew of any one veſſel, entitled to the forementioned bounties of 20*s.* per ton, and 4*s.* and 1*s.* per barrel, and imported by ſuch veſſel between June 1ſt and November 31ſt in any one year, the premium of eighty guineas: for the next greateſt quantity ſixty guineas; and for the next forty guineas; and for the next twenty guineas. By 36 Geo. III. c. 81. the curers of fiſh in Great Britain were allowed to take ſalt, for the purpoſe of curing fiſh, but by the 38th of Geo. III. which ſubjects ſalt to the exciſe duties, and enacts new regulations, this act may be conſidered as virtually repealed, at leaſt as to its principal clauſes. There are other proviſions included in the ſtats. 27 Geo. III. c. 10. 35 Geo. III. c. 56, all which proviſions and powers contained in preceding acts are revived by ſtat. 42 Geo III. c. 79, except as to the bounties, which bounties by this act are as follow: From the 5th of April 1803, one-half of the bounty of 20*s.* per ton, and one-half of the bounties granted by the preceding acts for every barrel of herrings landed from any raft or veſſel, in reſpect of which a bounty of 20*s.* per ton is granted by the ſaid acts, ſhall ceaſe and determine. For other regulations of the herring fiſhery, ſee HERRING.

The manner of fiſhing has nothing particular in it. The nets wherein the fiſh is drawn ſhould regularly have their meſhes an inch ſquare, that none of the leſſer fry may be taken.

The commerce of herring, both white, *i. e.* pickled, and red, is very conſiderable; but there are ſo many different ſorts, prepared in ſuch different ways, and different places, that it is hard to ſay any thing preciſe thereupon.

The white herrings cured by the Dutch uſed to be in the greateſt repute; they were diſtinguiſhed into four kinds, according to their ſizes. The goodneſs of this commodity conſiſts in its being fat, fleſhy, firm, white; being never caught but when in ſeaſon, chiefly in the month of July; being taken alive out of the nets; being ſalted the ſame day it is taken, and with good ſalt, and well barrelled.

The Iriſh herrings have been eſteemed the next in value after thoſe of Holland; and principally thoſe of Dublin, which are ſcarce inferior to the beſt herrings of Rotterdam or Enkuyſen.

It was about the year 1764, that the Iriſh parliament began to frame ſuch laws, and to grant ſuch aids as the nature of the fiſheries ſuggeſted. The principal fiſheries of this country are in Loch Suilly, the Roſſes, Killebegs, and Inverbay, on the coaſt of Donegal; and an inferior kind of herrings is occaſionally taken on the coaſt of Sligo and Mayo, as far ſouthward as Broadhaven. The fiſhery at Inverbay begins in July, and continues till the beginning, or ſometimes the end of September. The other fiſheries commence in November, and end in January. The herrings taken by the Britiſh veſſels are preferred, on account of their being gutted, and cured in barrels of 32 gallons. The Iriſh ungutted herrings, on the other hand, are in ſome parts of the coaſt ſalted in holes dug in the earth, till the fiſhers have an opportunity of ſelling them to the buſſes; they are then packed or piled up in the hold of the veſſel, and are thus carried to Cork, and other ports, when they are put into barrels of 28 gallons, and exported to the Weſt Indies. Of the winter herrings taken in Loch Suilly, 500 will fill a barrel; and of the early herrings, 800. The buſſes are from 20 to 100 tons burden, and are under certain parliamentary regulations, reſpecting netting, and the number of men. The nets are tanned with a mixture of tar and fiſh oil, in the proportion of five parts of tar and one of oil; and improvements have been made in the method of working the nets.

The Scotch herring is not ſo well prepared, gutted, ſalted, or barrelled, as the Dutch; and yet its taſte is excellent, that of thoſe caught on the weſtern coaſt eſpecially; nor is it to be doubted, but that if the Scots were as careful in theſe circumſtances as their neighbours, their herrings would be the beſt in the world.

The whole coaſt of Scotland may be conſidered as one continued fiſhery, diſtinguiſhed, however, by the names of the Shetland, or northern fiſhery, that on the eaſt ſide of the kingdom from the Pentland firth to Berwick, and the weſtern or Hebride fiſhery. The principal town on the Shetland iſlands is called Lerwic, ſituated on a narrow channel of the Main-land, called Braſſa or Braſſey-ſound. Hither the Dutch and other foreigners have been accuſtomed to reſort to the fiſheries at the appointed ſeaſons, when Lerwic hath had all the appearance of a continued market or fair. The eaſtern fiſheries along the eaſtern ſhores of Scotland, though leſs conſiderable than thoſe on the coaſts of Shetland, might with proper attention be of great national benefit. But though the whole line of coaſt from Caithneſs to Berwick is the occaſional reſort of herrings, in their autumnal voyage ſouthward, yet in this courſe of 300 miles, (including the Murray firth,) there is not a fixed or ſtationary fiſhery, ſuch as that at Yarmouth, Donegal, and Gottenburgh, where the herrings arrive almoſt to a certainty, and generally at the ſame period of time. The ſhores on the eaſtern ſide of Scotland, that have been moſt generally explored, and that have produced the greateſt quantity of herring, are thoſe of the Forth and the Murray firth. The herring fiſhery in the Forth was conducted formerly by open boats, which amounted to the number of 6 or 800, and many thouſand barrels of herrings were annually exported, beſides ſupplying the home demand. The coaſt fiſhing on the Murray firth was conducted on the ſame plan, governed by the ſame regulations, and proportionally beneficial to that populous, though remote part of the kingdom. It employed from 5 to 700 boats. Theſe fiſheries, at preſent in a low ſtate, might be extended to any degree; and alſo the deep water fiſhery, to the diſtance of 20 miles from the coaſt, where the herrings are larger and fatter than thoſe taken in the Forth, or near the ſhores, and are nearly equal to the herrings taken in deep lochs of the Weſt Highlands. This deep water fiſhery ſhould be carried on by buſſes or decked veſſels, from 20 to 80 tons burden, which ought to be at the Shetland iſlands early in the ſeaſon, and the produce ſhould be ſpeedily carried to the proper markets; whilſt the buſſes may continue the fiſhery down the channel till the end of the ſeaſon. In this manner the markets would be conſtantly ſupplied, greatly to the benefit of the merchant, the fiſhers, and the labouring poor, along the whole coaſt. The Hebride, or weſtern fiſhery, was frequented in very early times by the French and Spaniards, who trafficked there with the natives for fiſh; whence we may conclude that the natives were fiſhers, and that foreigners were the carriers. It is probable that the fiſhery was then carried on by little open boats, or berlins, ſuch as the Highlanders generally uſe at the preſent day. This fiſhery was the thoroughfare, as we may call it, of the great weſtern ſhoal of herrings, in their annual tour from the Shetland iſlands to Ireland, which, in the opinion of ſome writers, they environ, and from whence they return by the oppoſite channel, in the ſame manner as the eaſtern ſhoals environ Great Britain, and return north by the weſtern channel. This Hebride fiſhery, conſidering the manner in which it was conducted, may be juſtly ſtyled the ſchool of navigation; and on this account, as well as for its produce, deſerves Britiſh encouragement. As a nurſery of ſeamen, the boat fiſhery will exceed that of the buſſes with regard to numbers of perſons employed; but, on the other hand, it cannot be put into competition with the buſſes in reſpect of nautical knowledge.

The herring fiſhed in England is inconſiderable; the fiſh being too dry for the market. However, at Yarmouth and Leoſtoff they have in former times taken and cured about 50,000 barrels of red-herrings in a year; and very large quantities are alſo caught at the mouth of the Thames by the fiſhing-ſmacks of London, Folkſtone, Dover, Sandwich, &c. for the London markets, and near the ſea-coaſt of Kent and Suſſex for general conſumption. Some ſhoals are alſo forced, by the great ſwell of the Atlantic, into the Briſtol channel, and particularly into the bay of Barnſtaple, where they have been ſometimes taken and cured for exportation, in very conſiderable quantities.

Curing and preparing herrings.—1. For *white* or *pickled herrings:* as ſoon as the herrings are taken out of the ſea, one of the crew, appointed for this office, cuts them open, and takes out the guts, and every thing but the milts and roes, which are always to be left in the body of the fiſh. Then waſhing them in freſh water, they are left the ſpace of twelve or fifteen hours in a tub full of ſtrong brine made of freſh water, and ſea-ſalt.

When they are taken out, they drain them; and when well drained, put them up in barrels; taking care to diſpoſe and range them evenly, in rows, or layers, preſſing them well down, and ſtrewing a layer of ſalt both at top and bottom.

When the barrel is full, they ſtop it up very cloſe, that no air may get in, nor any brine out; either of which is very prejudicial to the fiſh.

The Dutch, after opening and gutting the herrings, cure and ſalt them by lining or rubbing their inſide with ſalt; they are then packed, with handfuls of ſalt between each row, and ſtopped up cloſe.

2. For *red-herrings:* the fiſh being caught, they proceed to waſh, gut, and lay them in brine, as for pickled herrings; only they let them lie double the time in brine, *viz.* twenty-four hours; inaſmuch as they are to take all their ſalt here, whereas the other kind takes half its ſalt in the barrel.

When the herrings are taken out of the brine, they ſpit them, *i.e.* ſtring them by the head on little wooden ſpits, and thus hang them in a kind of chimney, made for the purpoſe; and when the chimney is as full as it will hold, which leſs than ten or twelve thouſand ſeldom effects, they make a little fire underneath, of bruſh-wood, which yields a deal of ſmoke, but no flame.

Here the herrings remain till ſufficiently ſmoked and dried; which ordinarily is in twenty-four hours. Then they are taken down and barrelled up for keeping.

Their goodneſs conſiſts in being large, freſh, fat, oily, ſoft, and pliable, their outſide of a yellow, golden colour; their having roes, or milt, within them, and being well ſalted and barrelled. See Herring.

Fishery, *Ling.* This fiſh abounds near the Scilly iſles, and on the Yorkſhire coaſt. In the latter ſituation they are in perfection from the 1ſt of February to the 1ſt of May, and ſome till the end of that month. In June they ſpawn, depoſiting their eggs in the ſoft oozy ground of the mouth of the Tees. At that time the males ſeparate from the females, and reſort to ſome rocky ground near Flamborough Head, where the fiſhermen take great numbers without ever finding any of the female or roed fiſh among them. While a ling is in ſeaſon its liver is very white, and abounds with a fine flavoured oil; but when the fiſh goes out of ſeaſon the liver becomes red, like that of a bullock, and affords no oil. When the fiſh is in perfection, a very large quantity of oil may be melted out of the liver by a ſlow fire; but if a violent ſudden heat be uſed for that purpoſe they yield very little. Great quantities of ling are ſalted for exportation, as well as for home conſumption. When it is cut or ſplit for curing, it muſt meaſure 26 inches or upwards from the ſhoulder to the tail; if leſs than that, it is not reckoned a ſizeable fiſh, and conſequently not entitled to the bounty on exportation; ſuch are called drizzles, and are in ſeaſon all ſummer. The uſual ſize of a ling is from three to four feet; but ſome have meaſured ſeven feet.

Fishery, *Lobſter*. Lobſters are taken along the Britiſh channel, and on the coaſt of Norway, whence they are brought to London for ſale; and alſo in the frith of Edinburgh, and on the coaſt of Northumberland.

By 10 & 11 W. III. cap. 24. no lobſter is to be taken under eight inches in length, from the peak of the noſe to the end of the middle fin of the tail; and by 9 G. II. cap. 33. no lobſters are to be taken or deſtroyed on the coaſt of Scotland from the firſt of June, to the firſt of September, on pain of 5*l*.

Fishery, *Mackarel*. The mackarel is a ſalt-water fiſh, without ſcales. Its body is round and fleſhy; terminating almoſt in a point, at each extreme.

Some perſons, well ſkilled in naval architecture, hold its figure the moſt commodious for ſwimming of all others, and propoſe it as a model for the building of ſhips.

It is ordinarily about a foot long; when in the water it appears yellow, and when out of it of a ſilver white, excepting four ſtreaks, or ſpeckles, of a deep blue, on the back and ſides. Its uſual weight is about two pounds. During winter a film grows on the eyes of this fiſh; in the ſpring they are half blind; and in ſummer the film is caſt. See Mackarel.

The mackarel is a ſummer fiſh of paſſage, found in large ſhoals in divers parts of the ocean, not far north; but eſpecially on the French and Engliſh coaſts.

The fiſhing is uſually in the months of April, May, and June, and even July, according to the place. They enter the Engliſh channel in April, and proceed up to the ſtreights of Dover, and the mouth of the Thames, as the ſummer advances; ſo that by June they are on the coaſts of Cornwall, Suſſex, Normandy. Picardy, &c. where the fiſhery is moſt conſiderable. An inferior ſort is alſo taken during the harveſt months. They are an excellent food, freſh, but their taſte and flavour are much impaired a few hours after they are taken; and not to be deſpiſed when well prepared, pickled, and put up in barrels; a method of preſerving them chiefly uſed in Cornwall.

Naturaliſts have obſerved, that the water wherein mackarel have been boiled, often yields a light, after ſtirring it a little. See Fire, and *luminouſneſs of the* Sea.

The fiſh is taken two ways; either with a line, or nets: the latter is the more conſiderable, and is uſually performed in the night time. The rules obſerved in the fiſhing for mackarel are much the ſame as thoſe already mentioned in the fiſhery of herrings.

There are two ways of pickling them: the firſt is, by opening and gutting them, and filling the belly with ſalt, crammed in as hard as poſſible with a ſtick; which done, they range them in ſtrata or rows, at the bottom of the veſſel, ſtrewing ſalt between the layers.

In the ſecond way, they put them immediately into tubs full of brine, made of freſh water and ſalt; and leave them to ſteep, till they have imbibed ſalt enough to make them keep; after which they are taken out, and barrelled up, taking care to preſs them cloſe down.

Mackarel are not cured or exported as merchandize, except a few by the Yarmouth and Leoſtoff merchants, but are generally conſumed at home; eſpecially in the city of London, and the ſea-ports between the Thames and Yarmouth, eaſt, and the Land's End of Cornwall, weſt. By ſtat. 35 Geo. III. c. 54. the curers of mackarel in Great Britain may import any quantity of foreign ſalt, or take any quantity of Britiſh ſalt, from any ſalt-works and ſalt-pits, and remove coaſt-wiſe the ſalt ſo imported, or taken for the purpoſe of curing mackarel (or any cod, ling, hake, or ſalmon, being taken in the mackarel fiſhery) for home conſumption, duty free, except the cuſtoms due on importation, in as full a manner as the herring and pilchard fiſhery are enabled to do for home conſumption. For every barrel of white mackarel, twice packed, and completely cured, containing 32 gallons, which ſhall be exported from Great Britain into any parts beyond ſeas, (except into any part of the Mediterranean) a bounty of 2*s.* 8*d.* ſhall be paid; and for every barrel of mackarel which ſhall be landed from any boats or veſſels, and which ſhall be properly ſalted and cured, ſhall be paid a bounty of 1*s.*

Fishery, *Oyſter*, is principally carried on at Colcheſter, in Eſſex; Feverſham and Milton, in Kent; the Iſle of Wight; the Swales of the Medway; and Tenby, on the coaſt of Wales. From Feverſham, and adjacent parts, the Dutch have ſometimes loaded a hundred large hoys with oyſters in a year. They are alſo taken in great quantities near Portſmouth, and in all the creeks and rivers between Southampton and Chicheſter; many of which are carried about by ſea to London and to Colcheſter, to be fed in the pits about Wavenhoe, and other places. By 31 G. III. c. 51. if any perſon ſhall within any net, traul, dredge, or any other engine, take or catch any oyſter or oyſter brood, within the limits of any oyſter fiſhery in this kingdom, or uſe any ſuch engine for the purpoſe of catching oyſters or oyſter brood, though none be taken; or drag upon the ground of any ſuch fiſhery with any net or other engine; every ſuch perſon, except the owner, leſſee, or occupier of the ſaid fiſhery, or perſon lawfully entitled to catch oyſters therein, ſhall be deemed guilty of a miſdemeanor, and may be indicted at the aſſizes or quarter ſeſſions for the county or diviſion; and every ſuch offender being convicted by verdict before the juſtices in ſeſſions, or on his own confeſſion, may be puniſhed by fine and impriſonment, or either of them, as the court may think proper; ſuch fine not to exceed 20*l.* or be leſs than 40*s.*; and ſuch impriſonment not to be for more than three months, nor leſs than one month. Offenders may be apprehended by warrant of any juſtice, who may commit them to the common gaol or other priſon, until the next aſſizes or quarter ſeſſions, unleſs they enter into recognizance with two ſureties in 20*l.* each to appear and anſwer to ſuch indictment, &c. See Oyster.

Fishery, *Pearl*. See Pearl *fiſhery*.

Fishery, *Pilchard*. The pilchard is a ſmall ſalt-water fiſh, bigger than the anchovy, but leſs than the herring, which in other reſpects it reſembles. Its head is yellow; its belly white; and its back a ſea-green. It is excellent when freſh, or lightly ſalted. See Pilchard.

There are certain ſeaſons for fiſhing the pilchard; which, like the herring and anchovy, is a fiſh of paſſage from the northern latitudes; and its arrival is indicated by ſimilar ſigns with thoſe of the herrings. They are prepared and ſalted much as the anchovy is; with this difference, that the head is cut off the latter: but the pilchard is diſtinguiſhable from the anchovy, even though its head were off likewiſe; the pilchard having a very flat back, and the anchovy a round one.

The chief pilchard fiſheries are along the coaſts of Dalmatia, to the ſouth of the iſland Iſſea; on the coaſts of Bretagne, from Belle iſland as far as Breſt; and along the coaſts of Cornwall and Devonſhire; when they appear about the middle of July, and range between Fowey harbour and the Scilly iſlands about September; ſome few occaſionally returning after Chriſtmas.

It is a ſaying of the Corniſh men, with regard to the pilchard, that it is the leaſt fiſh in ſize, moſt in number, and greateſt in gain, of any they take out of the ſea. This obſervation is amply confirmed by Dr. Borlaſe's account of this fiſhery; for beſides the great number of perſons employed by it, the poor are fed with the offals of the captures, the land with the refuſe of the fiſh and ſalt, the merchant finds the gains of commiſſion and commerce, and the fiſherman the gains of the fiſh. The uſual produce of the number of hogſheads exported each year, for ten years, from 1747 to 1756 incluſive, from the four ports of Fowey, Falmouth, Penzance, and St. Ive's, amounted to 29,795 hogſheads. Every hogſhead for ten years laſt paſt, together with the bounty allowed for each hogſhead exported, and the oil made out of each, has amounted, one year with another, at an average, to the price of 1*l.* 13*s.* and 3*d.*; ſo that the caſh paid for pilchards exported has, at a medium, annually amounted to the ſum of 49,532*l.* 10*s.* The number taken at one ſhooting out of the nets is amazingly great. In 1767, there were at one time incloſed in St. Ives's bay 7000 hogſheads, each hogſhead containing 35,000 fiſh; in all 245,000,000*l.*

That on the coaſts of Dalmatia is ſo plentiful, that it not only furniſhes all Greece, but a great part of Italy. That on the coaſts of Bretagne has employed yearly above three hundred ſloops, and moſt of the ſeamen of the country.

The fiſh caught on our own coaſts, though bigger, are not ſo much valued as thoſe on the coaſts of France; owing principally to their not being ſo thoroughly cured.

The ſeaſon is from June to September.

The pilchards, like the herrings, naturally follow the light, and will gather about a boat that bears a light in the night time; which contributes much to the facility of the fiſhery.

On the coaſts of France they make uſe of the roes of codfiſh as a bait; which thrown into the ſea makes them riſe from the bottom, and run into the nets placed for that purpoſe.

On our coaſts there are perſons, called in Cornwall *huers*, poſted aſhore, who, ſpying by the colour of the water where the ſhoals are, make ſigns to the boats, to get among them, to caſt their nets.

When taken, the fiſh are brought to a warehouſe on ſhore, where they are laid up in broad piles, ſupported by backs and ſides.

As they pile them, they ſalt them with bay-ſalt; in which they lie ſoaking twenty or thirty days, and diſcharge a great quantity of blood, with dirty pickle, and bittern; which laſt draws much of the oil from the fiſh, to the great loſs of the owners. When taken out of the pile, there remains a quantity of ſalt, blood, ſcales, &c. at bottom, which, with freſh ſalt, ſerves for another pile.

They now proceed to waſh them in ſea-water to clear off the dirt and blood; and, when dry, they put them up in barrels, and preſs them hard down to ſqueeze out the oil, which iſſues away at a hole in the bottom of the caſk; and in this ſtate they are fit for ſale or uſe.

Fishery, *Salmon.* The ſalmon is a northern fiſh, occupying the European ſeas, the latitudes lying between France and Greenland, being unknown in the Mediterranean ſea, and other warm climates, and, according to ſome, breeds in the ſea: but the opinion of others ſeems better warranted, that it breeds in the clear ſandy parts of rivers, remote from their mouths. They commonly ſpawn in November; and when they have found a place fit for the purpoſe, the male and female unite in forming a proper receptacle for it in the ſand or gravel, about the depth of eighteen inches; in this the female depoſits her ſpawn, and the male his milt, which they cover carefully, as it is ſaid, with their tails; for after ſpawning, they are obſerved to have no ſkin on that part. The ſpawn lies buried till the ſpring. The milter and ſpawner, having performed their office, betake themſelves to the ſea; and if their return be prevented by weirs, or the like, they become ſick, lean, and are then called *kipper*, pine away, and die in two years time. If they ſpawn in the mean time, the produce is a diminutive ſalmon, called *ſkegger*, which will never arrive at the natural bulk; it being the ſea that makes them grow big, and the rivers fat. The female is diſtinguiſhed from the male, in that its noſe is longer, and more hooked, its ſcales not ſo bright, and its body ſpeckled over with dark brown ſpots, its belly flatter, and its fleſh not ſo red; more dry, and leſs delicious to the taſte. In ſpawning time, when they repair from the ſea up to the rivers, ſcarce any thing can ſtop their progreſs. Many have ſeen them leap up cataracts and precipices many yards high They will aſcend rivers 500 miles from the ſea, and force themſelves againſt the moſt rapid ſtreams. They are frequently taken in the Rhine as high as Baſil in Switzerland; they gain the ſources of the Lapland rivers notwithſtanding their ſtrong torrents; and ſurmount the perpendicular fall acroſs the Liffy, at Leixlip, 7 miles above Dublin, though nearly 30 feet in height. As ſoon as they come to the bottom of the caſcade, they ſeem diſappointed on meeting the obſtruction, and retire ſome paces back; they then review the danger that aſſails them, ſurvey it without motion, advance, and again retreat; till at laſt, ſummoning up all their force, they take a leap from the bottom, with the body quite ſtraight, and with a ſtrong tremulous motion; and they moſt frequently clear every obſtruction. It ſometimes happens, however, that they want ſtrength to make the leap, in which caſe they are entangled in their deſcent by baſkets placed on purpoſe, from which they cannot eſcape. The ſhooting of ſalmon, in their leap, is ſometimes practiſed for amuſement. See Salmon.

When the ſalmon firſt enter the freſh water, they have a number of inſects, the *lerneæ ſalmoneæ* of Linnæus, adhering to them, eſpecially above the gills, which are ſigns that the fiſh is in high ſeaſon: theſe die and drop off ſoon after the ſalmon have left the ſea. About the latter end of March the ſpawn begins to exclude the young, which gradually increaſe to the length of four or five inches, and are then termed ſmelts or ſmouts; and about the beginning of May the Tweed, &c. is full of them; but they are ſoon hurried away to the ſea. About the middle of June, the earlieſt of the fry begin to drop, as it were, into the river again from the ſea, being about twelve, fourteen, or ſixteen inches, and they gradually increaſe in number and ſize till about the end of July (at Berwick the fiſh in this ſtage is called gilſe); when they again leſſen in number and increaſe in ſize, ſome being, in Auguſt, ſix, ſeven, eight, or nine pounds in weight.

The chief ſalmon fiſheries in Europe are along the coaſts of England, Scotland, and Ireland. The fiſhing uſually begins about the firſt of January, and ends by the laſt of September. It is performed with nets, in the places where the rivers empty themſelves into the ſea, and along the ſea coaſts thereabout. The fiſh are ſeen to crowd thither frequently in ſhoals from all parts in ſearch of the freſh water; they alſo fiſh for them higher up in the rivers: ſometimes with nets, and ſometimes with a kind of locks, or weirs, made for the purpoſe, with iron grates therein, ſo diſpoſed, as that the fiſh, in going up the river, open them with their head; but are no ſooner entered than the gate claps to. Thus the ſalmon are incloſed as in a reſervoir, where it is eaſy to take them. In ſome places they fiſh for ſalmon in the night time, by the light of torches, or kindled ſtraw. The fiſhermen watch when the fiſh draws towards the light, whereof he is naturally a great lover, and ſtrikes him with a ſpear or liſter. In ſome parts of Scotland it is ſaid, they ride a fiſhing up the rivers, and, when they ſpy them in the ſhallow parts, ſhoot them with fire-arms.

Salmon form, in ſeveral countries, a great article of commerce; being cured in different ways, by ſalting, pickling, and drying. There are ſtationary fiſheries in Iceland, Norway, and the Baltic; but thoſe at Coleraine in Ireland, at Berwick in Great Britain, and in ſome of the rivers of Scotland, are the moſt conſiderable. The capture in the Tweed near Berwick, about the month of July, is prodigious; a boat load, and ſometimes near two, are taken in a tide; and it is common to take from fifty to a hundred fiſh at one hawl. At this time the coopers in Berwick begin to ſalt both ſalmon and gilſes in pipes, and other large veſſels, and then barrel them to ſend abroad. The ſalmon barrel holds above forty-two gallons, wine meaſure. Moſt of the ſalmon taken before April is ſent freſh to London; and that which they fail to ſend is boiled, pickled, and kitted. Freſh ſalmon has alſo been ſent to London in the latter end of September; but then the fiſh are full of large roes, very thin bellied, and are eſteemed neither palatable nor wholeſome. In the month of July a ſtone of freſh ſalmon, of eighteen pounds ten ounces and a half, has been ſold at Berwick for eight-pence; but the more common price is between ſixteen-pence and two ſhillings and ſix-pence. The ſeaſon for fiſhing in the Tweed begins the thirtieth of November, though the fiſhermen work very little till after Chriſtmas, and ends on Michaelmas day. There are on this river forty-one conſiderable fiſheries, beſide others of leſs value, which formerly rented for near 5400*l.* per annum.

Scotland poſſeſſes alſo great numbers of fine fiſheries on both ſides of that kingdom. The ſalmon are cured in the ſame manner as at Berwick; and a great quantity is ſent to London in the ſpring; but after that time the adventurer begins to barrel and export them to foreign countries; though the demand for them is much abated of late years. They have alſo in Scotland a great deal of ſalmon, ſalted in the common way, which, after ſoaking in brine for a competent time, is well preſſed, and then dried in ſmoke: this is called *kipper*, is chiefly made for home conſumption, and, if properly cured and prepared, is reckoned very delicious food. The great fiſheries are thoſe of the Tweed, the Forth, the Tay, the Dee, the Don, the Devron, the Spey, the Findhorn, the Neſs, the Braulie, and thence northward to Dungſbay head, the coaſt of the Pentland firth, the coaſt from cape Wrath to the Mull of Cantire, all the Hebride iſlands, and the coaſts of Airſhire, Galloway, and the Solway firth, where the rivers, bays, or lakes are open. The ſeaſon of fiſhing at Aberdeen is from the 30th of November to the 8th of September; but few fiſh come into the rivers before the 1ſt of January, from which time, to the middle of May, the ſalmon are boiled and killed for the London market, and ſent off almoſt every week, by ſwift ſailing ſloops, called ſmacks, retained for the purpoſe. Thoſe that are caught through the ſummer are ſalted for foreign exportation. No ſalmon is allowed to be barrelled and cured, except by the town's coopers, who are required to put the initial letters of their names on their barrels; nor can they be ſhipped for exportation till the letters A. B. D. have been burned on each barrel, by an officer appointed for that purpoſe. No fiſh that hath been bit by ſeals, none under a certain fixed weight, nor any that have been damaged in the carriage from the river, are to be put into a barrel, without having the word *rebate* burned on the end of the caſk. The barrels are of a fixed ſize, containing about 250 pounds of fiſh, ſo carefully packed that they do not differ a pound of fiſh from one another. After they are packed from the vats in which they had been ſalted, great care is taken to keep them brim full of pickle, till the bungs are fixed down, a day or two before they are ſhipped. By this attention the Aberdeen ſalmon hath acquired ſuch a character abroad, that it generally fetches the higheſt price, and no queſtions are aſked reſpecting the quality.

The north of Ireland abounds with this fiſh: the moſt conſiderable fiſhery is at Cranna, about a mile and a half from Coleraine, rented, in 1754, for 620*l.* a year. It is ſituated on the river Bann, where they fiſh with nets eighteen ſcore yards long, and are continually drawing night and day through the whole ſeaſon, which laſts about four months; eight hundred and forty fiſh have been taken at a ſingle draught. There is alſo a weir on the river, which takes the fiſh that eſcape the nets. In 1760, three hundred and twenty tons were taken in the Cranna fiſhery. The ſalmon are cured in this manner: they are firſt ſplit, and the guts and gills, and many of the bones, are taken out, and then rubbed with fine ſalt; and after lying in pickle in large tubs for ſix weeks, are packed up with layers of coarſe brown Spaniſh ſalt in caſks, ſix of which make a ton. Theſe are exported to Leghorn and Venice, &c. at the price of twelve or thirteen pounds a ton. Pennant's Brit. Zool. v. iii. p. 284. 294. See a further account of this fiſhery under Coleraine.

The ſtat. 4 & 5 Anne, cap. 21. was made for the increaſe and preſervation of ſalmon in rivers in the counties of Southampton and Wilts, requiring that no ſalmon be taken between the firſt of Auguſt and the twelfth of November, or under ſize, &c. And by 1 Geo. I. cap. 18. ſalmon taken in the rivers Severn, Dee, Wye, Were, Ouſe, &c. are to be eighteen inches long, at leaſt; and the nets ſhall not be leſs than 2½ inches in the meſh; nor ſhall any ſalmon be ſent to London out of the ſaid rivers under ſix pounds weight; or the perſons catching them ſhall forfeit 5*l.* This ſtatute contains ſeveral other regulations. And by 30 Geo. II. cap. 21. no ſalmon is to be caught in the rivers Thames and Medway between the eleventh of November and twenty-fourth of Auguſt, or to be of leſs weight than ſix pounds.

Salmon is alſo fiſhed for in rivers, after the manner of trout, with a line and hook. He bites beſt in the afternoon, about three, in May, June, July, and Auguſt; the water being clear, and a little breeze of wind ſtirring; eſpecially if the wind and ſtream ſet contrary ways. The ſalmon is caught like a trout, with worm, fly, and minim; and eſpecially the garden-worm, if well ſecured, and kept twenty days in moſs. The ſalmon never ſtays long in a place, but is continually ſhifting to be as near the ſpring-head as poſſible, and ſwimming generally in the deepeſt and broadeſt parts of the rivers, near the ground. Put two or three garden-worms well ſcoured on your hook at once, as if you were baiting for trout: and be ſure to give him time to gorge his bait, before you ſtrike. Some uſe a wire-ring on the top of the rod, through which the line may be let run to any length at pleaſure, by a reel near the hand.

Fishery, *Seal*, &c. The fiſhery for ſeals is very productive and gainful. The ſkin of the ſeal is tanned and made into ſhoes, commonly called dog-ſkin ſhoes; it alſo ſerves for the bottoms of chairs, and for various other purpoſes. The oil is uſed in chambers, and ſells at a much higher price than that of the cod-fiſh, which is burned in ſtreet-lamps. The greateſt ſeal fiſhery is on the coaſt of Labrador in North America. The boats uſed in the cod-fiſhery of Newfoundland are about 50 feet in length, decked at both ends; they have two maſts, and a ſhort bowſprit; they are built of fir or ſpruce, and will ſail, as the ſeamen ſay, in the wind's eye. In the winter ſeaſon, when the Newfoundland cod-fiſhery is finiſhed, theſe boats, with 30 or 40 men in each, repair to the frozen ſhores of Labrador, where the winds and tides often drive immenſe floats of ice into the bays, and on theſe floats a great number of ſeals. As the boats belong to different merchants, the float of ice is marked out in equal portions, and each boat's crew are ſtrictly limited to the part aſſigned them. Having ſettled theſe regulations, they attack the ſeals in their reſpective departments. The firſt man of the party advances towards a ſeal, which he ſtrikes immediately above the noſe with a club; then attacks another and kills it; and marches forward to a third, which he alſo kills. Thus advancing, the whole field of ice becomes a ſcene of blood, ſtrewed with dead ſeals. When the firſt ſeal is killed, the next perſon in rank tears off the ſkin, which he leaves on the ſpot, and advances to the ſecond, and ſo on. A third perſon takes a layer of fat, with which the ſeal is covered next the ſkin, which he leaves on the ſpot, and immediately follows the two others. Thus the killer, the flayer of ſkin and of fat, with the remaining crew, will ſometimes clear to the value of 500*l.* within the interval of 24 hours. When this happens, they return with what they call a full cargo, which abundantly reimburſes their employers. The ſeal-fiſhing in Scotland is in ſome reſpects ſimilar. The Scottiſh ſeas are open through the whole year, and the ſeals, being of the amphibious kind, frequent the caverns and openings of the rocks upon the ſhore, where they bring up their young. The Hebrides, and the northern ſhores of the main land, are the principal reſort of the ſeals. On the weſtern coaſt of North Uiſt, a part of the Long iſland, lies the rock Conſmil, about a quarter of a mile in circumference, which is ſtill famous for the yearly fiſhing of ſeals there the end of October. This rock belongs to the farmers of the adjacent lands; one of whom furniſhes a boat, to whom a particular ſhare is due on that account, beſides his proportion as a tenant. The miniſter, ſteward, and ſubordinate officers have their ſhares by virtue of their reſpective offices. The farmers man their boats with a competent number of perſons; and when the crew are landed, a ſignal is given for a general attack, the paſſes being ſurrounded, and they beat down the ſeals with their ſtaves. The ſeals on this onſet make towards the ſea with full ſpeed, and often force their paſſage over the necks of the ſtouteſt aſſailants, who always aim at the foreheads of the ſeals, giving many blows before they are killed; and ſometimes the ſeals lay hold of the ſtaves with their teeth, and carry them away to the ſea. Thoſe that are in the boat ſhoot at them as they run to ſea, but few are caught that way. Some of the largeſt ſeals loſe their lives by endeavouring to ſave their young, which they tumble before them towards the ſea, and in this act they are cruelly knocked on the head with ſticks or ſtaves. Three hundred ſeals, it is ſaid, have been killed at one time in this place. They are attacked in October, becauſe in the beginning of this month they bring forth their young on the weſt ſide of theſe iſlands; but thoſe on the eaſt ſide are of a ſmaller ſtature, and bring forth their young in the middle of June.

The ſeals eat no fiſh till they firſt take off the ſkin; they take hold of the fiſh between their teeth, and pluck the ſkin off each ſide with their ſharp-pointed nails. The natives ſay that the ſeals are regularly coupled, and reſent an encroachment on their mates at an extraordinary rate. It is ſaid that the ſeals make their mutual addreſſes by ſalutations; and the female puts away its young as ſoon as it is able to provide for itſelf, in doing which it recurs to many ſevere blows. In the ſkin of the females there is a hole, within which the teats are ſecure from injury, as it creeps along the rocks and ſtones; and on this account nature has formed the point of the tongue cloven, in order to enable the young to ſuck. The natives ſalt the ſeals with the aſhes of burnt ſea-ware, and ſay they are good food. The vulgar eat them commonly in the ſpring, and uſe a long pointed ſtick inſtead of a fork, to prevent the ſtrong ſmell which their hands would otherwiſe retain for ſeveral hours afterwards. This four-footed creature is reckoned one of the ſwifteſt in the ſea: and it is likewiſe ſaid, that in cold weather it will leap to the height of a pike above water; that the ſkin of it is white in ſummer, and darker in winter; and that its hair ſtands up with the flood, and falls again at the ebb. The natives cut the ſkin in long pieces, and uſe them as ropes to fix the plough to their horſes when they till the ground.

The *baſking ſharks* are ſuppoſed to be migratory fiſhes from the Arctic circle; they frequent the coaſt of Norway, the Orkney and Hebride iſles, the firth of Clyde, the bay of Ballyſhannon in Ireland, and the weſt coaſt of Wales, particularly Carnarvonſhire and Angleſey. They appear in the firth of Clyde, near the iſle of Arran, in ſmall ſhoals of ſeven or eight, but more generally in pairs, ſome time in June, and remain till the end of July, when they diſappear. Although they are in ſize from 10 to 40 feet in length, they are ſo tame and ſtupid, that they will ſuffer themſelves to be ſtroaked in the water. They lie on the ſurface, ſometimes on their bellies, and ſometimes on their backs, as if they were aſleep. When the harpooner ſtrikes his weapon into them, which he does as near the gills as poſſible, and they perceive themſelves wounded, they fling up their tail and plunge headlong into the bottom, coiling the rope round them in their agonies, and attempting to diſengage the harpoon by rolling on the ground. As ſoon as they find that their efforts are ineffectual, they ſwim away with ſuch rapidity and violence, that a veſſel of 70 tons has been towed away by them againſt a freſh gale. They ſometimes run off with 200 fathoms of line, and with two harpoons in the body; and will contend for 24 hours before they are ſubdued. When they are killed, the liver, which is the only uſeful part, is taken out and melted in kettles provided for that purpoſe. A large fiſh, particularly the female, will yield eight barrels of oil, two of uſeleſs ſediment, and afford a profit of 20*l.* The oil is of the moſt valuable kind, being pure and ſweet, extremely proper for lamps, and much valued by tanners. It is alſo uſed by the fiſhers for curing burns, bruiſes, and rheumatic complaints.

The catching of *ſea-dogs* is a kind of defenſive fiſhery. Theſe animals, though ſcarcely exceeding the ſize of a large cod, are equally deſtructive to nets, and to all the ſpecies of fiſh which they can overcome. They had become ſo offenſive on the coaſts of Newfoundland and Labrador, that the enraged fiſhermen made war upon them as a common enemy, and with ſuch ſucceſs, that they have almoſt extirpated the whole ſpecies from the American ſhores. They abound on the coaſt of Shetland, particularly the Hebrides, where they are taken in conſiderable numbers. Being ſplit and dried, they are conveyed by the women through different parts of the country, and ſold or exchanged for neceſſaries; theſe forming a petty inland commerce.

Fishery, *Sturgeon*. The ſturgeon is a large ſea-fiſh, which at its ſeaſon runs up the rivers; having a ſharp-pointed ſnout, a flat belly, and blueiſh back. Sturgeons, as well as whales, are reckoned among the number of royal fiſhes.

There are ſturgeons of all ſizes; and we even read of ſome twenty feet long; but the middle ſize are reckoned the beſt; though ſome prefer the ſmaller. See Sturgeon.

It is of the roe or eggs of this fiſh that the cavear, or kavia, ſo much prized by the Italians, &c. is prepared. See Cavear.

Sturgeon, when freſh, eats deliciouſly. To make it keep, they ſalt or pickle it in large pieces, and put them up in cags, from twenty-five to fifty pounds.

The greateſt ſturgeon fiſhery in the world is in the mouth of the Volga, in the Caſpian ſea; where the Muſcovites find employment for a great number of men. We have alſo had a conſiderable ſupply of ſturgeon from North America, which rivals that of the Baltic.

They are not caught in nets, but in a kind of incloſure, formed by huge ſtakes, diſpoſed in triangles, repreſenting the letter Z ſeveral times repeated. Theſe kinds of fiſheries are open on the ſide towards the ſea, and cloſe on the other; by which means the fiſh, aſcending in its ſeaſon up the river, embarraſſes itſelf in theſe narrow angular retreats; and not being able to turn itſelf, to go back again, on account of its bulk, is eaſily ſtruck, and killed with a ſort of harping-iron. They are alſo taken during ſummer, in the lakes Friſchechaff and Curiſchhaff, near Pillau, in large nets, made of ſmall cord; the adjacent ſhores are formed into diſtricts, and farmed out to companies of fiſhermen; ſome of which are rented for ſix thouſand guilders, or near 300 *l.* *per annum.*

The chief object of this fiſhery is the roe or ſpawn, which is a commodity as much uſed in Muſcovy as butter in Holland; and there are ſome ſturgeons that furniſh each four hundred pounds thereof. It is only the leſſer and younger ſturgeon that they pickle for eating.

Fishery, *Turbot*. The method of taking turbot and other fiſh by the people of Scarborough is this: when they go out to fiſh for turbot, each perſon is provided with three lines; each man's lines are fairly coiled upon a flat oblong piece of wicker-work. The hooks being baited and placed very regularly in the centre of the coil, each line is furniſhed with 14 ſcore of hooks, at the diſtance of ſix feet two inches from each other. The hooks are faſtened to the lines upon ſneads of twiſted horſe-hair, 27 inches in length. When fiſhing, there are always three men in each coble, and conſequently nine of theſe lines are faſtened together, and uſed as one line, extending in length nearly three miles, and furniſhed with 2520 hooks. An anchor and buoy are fixed at the end of each man's line; in all four anchors, which are commonly perforated ſtones, and four buoys are made of leather or cork. The lines are always laid acroſs the current, and remain upon the ground about ſix hours. The coble is 20 feet 6 inches long, and five feet in extreme breadth: it is about one ton burden, rowed with three pair of oars, and admirably conſtructed for the purpoſe of encountering a mountainous ſea. When the wind ſuits, they hoiſt a ſail.

Fishery, *Whale*, or *Greenland* Fishery. This huge fiſh, we have elſewhere obſerved, chiefly caught in the North ſea. The largeſt ſort are found about Spitzbergen, ſome of them being there two hundred feet in length. Thoſe on the coaſts of America are about ninety, or a hundred; and thoſe on the coaſt of Guyenne, and the Mediterranean, are the ſmalleſt of all.

The firſt perſons that ſeem to have been employed in the whale fiſhery were the Norwegians, probably ſoon after their diſcovery of Greenland, about the year 837: for we find that king Alfred received information from Octher, a Norwegian, in 887 or 890, that the Norwegians were employed in this fiſhery. He tells the king, that he ſailed along the Norway coaſt, as far north as the whale-hunters commonly uſed to travel; but it ſeems that all knowledge of this gainful employ was loſt, at leaſt in this country, for almoſt ſeven centuries. The Biſcayners were alſo concerned in it, for the ſake not only of the oil, but alſo of the whale-bone, before the Engliſh; for, though their north-eaſt diſcoveries in 1553 had pointed out the way to the whale-fiſhery at Spitzbergen, they were ſo ignorant of the buſineſs in 1575, as to be under a neceſſity of procuring information and aſſiſtance from Biſcay for this purpoſe. The firſt mention that occurs in the Engliſh hiſtory of whale-fins, or whale-bone, is in 1593, when eight hundred fins, part of the cargo of ſome Biſcay ſhips, that had been wrecked three years before, were brought to England from the bay of St. Laurence in America by an Engliſh ſhip; previous to which time, the ladies' ſtays, as Mr. Anderſon obſerves, muſt have been made of ſplit or ſome other tough and pliant wood; the whale fiſhery being carried on for the ſake of the oil long before the diſcovery of the uſe of the whale-bone, which was firſt brought to England, with the blubber or oil, in 1617. The Engliſh, having been accuſtomed to the Northern ſeas, by their repeated trials for a north-weſt and north-eaſt paſſage to China, in 1598 commenced their fiſhery for whales at or near Spitzbergen, where thoſe animals reſort in greater numbers than any where elſe. But the firſt Engliſh voyage for the purpoſe of killing whales was undertaken by the Ruſſian company in 1611, who ſent two ſhips thither, with ſix Biſcayners, expert in the buſineſs; the ſhips were loſt, though their men and boats, &c. were ſaved by a ſhip of Hull, then at Spitzbergen. In 1618, the Eaſt India adventurers joined ſtock with the Ruſſian company for purſuing the whale fiſhery, and fitted out thirteen ſhips, but the voyage proved unſucceſsful. The maner of managing the whale-fiſhing, both by the Engliſh and Dutch, was then quite different from the preſent mode: the whales, having never been diſturbed, reſorted to the bays near the ſhore, ſo that their blubber was eaſily landed at Spitzbergen, where they erected cookeries, *i. e.* coppers, &c. for boiling their oil; and theſe they left ſtanding from year to year, and only brought home the purified oil and the whale-bone. The Engliſh, having been the firſt in that fiſhery, kept poſſeſſion of the beſt bays; the Hollanders, coming later, were obliged to find bays farther to the north; the Danes, who came later into this trade than the Dutch, got in between the Engliſh and Dutch; the Hamburghers came after the Danes, and after them came the French, and alſo the Biſcayners, the moſt ancient whale-fiſhers in Europe, except the Norwegians, and purſued the ſame method. But, ſince theſe times, the whales are leſs frequent in the bays, and are commonly among the openings of the ice farther from the land; ſo that the blubber is now cut from the whales after they are killed, in the manner deſcribed in the ſequel of this article, and brought home to be boiled and purified, and the whale-fins are alſo to be cleaned at home. This latter method of fiſhing, being dangerous to ſhipping, diſcouraged our Engliſh adventurers who traded in a company; ſo that they ſoon after, *viz.* in 1619, relinquiſhed the fiſhery. Some private adventurers proſecuted the trade with various ſucceſs in 1621, 1622, and 1623, when they were moleſted by the Dutch, who were then ſuperior in number of ſhips, and had the prince of Orange's commiſſion; for in 1622 the Dutch, for preventing of diſturbance in their whale fiſhery, had erected an excluſive company, who, by their own power, might protect it: however, the fiſhery was laid open, in 1643, to all the inhabitants of the ſeven provinces. As to the claims which different European nations have alleged in favour of a monopoly of the whale-fiſhery at Spitzbergen, it has been urged by the Engliſh that they were the firſt diſcoverers, by ſir Hugh Willughby, in 1553; by the Dutch, who deny his having been ſo far north as Spitzbergen, and maintain their having firſt diſcovered it in 1596; by the Danes, that Spitzbergen is a part of Old Greenland, poſſeſſed in early times by them. But all nations have now wiſely given up their excluſive pretenſions, and that part of the world remains now alike free to all nations for this fiſhery. In 1636, king Charles I. confirmed by his proclamation the Greenland whale-fiſhery ſolely to the Ruſſia company, who ſoon relinquiſhed it. In 1672 an attempt was made for reviving this fiſhery, when an act was paſſed for the encouragement of it; and this act was continued in 1690, but without any great effect. A corporation was eſtabliſhed by act of parliament, in 1693, for carrying on this fiſhery, called the *Greenland Company*.

In 1725, the Engliſh South-ſea company revived this trade: but, after great loſſes, were obliged to diſcontinue it, in 1733. At this time a bounty of 20*s.* per ton was granted by parliament to Britiſh ſhips of two hundred tons and upwards, fitted out for the whale-fiſhery, which bounty was not only continued, in 1740, but an additional bounty of 10*s.* per ton was granted during the war with Spain, in which we were then engaged; and in 1749 a farther bounty, or allowance of 20*s.*, over and above that of 1733, was granted to all Britiſh whale-fiſhing ſhips, and extended to ſhips of the Britiſh American colonies; and in 1755 this bounty was extended to ſhips under two hundred tons burthen; and, as a farther encouragement to this fiſhery, foreign proteſtants, ſerving three years in it, were naturalized on certain conditions. See Hackluyt's Coll. Voyages, and Anderſon's Hiſtory of Commerce.

But, notwithſtanding the great importance and numerous advantages of this trade to England, and the encouragement which the legiſlature has given it, the Dutch carried it on with much greater ſucceſs than the Engliſh; and it became one of the principal branches of their flouriſhing trade. The chief merchants of the ſeveral provinces aſſociated themſelves into a body for carrying it on, and ſent every year a great fleet of veſſels to the North ſeas for that purpoſe. They attempted to make their firſt eſtabliſhments in Greenland; but not ſucceeding, they have ſince fixed their fiſhery about the weſtern coaſt of Spitzbergen, from the latitude of 76 deg. 40 min. to 80 deg. and from eaſt to weſt about eighty-nine leagues.

To give ſome idea of the manner and importance of this trade, we ſhall here ſubjoin the diſcipline for a long time obſerved in the whale-fiſhery, the method of fiſhing; the cargo and equipage of a veſſel; and the produce thereof.

The diſcipline is adjuſted by a ſtanding regulation, conſiſting of twelve articles; the principal of which are:

That in caſe a fiſhing-veſſel be ſhipwrecked and the captain and crew ſaved, the next veſſel they meet ſhall take them in; and the ſecond veſſel take half of them from the firſt; but that no veſſel ſhall be obliged to take any of the loading of a veſſel ſhipwrecked; that as to the effects of a ſhipwrecked veſſel, which are abſolutely relinquiſhed, and which another captain ſhall find, and take up, upon his arrival in Holland, he ſhall account for one half of them to the proprietors of the ſhipwrecked veſſel, clear of all expences; that if the crew deſert a ſhipwrecked veſſel they ſhall have no claim to any of the effects ſaved, but the whole ſhall go to the proprietor; but if they be preſent when the effects are ſaved, and aſſiſt therein, they ſhall have one-fourth thereof; that if a perſon kill a fiſh on the ice, it ſhall be reputed his own, ſo long as he leaves any perſon with it; but the minute he leaves it, it becomes the due of the firſt captain that comes that way; but that, if a fiſh be tied to an anchor, or a rope faſtened to the ſhore, it ſhall remain to its firſt proprietor, though he leave it alone; that if any perſon be wounded or lamed in the ſervice, the commiſſioners of the fiſhery undertake to procure him a reaſonable ſatisfaction; to which the whole fleet ſhall contribute.

Beſides this general regulation, to the obſervance of which all the captains, pilots, and maſters of veſſels, were obliged to ſwear, before they put to ſea, there was alſo a particular one for each ſhip's crew, which they were all ſworn to execute, in preſence of one of the commiſſioners, who went aboard every ſhip, to receive the oath.

This regulation was a kind of charter-party, importing, that they would attend prayers morning and evening, on pain of an amercement, at the diſcretion of the captain; that they would not get drunk, nor draw their knives, on forfeiture of half of their wages; nor fight, on forfeiture of the whole; that no one ſhould lay wagers on the good or ill ſucceſs of the fiſhing, nor buy or ſell on theſe conditions, in caſe they took one or more fiſh, on penalty of twenty-five florins; that they would be contented with the proviſions allowed them; and that they would never light fire, candle, or match, by night or day, without the captain's leave, on the like penalty.

After the reading of this regulation, the crew were all called to receive the cuſtomary gratuity before their ſetting out, with an aſſurance of another ſum at their return in proportion to the ſucceſs of the fiſhing.

The captain, on this occaſion, received from an hundred to an hundred and fifty florins; the pilot from forty to ſixty; each harpooner from forty to fifty florins; the other officers from twenty-ſix to thirty-ſix florins; the elder ſailors twenty; and the younger twelve.

The fleets, which conſiſted moſtly of fluyts from two to three hundred tons, and from thirty-ſix men to forty-two, uſually ſet ſail about the beginning of April, and took its courſe by the iſles of Iceland, from 60 to 61 degrees of latitude; after which, leaving them to the weſt, it ſteered northward, through 73, 74, and 75 deg. of latitude, where they began to find the ice.

It was among theſe huge heaps of ice, wherewith the whole quarter is filled, that they firſt began to ſpy the whales; and there moſt of the veſſels fixed their abode for the fiſhing. But as the fiſh were larger and fatter the farther north they went, ſome captains would venture as far as 80 or 82 deg. of north lat. Each veſſel of three hundred tons had ſix ſhalloops; and each ſhalloop had ſix harpooners, with five ſeamen to row it. To every ſhalloop there were ſeven lines, of three inches circumference; five of them in the hind part of the veſſel, and two before. The hind lines together made ſix hundred fathoms, and, with the addition of the other two, eight hundred and eighty. If the whale dived deeper, or ran farther underneath the ice than this ſtint, the line muſt be cut, leſt the ſhalloop ſhould be drawn after it.

In the Engliſh whale-fiſhery every ſhip has ſix or ſeven boats; each of which has one harpooner, one boat-ſteerer, one manager of the line, and four ſeamen to row it. In each boat there are two or three harpoons, ſeveral lances, and ſix lines faſtened together, each line being a hundred and twenty fathom long. To each harping iron is faſtened a ſtrong ſtick, about ſix feet long, and a ſoft pliable line, about ſix fathom long, called the fore-gauger, which is faſtened to the lines in the boat. When more line is wanted, the lines of a ſecond boat are faſtened to thoſe of the firſt.

The inſtrument, wherewith the whale is ſtruck, is a harping-iron or javelin, five or ſix feet long, pointed with ſteel, in a triangular ſhape, like the barb of an arrow.

The harpooner, upon ſight of the fiſh, from one end of the ſhalloop where he is placed, flings the harping-iron with all his might againſt his back; and, if he be ſo happy as to make it penetrate the ſkin and fat into the fleſh, he lets go a ſtring faſtened to the harping-iron, at the end whereof is a dry-gourd, which ſwimming on the water, diſcovers whereabout the whale is; for the minute he is ſtruck he plunges to the bottom, commonly ſwimming againſt the wind.

If the whale return to breathe in the air, the harpooner takes occaſion to give him a freſh wound, till, fainting by the loſs of blood, the men have an opportunity of approaching him, and thruſting a long ſteeled lance under his gills into his breaſt, and through the inteſtines, ſoon diſpatch him; and when the carcaſe begins to float, they cut holes in the fins and tail; and, tying a rope in theſe holes, they tow him to the veſſel, where he is faſtened along the larboard ſide of the ſhip, floating upon his back almoſt level with the ſea. They then begin to take the blubber or fat, and the fins, as they are called, or *whale-bone*.

In order to this, ſeveral men ſtand upon the fiſh, with a kind of iron calkers, or ſpurs, to prevent their ſlipping; and cut off the tail, which is hoiſted upon deck, and then cut out ſquare pieces of blubber, weighing two or three thouſand pounds, which are hoiſted on board with the capſtan, where each piece is again cut into ſmaller pieces, each of two or three hundred pounds weight; and theſe are thrown into the hold, and left to drain for three or four days. When all the blubber is cut from the belly of the fiſh, it is turned on one ſide, by means of a piece of blubber left in the middle, called the *cant*, or turning-piece; and then they cut out this ſide in large pieces, called *hockies*, as before, and alſo the whale-bones with the gums, which are preſerved entire, and hoiſted on deck, where the blades are cut and ſeparated, and left till they have time to clean and ſcrape them. The fiſh is next turned on its back and the blubber cut out from the back and crown bone; and laſt of all they cut the blubber from the other ſide as before. They then cut out the two large jaw-bones, ſituate in the under-lips, which are hoiſted on deck, cleanſed and faſtened to the ſhrouds, and tubs are placed under them to receive the oil which they diſcharge; this oil belongs to the captain, and likewiſe the tail and fins. The carcaſe is left to float, and ſupplies food for Greenland birds, called mallemucks, &c. In three or four days they hoiſt the pieces of blubber out of the hold, chop them, and put ſmall pieces through the bung-holes into their caſks. A whale, the longeſt blade of whoſe mouth is nine or ten feet, generally fills thirty butts with blubber; but one of the largeſt fiſh will fill ſeventy butts and more. A good large whale is valued at about 1000*l.* ſterling. A full ſhip of three hundred tons is worth, clear of all expence, at leaſt 5000*l.* There is a premium aſſigned to every perſon in the ſhip for every whale: the captain has three guineas; the mate, one; each harpooner, one; the ſurgeon, one; carpenter, one; cook and boat-ſteerers, half a guinea each; a common man, a crown; and each boy, half a crown. The captain and harpooners have no wages; but the captain is allowed twenty-five pounds, and the harpooners, nine guineas each. In a ſucceſsful voyage they have ſix ſhillings for every ton of oil boiled in Greenland-dock; but the reſt of the ſhip's company have monthly wages, beſides the fiſh-money, but no oil-money.

Nothing now remains, but to ſail homewards, where the fat is to be boiled, and melted down into train-oil.

The whale-fiſhery of the Caroline iſlands is more eaſy and agreeable than that of all other places, and, beſide the great profit, affords a pleaſant ſpectacle to multitudes of people on the ſhores.

There are ten or twelve of theſe iſles diſpoſed in form of a circle, ſo that they make a ſort of port, in which the ſea is perpetually calm and pleaſant.

When a whale appears in this gulf, the people all get into their canoes, and rowing toward the ſea, keep between the creature and its retreat, and drive him forwards towards the iſles at the bottom of the port. They drive him in this manner before them into the ſhallows, where they plunge into the water themſelves, and ſome get ropes and chains about him, while others dart him with their ſpears. Their agility and addreſs are wonderful in this. The creature can never get away when they have once got him faſtened, but is ſoon killed, and got to the ſhore.

FISHERY, *Produce of one Year's Whale.* To ſtate the produce, we make choice of the fiſhery of 1697, as being one of the greateſt and moſt fortunate that ever was known; to which we ſhall add that of the year 1725.

In the year 1697, there were a hundred and eighty-nine veſſels of divers nations; whereof a hundred and twenty-one were Dutch, forty-ſeven Hamburghers, two Swediſh, four Daniſh, twelve of Bremen, two of Embden, and one of Lubeck; who caught in all 1968 fiſh.

In the year 1725, there were two hundred and twenty-ſix veſſels; whereof one hundred and forty-four were Dutch, twelve Engliſh, forty-three Hamburghers, twenty-three of Bremen, two of Berghen, two of Flenſburg. Their captures were 349 fiſh.

The Dutch captures in 1697, produced - -	41,344	puncheons of blubber.
The Hamburghers -	16,414	
The Swedes - -	540	
The Danes - -	1710	
The Bremeners -	3790	
The Embdeners - -	68	

The Engliſh captures in 1725, produced 1000 puncheons of blubber, and 20 tons of whale-bone.

Now, eſtimating the puncheon of blubber at thirty florins Dutch, or 2*l.* 15*s.* Engliſh, the current price in the year 1697, the total produce of the year's fiſhing amounts to 175,631*l.* 10*s.* ſterling. As to fins, or whale-bones, ſetting them at two thouſand weight *per* whale, and an hundred weight at 4*l.* 4*s.* they will yield 165,312*l.* which, added to the former ſum, amounts to 340,943*l.* 10*s.*

Mr. Anderſon, in his Hiſtory of Commerce, vol. ii. p. 350, obſerves, from an account of the Dutch whale-fiſhing for forty-ſix years, ending anno 1721, that in this time they had employed 5886 ſhips, and caught 32907 whales, which valued one with another at 500*l.* give an amount for the whole value of above 16 millions ſterling, gained out of the ſea moſtly by the labour of the people, deducting the expence of the wear and tear of ſhipping, the caſks, and the proviſions.

The whale-fiſhery begins in May, and continues through the months of June and July; but whether the ſhips have good or bad ſucceſs, they muſt come away and get clear of the ice by the end of Auguſt; ſo that in the month of September at fartheſt they may be expected home; but the more fortunate ſhips may return in June or July.

The ſtatute 26 Geo. III. c. 41. preſcribes the conditions on which ſhips going on the Greenland whale-fiſhery ſhall obtain licences from the commiſſioners of the cuſtoms. A certificate ſhall be produced, ſigned by an officer of the cuſtoms, after due examination of each ſhip, ſtating that the ſhip is legally qualified for the voyage, by being navigated by a maſter and three-fourths Britiſh ſubjects, and having on board a competent number of men, boats, lines, proviſions, &c. Every ſhip of the burden of 200 tons, deſigned for this fiſhery, ſhall have on board 40 fiſhing lines of 120 fathom each, 40 harpoon irons, 4 boats with 7 men at the leaſt, including a harpooner, a ſteerſman, and a line manager, to each boat, beſides the maſter and ſurgeon, and 6 months proviſion at the leaſt for ſuch a number of men; and every ſhip of larger burden, an increaſe of 6 men, one boat, 10 ſuch lines, and 10 harpoon irons more, for every 50 tons above the ſaid 200 tons, together with proviſions in proportion; and every ſhip ſhall have apprentices indentured for 3 years, in the proportion of one at the leaſt for every 35 tons burden, and one freſh or green man for every 50 tons burden. On the return of ſuch ſhip, her condition ſhall be certified by the proper officer of the cuſtoms, together with a variety of particulars relating to her voyage, cargo, &c. &c.; and then the commiſſioners at the port where ſuch ſhip ſhall arrive ſhall aſſign a bounty or premium of 30*s.* *per* ton, according to the admeaſurement of ſuch ſhip duly certified. This bounty ſhall be reſtricted to ſuch ſhip as ſhall have ſailed from the port whence ſhe cleared on or before the 10th of April in each year, and ſhall have continued in the Greenland ſeas, Davis's ſtraits, or ſeas adjacent, endeavouring to catch whales, and not have departed thence before the 10th of Auguſt next following, unleſs ſuch ſhip, if 300 tons, be laden with 30 tons of oil, or blubber in proportion, and 1½ ton of whale-fins in like proportion to the tonnage, or be forced by accident to depart from theſe ſeas. Each ſhip entitled to the bounty muſt have kept a log-book. The owners may inſure the bounty, in caſe of the loſs of the ſhip. Whale-fins, oil or blubber of whales, ſeal oil or ſeal ſkins, or any other produce of ſeals or fiſh caught in the ſeas of Greenland, or Davis's ſtraits, or parts adjacent, may be imported duty free. No harpooner, line-manager, or boat-ſteerer, belonging to any ſhip in this trade, ſhall be liable to be impreſſed from this ſervice. The Greenland ſeas, Davis's ſtraits, and ſeas adjacent, ſhall be deemed and extend to the latitude of 59° 30′ N., and no farther. The ſtat. 29 Geo. III. c. 52. c. 53. contains ſome additional regulations. This act is continued by 41 Geo. III. c. 97.

Southern Whale Fiſhery. The ſtatutes 35 Geo. III. c. 92. and 42 Geo. III. c. 18. aſſign premiums to 16 ſhips employed in this fiſhery, under certain preſcribed reſtrictions: 12 of which ſhall be fitted and cleared out between January 1ſt and December 31ſt, 1802, and between January 1ſt and December 31ſt in each of the three ſucceeding years, ſhall ſail to the ſouthward of the equator, there carry on the fiſhery, and return to ſome port of Great Britain before December 1ſt in the year ſubſequent to that of their being cleared out; to 4 of theſe which ſhall arrive firſt within the time limited, with the greateſt quantity of oil or head-matter, being not leſs in the whole than 20 tons in each, there ſhall be allowed 300*l.* each; and 200*l.* to each of the 4 ſhips which ſhall next arrive with the next greateſt quantity of oil or head-matter; and 100*l.* to each of the 4 veſſels which ſhall next arrive with the greateſt quantity of oil, &c. not leſs than 20 tons. To 4 other ſuch ſhips, which ſhall proceed to the weſtward of 36° of S. latitude, and ſhall carry on the ſaid fiſhery, and ſhall return, before the 31ſt of December in the ſecond year after their clearing out, to ſome port of Great Britain, there ſhall be allowed 400*l.* each, having not leſs than 20 tons of oil or head-matter, as aforeſaid. The ſtat. 35 Geo. III. c. 92. requires ſuch ſhips to be navigated by perſons, of whom the maſter and at leaſt three-fourths of the mariners are his majeſty's ſubjects. Or if ſuch ſhip clear out from any port of Great Britain, ſuch ſhip may be navigated by perſons being proteſtants, and who, not being ſubjects of his majeſty, have been before employed in carrying on the ſaid fiſhery, and on clearing out have taken the oath of fidelity and allegiance to his majeſty, and another oath that it is their intention to eſtabliſh themſelves and their families in Great Britain, &c. No premium ſhall be paid to any ſhip that has not an apprentice indentured for three years for every 50 tons burden; nor unleſs ſuch ſhip ſhall have regularly kept a log-book on board. The commiſſioners of the cuſtoms in England and Scotland are to pay the premiums, which are to be claimed within two months. Ships concerned in this fiſhery may ſail and paſs for that purpoſe to the eaſtward of the Cape of Good Hope, and to the weſtward of Cape Horn, or through the ſtraits of Magellan; but ſuch ſhips ſhall be obliged to take out a licence for each reſpective voyage from the Eaſt India company, &c. &c. Every ſhip intending to navigate any ſea compriſed within the boundaries of the excluſive trade of the South Sea company, deſcribed by an act of the 9th of queen Anne, muſt take a licence for the voyage from the ſaid company. By ſtatute 42 Geo. III. c. 18. any ſhip fitting and clearing out, and licenſed according to the preceding acts, ſailing to the eaſtward of the Cape of Good Hope, and having paſſed beyond 123° of E. longitude, may paſs to the northward as far as 1° of N. latitude, but no further to the northward, until ſuch ſhip ſhall have ſailed or paſſed to the eaſtward of 180° E. longitude from London.

Fishery, *Whitings.* Theſe fiſh frequent the Engliſh ſeas in large ſhoals, particularly during the ſpring, keeping at the diſtance of half a mile to three miles from the ſhore. They are taken in abundance by the line, and afford excellent diverſion. They are the moſt delicate and wholeſome of any of the genus, but do not grow to a large ſize near the coaſt, where the uſual length is 10 or 12 inches. In the deep water on the edge of the Dogger-bank, they have been found to weigh from four to eight pounds.

Fishery, *Free*, in *Law*, or the excluſive right of fiſhing in a public river, is a royal franchiſe (ſee Franchise); and is conſidered as ſuch in all countries where the feodal law has prevailed. (Seld. Mare Clauſum. l. 24. Dufreſne. v. 503. Craig de Jur. Feod. ii. § 15.) However, the making of ſuch grants, and thus the appropriating of that which it ſeems unnatural to reſtrain, the uſe of running water, was prohibited for the future by king John's great charter;

and the rivers that were fenced in his time were directed to be laid open, as well as the foreſts to be diſafforeſted. This opening was extended by the ſecond and third charters of Henry III. to thoſe alſo that were fenced under Richard I.; ſo that a franchiſe of free fiſhery ought now to be at leaſt as old as the reign of Henry II. This differs from a *ſeveral* fiſhery; becauſe he that has a ſeveral fiſhery muſt alſo be (or at leaſt derive his right from) the owner of the ſoil, which in a free fiſhery is not requiſite. (M. 17 Edw. IV. 6. P. 18 Edw. IV. 4. T. 10 Hen. VII. 24. 26. Salk. 637.) It differs alſo from a *common* of piſcary, in that the free fiſhery is an excluſive right, where the common of piſcary is not ſo; and, therefore, in a free fiſhery, a man has a property in the fiſh before they are caught; in a common of piſcary, not till afterwards. (F. N. B. 88. Salk. 637.) Some, indeed, have conſidered a free fiſhery not as a royal franchiſe, but merely as a private grant of a liberty to fiſh in the *ſeveral* fiſhery of the grantor. (2 Sid. 8.) But to conſider ſuch right as originally a flower of the prerogative, till reſtrained by *magna carta*, and derived by royal grant (previous to the reign of Richard I.) to ſuch as now claim it by preſcription, and to diſtinguiſh it (as judge Blackſtone does) from a *ſeveral* and a *common* of fiſhery, may remove ſome difficulties (ſays the learned Judge) in reſpect to this matter, with which our books are embarraſſed. For it muſt be acknowledged, that the rights and diſtinctions of the three ſpecies of fiſhery are very much confounded in our law-books; and that there are not wanting reſpectable authorities (ſee Hargrave's Notes on Co. Litt. 122.) which maintain, that a *ſeveral* fiſhery may exiſt diſtinct from the property of the ſoil, and that a *free* fiſhery implies no excluſive right, but is ſynonymous with *common* of piſcary. Blackſt. Com. vol. ii.

FISHERIES, *Britiſh Society for Encouragement of.* By ſtat. 35 Geo. III. c. 100. the governor, deputy-governor, and directors of the Britiſh ſociety for extending the fiſheries, and improving the ſea coaſts of this kingdom, incorporated by 26 Geo. III. c. 106. are empowered to give the following premiums and loans to perſons at the ſociety's ſettlements; *viz.* 60*l.* a year, in premiums or rewards, to ſober and induſtrious perſons reſiding at any of theſe ſettlements, who are moſt expert in fiſhing, curing of fiſh, preparing of ſoap or oil from fiſh, making of nets, &c.; and alſo to lend at legal intereſt a ſum not exceeding 500*l.* for the purpoſe of purchaſing, building, or equipping boats or other veſſels for the fiſhery; and alſo ſuch farther ſums on loans to ſuch perſons as may build houſes or tenements at any of the ſettlements of the ſociety, the ſum ſo lent not exceeding one-third of the value of ſuch buildings, payable by inſtalments in the courſe of five years; and alſo ſuch ſums in loans, not exceeding 200*l.*, on proper ſecurity to be repaid in one year, to ſuch perſons as may undertake to provide ſtores of oatmeal or ſalt, or other neceſſaries, at either of the ſaid ſettlements, the ſum not to exceed two-thirds of the value of the commodity; and alſo ſuch ſums of money, not exceeding 200*l.*, in loans to ſuch perſons as may eſtabliſh a manufactory of ſail-cloth or cordage, &c. ſuch ſum to be repaid in three years, and not to exceed two-thirds of the value of the material provided.

FISHES, aboard a *Ship*, are pieces of timber, convex on one ſide, and concave on the other, uſed to ſtrengthen the maſts and yards, when they begin to fail, through an extraordinary weight of ſail, or after damage in battle, or tempeſtuous weather. They both nail the fiſhes on with iron ſpikes, and alſo *woold* them as they call it, that is, wind ropes hard about them. There is alſo a tackle called the fiſh, which hangs at the end of the davit by the ſtrap of the block, in which is the runner of the fiſh-hook; by which means the fluke of the anchor is haled up to the ſhip's bow, or chainwale. (See BLOCKS.) Perhaps this tackle was called a fiſh, from that which the ancients called a dolphin, which was a pointed and vaſtly heavy piece of iron, which they uſed to heave up by a tackle to a good height, and then, when they came near enough to the enemy's ſhip, let it fall at once, to break or pierce a hole through the bottom of the enemy's veſſel, to ſink her.

FISH-GIG, an inſtrument uſed to ſtrike fiſh at ſea, particularly dolphins. It conſiſts of a ſtaff, three or four barbed prongs, and a line faſtened to the end, on which the prongs are fixed; to the other end is fitted a piece of lead, which ſerves to give additional force to the ſtroke when the weapon flies, and to turn the points upward after the fiſh is penetrated.

FISH-GARTH, according to Skinner, ſignifies an engine to take fiſh; but it ſhould rather ſeem to denote the dam or weir in a river, where theſe engines are laid and uſed.

FISH-GLUE. See ICHTHYOCOLLA and GLUE.

FISHING, the act or art of catching fiſh.

Right of fiſhing and the property of fiſh belong to the lord of the manor, when he hath the ſoil on both ſides of a river; but where a river ebbs and flows, and is an arm of the ſea, they are common to all; and he who claims a privilege to himſelf muſt prove it. In the Severn, the ſoil belongs to the owners of the land on each ſide; and the ſoil of the River Thames is in the king, &c. but the fiſhing is common to all. There are ſeveral ſtatutes for preventing the deſtruction of the fry of fiſh; and perſons uſing nets for that purpoſe, or taking ſalmon or trout out of ſeaſon, or any fiſh under certain lengths, are liable to forfeit 20*s.*; and juſtices of peace and lords of leets have power to put the acts in force. See 1 Eliz. cap. 17. 3 Jac. I. cap. 12. 30 Geo. II. cap. 21. See *Salmon* FISHERY, and *Stealing of* FISH.

Fiſhing is diſtinguiſhed with regard to its inſtrument into that performed with the net, for fiſh that go in ſhoals; and that with the hook, for ſolitary fiſh; which latter is properly called *angling*.

Fiſhing, again, is diſtinguiſhed with regard to its object into that performed in ſalt water, and that in freſh. The firſt practiſed for whales, herring, cod, ſalmon, pearls, mackarel, and other ſea-fiſh. The latter practiſed for pike, trout, carp, tench, perch, dace, eels, &c.

The inſtruments principally uſed in angling or fiſhing with the hook, are the rod, line, hook, and fly.

The points on which the art of fiſhing chiefly turns are the proper ſeaſon, place, bait, and manner of application. What relates to each thereof, we ſhall here give the reader in the ſeveral kinds of fiſhing chiefly practiſed among us.

In March, April, and September, the warmeſt days are the beſt for fiſhing, and the bait muſt be deep; for the fiſh in theſe cool months lie near the bottom. In fly-fiſhing, it is always obſerved, that the fiſh will riſe beſt after a ſmall ſhower of rain, that has juſt beat down the flies upon the water without muddying it. March, April, May, and June, are the beſt months for fly-fiſhing, and the beſt hours are about nine in the morning, and three or four in the afternoon; in a ſtill warm evening they will bite as long as the day-light laſts, at thoſe ſeaſons when the gnats are ſeen moſt plentifully about in the air.

In the extremity of heat, when the earth is parched with drought, there is but little ſport to be expected in fiſhing in any water. In cold weather, when there is a white hoary froſt in the morning, the fiſh will not bite kindly all day, except in the evening, if that ſhould prove ſerene and warm.

Too much wind is never convenient for fiſhing, though a little is rather advantageous than otherwiſe. It is bad fiſhing about ſheep-ſhearing time, in waters where the ſheep are waſhed; for the fiſh glut themſelves in ſuch a manner with what is waſhed from theſe creatures, that they will not take any bait till that ſeaſon is over.

North and eaſt winds are enemies to fiſhing; and it is not right to fiſh ſoon after the time of the fiſh ſpawning, for they are then ſick, and have no great appetite, ſo that they do not bite readily. All fiſh have a natural fore-knowledge of a ſhower of rain, and when clouds are coming on that will fall in rain, they will not bite; the expert angler, who is uſed to this, often eſcapes being wet to the ſkin by it.

The ſubterranean or under-ground fiſhing of the lake Ribeſkajamnia has been much talked of by thoſe who have written of the Zirchnitzer ſea, of which it is a part; but on the whole it amounts to no more than this. The waters of this lake emptying themſelves through ſubterranean paſſages into another lake below, the whole body of the water, with the fiſh in it, is firſt received into a large opening, which conveys it into a ſort of ſubterranean baſon, in the bottom of which there are many holes, and through theſe the water is let out, but the fiſh left behind. The people of the place who know this, deſcend through the large hole into this ſubterraneous baſon with torches in their hands, and as the waters run off, they ſeize upon the fiſh wherever they can catch them. This ſort of fiſhing is attended with one inconvenience; for the people being obliged to ſtand up to the middle more or leſs in the water, the horſe-leeches, which are extremely plentiful there, ſeize upon their legs and other parts, and are only to be got off by ſome perſons making water upon the part; the heat and nauſeous taſte of the urine always making them let go their hold. Phil. Tranſ. N° 91. For a curious method of fiſhing in China, ſee CHINA.

FISHING, *White-bait.* See BAIT.

The ſeaſon for taking white-bait is only from the firſt of Auguſt to the firſt of October. 30 Geo. II. cap. 21.

FISHING, *Barbel.* See BARBUS.

No barbel is to be taken in the Thames or Medway under twelve inches in ſize, from the eye to the end of the tail, and only between the twenty-fourth of Auguſt and the twenty-firſt of March. 30 Geo. II. cap. 21.

FISHING, *Carp.* The carp is generally held the queen of freſh-water fiſh. It is exceeding ſubtle, and of all others, the eel only excepted, lives longeſt out of water. Mr. Ray aſſures us, that in Holland they have a ſpeedy way of fattening them, by hanging them up in a net in a cellar, and feeding them with white bread and milk. The fiſh is wrapped up in a quantity of wet moſs, ſpread on a piece of net, and then gathered into a purſe in ſuch a manner, however, as to allow him room to breathe. The net is then plunged into water, and hung up to the cieling of a cellar: the dipping muſt at firſt be repeated every three or four hours, but afterwards it need only be plunged into water once in about ſix or ſeven hours. Bread ſoaked in milk is firſt given him in ſmall quantities: in a ſhort time the fiſh will bear more, and grow fat by this treatment. Many have been kept in this way, breathing nothing but air, for ſeveral days ſucceſſively. (Phil. Tranſ. vol. lxi. part 1. p. 310.) They breed ſeveral times in the year; for which reaſon we ſeldom meet with male or female without either milt or ſpawn. Their natural place is ſome ſtill water; in running waters they rarely, if ever, breed. To make them fat and large, it is a good way, when the pond is low, in April, to rake all the ſides thereof with an iron rake, and ſow hay-ſeeds thereon. By autumn there will be a crop of graſs, which coming to be overflowed as the pond riſes, will be a fine feeding-place for them. See FISH-PONDS.

Great patience is requiſite in angling for carp, on account of their incredible policy. They always chooſe to lie in the deepeſt places; they ſeldom bite in cold weather; and in hot, a man cannot be too early or too late for them. When they do bite, there is no fear of the hold. The tackle muſt be very ſtrong, and it will be proper to bait the place beforehand, where it is to be fiſhed for, with a coarſe paſte. It may be alſo proper to bring the carp to the place intended for angling, by throwing in cow-dung and blood, or bran and blood mixed together, or ſome chicken guts cut ſmall. The baits are the red-worm, in March; the cadew, in June; and the graſs-hopper, in July, Auguſt, and September. Proper paſtes may alſo be prepared for them; as honey and ſugar, wrought together with flour, and thrown in pieces into the water ſome hours before you begin to angle. Honey and white crumbs of bread mixed together alſo make a good paſte. The following paſte is much recommended: take common wheat flour and veal, or any other young meat, of each equal quantities; beat them together in a mortar till the meat is thoroughly diſſolved or broke to pieces; then add about half the quantity of honey; beat it well together again, and add more flour till the whole is of a proper conſiſtence. This has the advantage of a paſte, and of an animal bait, and hangs well upon the hook, ſo that it ſeldom fails of ſucceſs.

The beſt ſeaſon for catching ſuch as are intended for ſale is autumn.

FISHING, *Chub.* The chevin or chub is a freſh-water fiſh with a large head. It ſpawns in March, and is very ſtrong, though inactive, yielding in a very little time after it is ſtruck; and the larger it is the quieter. His bait is any kind of worm or fly, particularly the large yellow moth; alſo grains, cheeſe, the pith in the bone of an ox's back, &c. He affects a large bait, and variety of them at the ſame hook. Early in the morning angle for him with ſnails; but, in the heat of the day, chooſe ſome other bait; and in the afternoon, fiſh for him at ground or fly. See CHUB.

No chub is to be taken under nine inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt, in the river Thames and waters of Medway. 30 Geo. II. cap. 21.

FISHING, *Dace* or *Dare.* See DACE.

No dace are to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail in ſize, and only between Auguſt 24th and March 21ſt. 30 Geo. II. cap. 21.

FISHING, *Eel.* See EEL.

The ſilver eel may be caught with divers baits, particularly powdered beef, garden-worms or lobs, minnows, hens guts, fiſh, garbage, &c. But as they hide themſelves in winter in the mud, without ſtirring out for ſix months, and in the ſummer, they take no delight to be abroad in the day, the moſt proper time to take them is in the night, by faſtening a line to the bank ſide with a hook in the water; or a line may be thrown at large, with a good ſtore of hooks baited, and plumbed with a float, to diſcover where the line lies in the morning. A ſmall roach does well here for a bait, the hook being laid in his mouth. For other methods of catching eels, ſee BOBBING, BULTERS, EEL-*ſpear*, and SNIGGLING.

No leaps or rods for eels are to be laid in the Thames and

Medway but from April 21ſt to October 30th; but they may be hooked for all the year. 30 Geo. II. cap. 21.

FISHING, *Flounder.* The flounder is a flat ſea or river fiſh, caught in April, May, June, and July, in any time of the day, in a ſwift ſtream, and ſometimes alſo in a ſtill deep. The beſt bait is red worms, waſps, and gentles.

Flounders may be taken in the rivers Thames and Medway at any time of the year; but their ſize muſt not be leſs than ſix inches from the eye to the end of the tail. 30 Geo. II. cap. 21.

FISHING, *Gudgeon.* The gudgeon is a ſmall fiſh of a very delicious taſte. It ſpawns three or four times in the ſummer-ſeaſon, and feeds in ſtreams and on gravel, ſlighting all kinds of flies; but is eaſily taken with a ſmall red worm, fiſhing near the ground; and being a leather-mouthed fiſh, will not eaſily get off the hook when ſtruck. The gudgeon may either be fiſhed with a float, the hook being on the ground, or by hand, with a running line on the ground, without cork or float. He will bite well at waſps, gentles, and cadworms; and one may even fiſh for him with two or three hooks at the ſame time, which makes good ſport. When you angle for gudgeons, ſtir up the ſand or gravel with a long pole, which will make them gather to the place and bite the faſter.

The ſeaſon for gudgeon fiſhing in the Thames and Medway is from Auguſt 24th to March 21ſt. 30 Geo. II. cap. 21.

FISHING, *Pearch* or *Perch.* The pearch or perch is hook-backed, not unlike a hog, armed with ſtiff prickles, and his ſides with dry thick ſcales; he is voracious, and will venture on his own kind even with greater courage than the pike. He ſeldom grows much above a foot long. He ſpawns in February or March, and bites beſt when the ſpring is far ſpent. The proper baits are the bradling, minnow, and ſmall frog; as alſo the lob-worm, bob, oak-worm, gentle, waſp, and cad-bait. The minnow yields the beſt ſport, which is to be alive, and ſtuck on the hook through the upper-lip or back-fin, and kept ſwimming about mid-water. If the frog be uſed, he is to be faſtened to the hook by the ſkin of his leg. When the fiſh bites, as he is none of the leather-mouthed kind, he muſt have time to pouch his bait. The beſt place to fiſh for him is in the turning of the water-eddy in a good gravel bottom.

No perch is to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt. 30 Geo. II. cap. 21.

FISHING, *Pike.* The pike is reputed the tyrant of the freſh waters. By the common conſent of naturaliſts, he is the longeſt-lived of all fiſhes. The larger he is found, the coarſer is his fleſh; and ſo *vice verſâ.* This fiſh never ſwims in ſhoals, but always ſingle, being very rapacious, and preying even on his own kind. The pike ſpawns in February and March. The beſt ſort is in rivers; the worſt in meres and ponds. His ordinary food is frogs, and what fiſh he can lay hold on.

There are two ways of fiſhing for the pike: by the *ledger bait* and the *walking-bait.* 1. The ledger-bait is that fixed in one certain place, and which the angler may leave behind him. Of this kind the beſt is ſome living bait, as a dace, roach, gudgeon, or a living frog. To apply it, if a fiſh, ſtick the hook through his upper-lip; then faſtening it to a ſtrong line twelve or fourteen yards long, tie the other end of the line to ſome ſtake in the ground, or bough of a tree, near the pike's uſual haunt, letting the line paſs over the fork of a ſtick placed for the purpoſe, ſuſpending the hook, and about a yard of line in the water, but ſo as that when the pike bites, the fork may give way, and let him have line enough to go to his hold and paunch. If the bait be a frog, the arming wire is to be put in at his mouth and out at his vent, and one of his legs to be ſtitched or tied over the upper joint of the wire. 2. The walking-bait is that which the fiſher caſts in, and conducts with a rod, &c. This is perforated by a troll, with a winch for winding it up. At the top of the line is to be placed a ring for the line to be run through. The line, for two yards and a quarter next the hook, to be of ſilk double, and armed with wire the length of ſeven inches. On the ſhank of the hook is to be faſtened a ſmooth piece of lead, ſo as to ſink the fiſh-bait, which is to be a gudgeon with its head downwards. Thus diſpoſed, the bait is to be caſt up and down; and if you feel the fiſh at the hook, give him length enough to run away with the bait, and paunch it; then ſtrike him with a ſmart jerk. To fiſh with a dead bait, uſe a yellow frog, dace, or roach, anointed in gum of ivy, diſſolved in oil of ſpike, and caſt it where the pike frequents. After it has lain a little while at the bottom, draw it to the top, and ſo up the ſtream, and you will quickly perceive a pike in earneſt purſuit thereof. This fiſh bites beſt about three in the afternoon in clear water, with a gentle gale, from the middle of ſummer to the end of autumn; but in winter all day long; and in the ſpring he bites beſt early in the morning, and late at night. Another method of fiſhing for pike, ſee under HUXING.

No pike or jack is to be taken in the Thames or Medway under twelve inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt. 30 Geo. II. cap. 21.

FISHING, *Roach.* The roach or rochet is no delicate fiſh. Thoſe in rivers are more valued than thoſe in ponds, though the latter are much the larger. They ſpawn about the middle of May.

To angle for this fiſh in April, cads or worms are proper baits; ſo are ſmall white ſnails or flies in ſummer. The bait is always to be under water, for this fiſh will not bite at top. Others uſe May-fly in that ſeaſon with good ſucceſs. In autumn, a paſte muſt be uſed, made of the crumb of white bread moulded with a little water, laboured with the hands into a tough paſte, and coloured not very deep, with red lead. In winter, gentles are the beſt bait. Sprouted malt, the young brood of waſps, and bees dipt in blood, and the thick blood of ſheep half dried, are noſtrums in this ſort of fiſhing.

In the neighbourhood of London they have a peculiar method of fiſhing for roach; they take a ſtrong cord, at the end of which is faſtened a three pound weight; and a foot above the lead a packthread of twelve feet is made faſt to the cord; and to the packthread, at proper diſtances, they add twelve ſtrong links of hair with roach hooks at them, baited with a white ſnail or perriwinkle. Then holding the cord in their hands, the biting of the fiſh draws the packthread, and this the cord, which gives them notice what to do. By this means they ſometimes dray up half a dozen, and very commonly two or three at a draught. By 30 Geo. II. cap. 21. no roach is to be taken in the Thames or Medway under ſix inches from the eye to the end of the tail, and only between Auguſt 24th and March 21ſt.

FISHING, *Smelt.* See SMELT.

By 30 Geo. II. cap. 21. no ſmelt is to be taken in the Thames or Medway leſs than five inches from the eye to the end of the tail, or at any time, except from January

25th to June 1ſt; and thoſe that are caught in other waters muſt be of the above ſize. 33 Geo. II.

Fishing, *Soal.* See Soal.

Fishing, *Tench.* The tench is a fine freſh-water fiſh, having very ſmall ſcales, but large, ſmooth fins, with a red circle about the eyes, and a little barb hanging at each corner of the mouth. It takes more delight among weeds in ponds than in clear rivers, and covets to feed in foul water. His ſlime is ſaid to have a healing quality for wounded fiſh; upon which he is commonly called the *fiſhes' phyſician.* When the carp, pike, &c. are hurt, it is ſaid they find relief by rubbing themſelves againſt the tench.

The ſeaſon for catching this fiſh is in June, July, and Auguſt very early and late, or even all night, in the ſtill part of rivers. His bait is a large red worm, at which he bites very eagerly, eſpecially if firſt dipped in tar. He alſo delights in all ſorts of paſtes made up of ſtrong-ſcented oils, or with tar; or a paſte of brown bread and honey; nor does he refuſe the cad-worm, lob-worm, flag-worm, green gentles, cod-bait, or ſoft boiled bread-grain.

When a number of tench are to be taken out of a muddy pond, the method is to take a large caſting net, well leaded, and with the meſhes from the crown to a full yard and a half, not too ſmall; for then, if the pond be deep, the fiſh will ſtrike away before the net gets to the bottom. The place where the net is to be thrown into muſt be cleared of weeds, &c. with a rake. A bait is next to be prepared for drawing the fiſh together: for this purpoſe put a quarter of a peck of wheat into three quarts of water, ſend it to an oven, and let it be well ſoaked; then add to it five pints of blood, and as much bran as is neceſſary to give it the conſiſtence of a paſte; mix with it ſome clay, and add a quart of lob-worms chopped to pieces. Let the whole be wrought up into a ſtiff paſte, and rolled into balls of the ſize of a hen's egg, and throw theſe into the pond in the place where the net is to be caſt. Let theſe, and ſome grains, be occaſionally thrown in, and the place be thus baited for ſeveral days. When the fiſh may be ſuppoſed to be well acquainted with the place, let a good baiting be given in the morning, and in the cloſe of the evening let the caſting-net be carefully thrown in. When the net is ſunk, the mud all about it is to be ſtirred with a long pole with a fork at the end; the net is to lie half an hour, and the mud to be thus ſtirred all the time; by this means the tench will be raiſed, and will be taken in pulling out the net; but if the net were to be thrown in and taken out in the common way, there would hardly be one fiſh taken; for the cuſtom of both tench and carp, when they are frighted, is to plunge their heads up to the eyes in the mud, and thus placed with their tails erect, the net muſt draw over them, without the poſſibility of entangling them.

Fishing, *Trout.* The trout is a delicious freſh water fiſh, ſpeckled with red and yellow, coming in and going out of ſeaſon with the buck, and ſpawning in the cold months of October and November, whereas all the other ſpecies ſpawn in hot ſummer weather. There are divers kinds of this fiſh, all valuable; but the beſt are the red and yellow trouts; and of theſe the female, diſtinguiſhed by a leſs head and deeper body, is preferred. They are known to be in ſeaſon by the bright colour of their ſpots, and by their large and thick back; which laſt may ſerve alſo as a rule for other fiſh. Through the whole winter they are ſick, lean, and unwholeſome, and frequently louſy. As the ſpring comes on, deſerting the ſtill, deep waters, they repair to the gravelly ground, againſt which they continue to rub till they get rid of their lice, which are a kind of worms with large heads. From that time they delight to be in the ſharp ſtreams, and ſuch as are ſwift, where they lie in wait for minnows and May-flies. At the latter end of May they are in their prime.

The uſual baits whereby the trout is caught are the worm, minnow, and fly, either natural or artificial. The proper worms are the brandling, lob-worm, ſquirrel-tail worm, which has a ſtreak round the back, a red head, and a broad tail, earth-worm, dung-worm, and maggot or gentle, eſpecially the three firſt; the brandling is commonly found in an old dunghill, or under cow-dung, or elſe among tanner's bark; the others are found in the earth, and under large ſtones, or ſtumps of trees; but whatever worms are uſed, they are the better for keeping, which is to be done in an earthen pot, with moſs, frequently changed. To take the trout with a ground bait, the angler ſhould have a light, taper rod, with a tender hazel top; and may angle with a ſingle hair of three links, the one tied to the other, for the bottom of the line, and a line of three-haired links for the upper part: with this ſort of tackle, if the ſportſman has room enough, he will take the largeſt trout in any river. The angler muſt always keep out of ſight, and the point of the rod muſt be down the ſtream. The ſeaſon for fiſhing for the trout for the ground bait begins in March, and the mornings and evenings are the beſt time of the day; but in cloudy weather the ſport may be followed all day long. There muſt be a plummet at ten inches from the hook, which the angler muſt feel always touching the ground; and this muſt be heavier as the ſtream is ſwifter. When the minnow is uſed, chuſe the whiteſt, and that of middling ſize; ſlip the hook through his mouth, and the point and beard out at the tail, ſo as it may lie almoſt ſtraight on the hook. Then try, againſt the ſtream, whether it will turn. The tackle in this caſe may be ſtronger, for the trout will ſeize this bait as ſoon as it comes in ſight; the upper part of the line may be of three ſilk and three hairs, and the lower of two of each; and the hook may be moderately large. In defect of a minnow, a ſmall loach, or a ſtickle-back, may ſerve the turn; or, for want of either, an artificial one may be made of cloth by the life, which is found every whit as good a bait as the natural one.

The moſt agreeable manner of fiſhing for trout is with the fly: the rod in this caſe muſt be light and pliable, and the line long and fine; if one hair be ſtrong enough, as it may be made by proper ſkill in the angler, there will be more fiſh caught than when a thicker line is uſed; and the fly-fiſher ſhould have the wind in his back, and the ſun before him. See Angling.

By 1 Eliz. cap. 21. no trout is to be taken under eight inches in length; and by ſtat. 24 Anne, cap. 21. ſea trout is not to be taken in particular rivers, creeks, or arms of the ſea between June 30th and Nov. 11th. By 30 Geo. II. cap. 21. no trout is to be taken in the Thames or Medway between November 11th and Auguſt 24th, or to be of leſs weight than one pound.

Fishing-*baits.* See the preceding articles, and Angling.

Fishing-*fly,* a bait uſed in angling for divers kinds of fiſh. The fly is either *natural* or *artificial.*

Natural flies are innumerable: the more uſual on this occaſion are the dun-fly, the ſtone or May-fly, the red-fly, the moor-fly, the tawny-fly, the vine-fly, the ſhell-fly, the cloudy and blackiſh-fly, the flag-fly; alſo caterpillars, canker-flies, bear-flies, &c. all which appear ſooner or later, according to the forwardneſs or backwardneſs of the ſpring. To know the particular fly the fiſh moſt covets, when you come in the morning to the river-ſide, beat the buſhes with your rod, and take up what variety you can of all ſorts of flies; try them all, and you will quickly know which are in moſt eſteem; not but that fiſh will ſometimes change their fly; but it is only when they have ſometimes glutted themſelves therewith.

There are two ways to fiſh with natural flies, either on the ſurface of the water, or a little underneath it.

In angling for chub, roach, or dace, move not your natural fly ſwiftly, when you ſee the fiſh make at it; but rather let it glide freely towards him with the ſtream; but if it be in a ſtill and ſlow water, draw the fly ſlowly ſideways by him, which will make him eagerly purſue it.

The *artificial* fly is moſt ſucceſsfully uſed in bluſtering weather, when the waters are ſo troubled by the winds that the natural fly cannot be ſeen, nor reſt upon them.

Of this artificial fly there are reckoned ten principal ſorts:

1. The dun-fly, in March, made of dun wool, and the feathers of a partridge wing. 2. A dun-fly, made of black wool, and the feathers of a black drake; the body made of the firſt, and the wings of the latter. 3. The ſtone-fly, in April, the body made of black wool, dyed yellow under the wings and tail. 4. The ruddy-fly, in the beginning of May; the body made of red wool, and bound about with black ſilk, with the feathers of a black capon, which hang dangling on his ſides next his tail. 5. The yellow or greeniſh fly, in June; the body made of black wool, with a yellow liſt on either ſide, and the wings taken off the wings of a buzzard, bound with black broken hemp. 6. The mooriſh-fly; the body made of duſkiſh wool, and the wings with the blackiſh mail of a drake. 7. Tawny-fly, till the middle of June; the body made of tawny wool, the wings made contrary one againſt the other, of the whitiſh mail of a white drake. 8. The waſp-fly, in July; the body made of black wool, caſt about with yellow ſilk, and the wings of drakes' feathers. 9. The ſteel-fly, in the middle of July; the body made of greeniſh wool, caſt about with the feathers of a peacock's tail, and the wings made of buzzards' wings. 10. The drake-fly, in Auguſt; the body made of black wool, caſt about with black ſilk, his wings of the mail of a black drake, with a black head.

The beſt rules for artificial fly-fiſhing are,

1. To fiſh in a river ſomewhat diſturbed with rain, or in a cloudy day, when the waters are moved by a gentle breeze; the ſouth wind is beſt; and if the wind blow high, yet not ſo but that you may conveniently guide your tackle, the fiſh will riſe in plain deeps; but if the wind be ſmall, the beſt angling is in ſwift ſtreams.

2. Keep as far from the water-ſide as may be; fiſh down the ſtream, with the ſun on your face, and touch not the water with your line.

3. Angle always in clear rivers with a ſmall fly and ſlender wings, but in muddy places uſe larger.

4. When after rain the water becomes browniſh, uſe an orange fly; in a clear day, a light-coloured fly; a dark fly for dark waters, &c.

5. Let the line be twice as long as the rod, unleſs the river be encumbered with trees.

6. For every ſort of fly have ſeveral of the ſame, differing in colour to ſuit with the different complexions of ſeveral waters and weathers.

7. Have a nimble eye and active hand, to ſtrike preſently with the riſing of the fiſh, or elſe he will be apt to throw out the hook.

8. Let the fly fall firſt into the water, and not the line, which will ſcare the fiſh.

9. In ſlow rivers or ſtill places, caſt the fly croſs over the river, and let it ſink a little in the water, and draw in gently back with the current.

Salmon flies ſhould be made with their wings ſtanding one behind the other, whether two or four. That fiſh delights in the gaudieſt colours that can be; chiefly in the wings, which muſt be long, as well as the tail.

FISHING-*floats* are little appendages to the line, ſerving to keep the hook and bait ſuſpended at the proper depth, to diſcover when the fiſh has hold of them, &c.

Of theſe there are divers kinds, ſome made of Muſcovy duck quills, which are the beſt for ſlow waters; but for ſtrong ſtreams, ſound cork, without flaws or holes, bored through with an hot iron, into which is put a quill of a fit proportion, is preferable; pare the cork to a pyramidal form, and grind it ſmooth.

FISHING-*hook*, a little engine of ſteel-wire, of a proper form to catch and retain fiſh.

The fiſhing-hook, in general, ought to be long in the ſhank, ſomewhat thick in the circumference, the point even and ſtraight: let the bending be in the ſhank. For ſetting the hook on, uſe ſtrong, but ſmall ſilk, laying the hair on the inſide of your hook; for if it be on the outſide, the ſilk will fret and cut it aſunder.

There are ſeveral ſizes of theſe fiſhing-hooks, ſome big, ſome little; and of theſe ſome have peculiar names, as, 1. Single-hooks. 2. Double-hooks, which have two bendings, one contrary to the other. 3. Snappers or gorgers, which are hooks to whip the artificial fly upon, or to bait with the natural fly. 4. Springers or ſpring-hooks, a kind of double hooks, with a ſpring which flies open, being ſtruck into any fiſh, and ſo keeps its mouth open.

FISHING-*line*. See *Angling* LINE.

FISHING-*nets*. See NET.

FISHING-*rod*, a long, ſlender rod or wand, to which the line is faſtened for angling.

Of theſe there are ſeveral ſorts, as,

1. A troller or trolling rod, which has a ring at the end of the rod for the line to go through when it runs off a reel. 2. A whipper or whipping-rod, a top-rod that is weak in the middle, and top-heavy, but all ſlender and fine. 3. A dopper, which is a ſtrong rod, and very light. 4. A ſnapper, or ſnap-rod, that is, a ſtrong pole, peculiarly uſed for the pike. 5. A bottom-rod, being the ſame as the dopper, but ſomewhat more pliable. 6. A ſniggling or poking-ſtick, a forked ſtick, having a ſhort ſtrong line, with a needle, baited with a lob-worm: this is only for eels in their holes.

Fiſhing-rods are made of different materials and ſtrength, according to the purpoſes for which they are uſed: in fiſhing with more than one hair, and with a ſilk-worm gut, red deal is reckoned the beſt, with hickery top, and the length of the whole rod ſhould be about four yards; but for a ſmall fly and ſingle hair, the length of three yards will be ſufficient, with the top of yellowiſh hickery, and about nine inches of whalebone, near as long as the ſtock, which ſhould be of white deal. The ſtocks or buts of rods are generally of ground hazle, aſh, or willow, about two or three feet long; and every joint ſhould gradually taper to the top. Hazle tops are preferred, though ſome uſe the Bamboo cane, and ſay it exceeds the beſt hazle. For ground angling, eſpecially in muddy waters, the cane or reed is preferred for a ſtock; with a hazle top, conſiſting of one, two, or three pieces, and a ſmall piece of round, ſmooth, taper whalebone, which is whipped to the hazle with ſtrong ſilk, rubbed with ſhoe-maker's wax; the whole length of the rod being five yards or five and a half yards. The beſt method of piercing hazle and bone is firſt to whip the end of the hazle with thread, and to bore it with a ſquare piece of iron of a proper ſize; and then make the thick end of the bone, firſt dipped in pitch to go into it; after which let it be ſcraped, filed, and neatly whipped. However, the neateſt rod may be thus made: get a thick white deal or fir-board, free from knots, and ſeven or eight feet long; let this be divided by a joiner into ſeveral breadths, and with his planes let him ſhoot them round, ſmooth, and taper. To one of theſe faſten an hazle rod, ſix or ſeven feet long, which may conſiſt of two or three pieces; to the top of which fix a piece of yew, about two feet long, made round, taper, and ſmooth, and to the yew a piece of ſmall, round, ſmooth whalebone, five or ſix inches long. The fir may be coloured by warming it at the fire, and with a feather dipped in aqua-fortis, ſtroking it over and chafing it into the wood, which will make it of a pure cinnamon colour.

It is found uſeful to have rings or eyes made of fine wire, and placed upon the rod from one end to the other, in ſuch a manner as that when the eye is laid to one you may ſee through all the reſt: through theſe rings the line is made to run, which will thus be kept in a due poſture; and you muſt have a winch or wheel affixed to the rod about a foot above the end, by which, whenever it is proper, you may give range to the fiſh. See Angling.

Fishing-*veſſels*, or thoſe uſed in the ſeveral fiſheries at ſea, or on the coaſts, are the buſs, coble, cock, dogger, driver, eel-boat, fly-boat, fluyt, hooker, Peter-boat, ſmack, ſtand-boat, trawler, trinker, &c.

Fishing *Bay*, in *Geography*, a bay of America, in Maryland, lying on the eaſt ſide of Cheſapeak bay, partly in Dorcheſter and Somerſet counties, the entrance of which is between Goldſborough and Devil's iſlands. This bay receives ſeveral rivers from each of the above-mentioned counties; the chief of which are Wicomico and Nanticoke, and alſo Tranſquaking and Blackwater creeks.—Alſo, a bay on the ſouth ſide of lake Ontario, about 37 miles E. of fort Niagara.

Fishing *Creek*, a townſhip of America, in Pennſylvania, ſituated on Suſquehanna river.—Alſo, a river of Virginia, which runs into the Ohio. N. lat. 39° 35′. W. long. 80° 57′.—Alſo, a river of Kentucky, which runs into Cumberland river, N. lat. 36° 49′. W. long. 84° 19′.—Alſo, a river of Pennſylvania, which runs into the Suſquehanna. N. lat. 40° 19′. W. long. 76° 56′.—Alſo, a river of New Jerſey, which runs into Delaware bay. N. lat. 39° 5′. W. long. 74° 54′.

Fishing-*town Point*, a cape on the eaſt coaſt of Borneo. S. lat. 1° 38′. E. long. 116° 30.

FISHKILL, a poſt town of America, in Dutcheſs county, New York, five miles E. of Hudſon river or Fiſhkill, containing about 30 houſes, a church for epiſcopalians, and another for Low Dutch. The townſhip is very extenſive, and contains ſix churches, and 6168 inhabitants, of whom 524 are ſlaves; 66 miles N. of the city of New York. *Fiſhkill landing* is a part of the above town on the river, where is a poſt-office.

Fish-kill, or *Creek*, is the ſmall river on which the above-mentioned town ſtands, and from which it derives its name. It diſcharges itſelf into Hudſon river, nearly oppoſite to New Windſor.—Alſo, the name of a ſmall ſtream which runs S.W. into Oneida lake.—Alſo, a ſtream which riſes from Saratoga lake, and runs ſix miles eaſterly to the Hudſon. Its mouth is oppoſite to Batten-kill, two miles above Saratoga town, memorable on account of general Burgoyne's army having laid down their arms as priſoners on its north ſide, during the conteſt between Great Britain and America.

FISHLIN, one of the ſmaller Shetland iſles, five miles S. from the iſland of Yell. N. lat. 60° 13′. W. long. 1° 23′.

FISH-PONDS, reſervoirs of water for the breeding, feeding, and preſerving of fiſh.

The quality of the pond, water, &c. proper for this end is ſcarce determinable by any certain ſymptom or rule: for ſome very promiſing ponds do not prove ſerviceable that way. One of the beſt indications of a breeding pond is, when there is good ſtore of ruſh and grazing about it, with gravelly ſhoals, ſuch as horſe-ponds uſually have; and when a water takes thus to breeding, with a few milters and ſpawners, that is, males and females, two or three of each, a whole country may be ſtocked in a ſhort time.

Eels and perch are of very good uſe to keep down the ſtock of fiſh; for they prey much upon the ſpawn and fry of bred fiſh, and will probably deſtroy the ſuperfluity of them.

As for pike, perch, tench, roach, &c. they are obſerved to breed almoſt in any waters, and very numerouſly; only eels never breed in ſtanding waters that are without ſprings; and in ſuch are neither found, nor increaſe, but by putting in; yet where ſprings are they are never wanting, though not put in. And, which is moſt ſtrange of all, many ſay there is not in an eel the leaſt token of propagation, either by milt or ſpawn; ſo that how they are produced is a queſtion very myſterious. See Eel.

For fiſh-ponds, it is agreed, thoſe grounds are beſt which are full of ſprings and apt to be mooriſh; the one breeds them well, and the other preſerves them from being ſtolen. The ſituation of the pond is alſo to be conſidered, and the nature of the currents that fall into it; likewiſe, that it be refreſhed with a little brook, or with the rain-water that falls from the adjacent hilly ground. Add, that thoſe ponds which receive the ſtale and dung of horſes, and other cattle, breed the largeſt and fatteſt fiſh.

Fiſh-ponds are not only a thing of convenience to great families, but may be made a very profitable article with the farmer under due management. Watery and boggy land is often fit for no other uſe, and theſe are then a great improvement of it. Ponds made in dry grounds in the flat bottoms between hills, will alſo ſerve not only to ſupply the cattle with water, but the profit of the fiſh that may be bred in them is greater than many are aware of, and comes without any labour or expence.

In making the pond, obſerve that the head be at the loweſt part of the ground; and that the trench of the flood-gate or ſluice have a good ſwift fall, that it may not be long in emptying on occaſion.

The beſt way of making the head is by driving three or four rows of ſtakes about ſix feet long, and at about four feet diſtance from one another, the whole length of the pond head: the firſt row of theſe is to be driven in four feet deep, that they may be very firm and ſecure; and if the bottom be not good, but be of a looſe ſand, ſome lime is to be added, which will harden into a ſort of ſtone. The earth dug out of the pond is to be laid between theſe ſtakes and rammed hard down. Other rows of ſtakes muſt be added behind and over theſe, and the ſpaces filled up till the whole is as high and as thick as is neceſſary. The face of it muſt be made even and ſlanting, and there muſt be a waſh left to carry off the ſuperfluous water in floods, &c.

If the pond carry ſix feet of water, it is enough; but it muſt be made eight feet deep, to receive the freſhes and rains that may fall into it.

It would alſo be advantageous to have ſhoals on the ſides for the fiſh to ſun themſelves in, and lay their ſpawn on;

beſide, in other places, certain holes, hollow banks, ſhelves, roots of trees, iſlands, &c. to ſerve as their retiring-places. Conſider farther, whether your pond be a breeder; if ſo, never expect any large carp from thence, the greatneſs of the number of ſpawn overſtocking the pond.

Carp and tench will live and thrive very well together in the ſame pond. Where pike are kept, there ſhould be roach, or ſome other quick breeding fiſh, to ſupply them with food.

Some think that pike and tench may be kept in the ſame pond. They imagine that pike will not feed upon tench; but they are miſtaken, for the pike is fonder of this than of almoſt any other fiſh. Ponds with clear gravelly and ſandy bottoms are uſually the beſt for breeding of fiſh, and foul water with muddy bottoms is the beſt for them to fatten in. Carp have been known to grow in one year from five to eighteen inches long in ponds where the water of the common ſewers of any town have run into it.

The ordinary growth of a carp is not above two or three inches in that time, ſo that all the exceſs is to be attributed to the fatneſs of the water of the ſewers.

The carp, which was firſt brought into England by Leonard Maſcal, about the year 1514, is the moſt valuable of all kinds of fiſh for the ſtocking of ponds, becauſe of its quick growth and great increaſe. If the breeding and feeding of this fiſh were more underſtood and practiſed, the advantages would be very great, and fiſh-ponds become as valuable an article as gardens. The gentleman who has land in his own hands may, beſide furniſhing his own table, and ſupplying his friends, raiſe a great deal of money, and very conſiderably improve his land at the ſame time, ſo as to make it yield more this way than by any other employment whatever. The ſale of carp makes a part of the revenue of the nobility and gentry in Pruſſia, Pomerania, Brandenburg, Saxony, Bohemia, Mecklenburg, and Holſtein. For this purpoſe particular attention ſhould be paid to the ſoil, water, and ſituation of the carp-pond: the beſt kinds of ponds are thoſe which are ſurrounded by the fineſt paſtures and corn-fields of a rich black mould, having ſoft ſprings on the ſpot, or running water that is neither too cold, nor impregnated with acid, calcareous, ſelenitic, or other mineral particles. The water, indeed, may be ſoftened by expoſing it to the air and ſun in a reſervoir, or by forming an open channel for it at ſome diſtance from the pond. They ſhould likewiſe be ſheltered againſt the eaſterly and northerly winds, and be fully expoſed to the influence of the ſun.

It is found by experience moſt convenient to have three kinds of ponds for carp; *viz.* the ſpawning pond, the nurſing and the main pond. The firſt ſort of pond muſt be well cleared of all other kinds of fiſh, eſpecially thoſe of the rapacious kind, ſuch as the pike, perch, eel, and trout, and alſo of all newts, of lizards, and the water-beetles. It ſhould be ſupplied with ſoft water, and be expoſed to the ſun and air. A pond of one acre requires three or four male carp, and ſix or eight female ones, and in the ſame proportion for each additional acre. The beſt carp for breeding are thoſe of five, ſix, or ſeven years old, in good health, with full ſcale, fine full eyes, and a long body, and without any blemiſh or wound. The pond ſhould be ſtocked on a fine calm day, towards the latter end of March or in April. Carp ſpawn in May, June, or July, according to the warmth of the ſeaſon; and for this purpoſe they ſwim to a ſteady, warm, ſheltered place, where they gently rub their bodies againſt the ſandy ground, graſs, or oſiers, and by this preſſure the ſpawn iſſues out. At the ſpawning ſeaſon all kinds of fowl ſhould be kept from the ponds. The young fry, hatched from the ſpawn by the genial influence of the ſun, are left in this pond through the whole ſummer, and even the next winter, if the pond is deep enough to prevent their ſuffocation under the ice in a ſevere winter; otherwiſe the breeders and fry are put into ſeparate ponds, more convenient for the wintering.

Ponds of the ſecond kind are the nurſeries; the young ſhould be removed into the nurſery in March or April, on a fine calm day; a pond of an acre will admit a thouſand or twelve hundred of this fry. When they are firſt put in, they ſhould be well watched and driven from the ſides of the pond, leſt they become the prey of rapacious birds. In two ſummers they will grow ſo much as to weigh four, five, ſometimes ſix pounds, and to be fleſhy and well taſted.

The main ponds are the laſt ſort; into theſe are put carp, that meaſure a foot, head and tail incluſive. Every ſquare of fifteen feet is ſufficient for one carp; their growth depends upon the room, and the quantity of food allowed them. The beſt ſeaſons for ſtocking the main ponds are ſpring and autumn: carp continues to grow for a long time, and to a very conſiderable ſize and weight. Mr. Forſter mentions one which he had ſeen in Pruſſia above a yard long, and of twenty-five pounds weight; and two or three hundred between two and three feet long, and which, as he was told, were of between fifty and ſixty years ſtanding. Geſner mentions an inſtance of one that was 100 years old: theſe were tame, and came to the ſhore in order to be fed, and ſwallowed with eaſe a piece of white bread of the ſize of a halfpenny roll. Ponds ſhould be well ſupplied with water during the winter, and when they are covered with ice, holes ſhould be opened every day for the admiſſion of freſh air, through want of which carp frequently periſh. See *Carp* FISHING, and *Breeding of* FISH.

For the general management of fiſh-ponds reſerve ſome great waters for the head-quarters of the fiſh, whence you may take, or wherein you may put any quantity thereof; and take care to have ſtews, and other auxiliary waters, ſo that you may convey any part of the ſtock from one to the other, and loſe no time in the growth of the fiſh, but employ the water as you do your land, to the beſt advantage. View the grounds, and find out ſome fall between the hills as nearly flat as may be, ſo as to leave a proper current for the water: if there be any difficulty in judging of ſuch, take an opportunity, after ſome ſudden rain, or the breaking up of a great ſnow in winter, and you will plainly ſee which way the ground caſts, for the water will take the true fall, and run accordingly.

The condition of the place muſt determine the quantity of ground to be covered with water. For example, we may propoſe in all fifteen acres in three ponds; or eight acres in two, and no leſs; and theſe ponds ſhould be placed one above another, ſo as the point of the lower may almoſt reach the head or bank of the upper; which contrivance is no leſs beautiful than advantageous.

The head or bank, which, by ſtopping the current, is to raiſe the water, and to make a pond, muſt be built with the clay and earth taken out of the pan or hollow dug in the loweſt ground above the bank: the ſhape of the pan is to be an half oval, whereof the flat is to come to the bank, and the longer diameter to run ſquare from it.

All fiſh-ponds ſhould be drawn once in three or four years, and the fiſh ſorted; if it be a breeding-pond, the ſmaller fiſh ſhould be taken out to ſtore other ponds with; and in feeding ponds all the fiſh ſhould be kept as nearly as may be of a ſize, for the larger and ſmaller never all thrive well together.

Flounders will both thrive and breed in any pond, eſpecially in a clay pond, and will be much larger than in rivers.

Bitterns, herons, otters, water-rats, and ſea-gulls, are all great deſtroyers of fiſh, and the ponds ſhould be kept as clear as poſſible of them ; but the greateſt of all deſtruction in fiſh-ponds is occaſioned by froſts.

To remedy this, ſome propoſe to break the ice and lay in pipes, ſtraw, and other things, to give air to the fiſh ; but all theſe fail when the ponds are foul ; but when they are clean, the fiſh ſeldom ſuffer any harm, be the froſt ever ſo long, though no holes be broke in the ice. The ſtench of foul water ſeems to be the occaſion of the death of the fiſh, in this caſe of its being locked up by froſts, and not the want of air. The cleaning of ponds frequently is of great uſe as well on this as on many other occaſions ; and it is done at no expence, becauſe the mud, ſerving as manure to the lands, more than pays the expence of taking it out.

When the ground is boggy, and carts cannot come up to take the mud, it is beſt to cut the ponds long and narrow in form of moats, that it may be thrown out at one toſs by the labourers in clearing them ; for if it require two toſſes, the difference will be juſt the double price of labour.

In many ſituations where fiſh-ponds can be readily formed, it may not unfrequently be adviſeable to have recourſe to them in the view of profit from the fiſh, and their convenience in family uſe. It is not eaſy to aſcertain what quantity of produce, or profit, might be derived from ponds of this deſcription under different circumſtances, as very few experiments have yet been detailed from which concluſions can be drawn. It would lead to much intereſting information on the ſubject, if the annual increaſe in the weight of different ſorts of fiſh, in different ſtages of their growth, and under different circumſtances of ſoil and water, were correctly determined.

It has been ſtated by Mr. Lowden of Berkſhire, in the “Annals of Agriculture,” that a pond of the extent of three acres and a half, drawn, after three year's ſtocking with ſtores of one year old, afforded 195 pounds weight of carp, and 230 pounds weight of tench ; which in the whole was 425 pounds, which ſold for twenty pounds ten ſhillings, or nearly *2l.* *6s.* *0d.* the acre per annum. And that the ſame pond, when ſtocked with tench only, on being drawn three years afterwards, produced about twenty-ſix pounds. Therefore, ſuppoſing that, in a pond which ſupports two thouſand four hundred fiſh, half a pound be gained annually, it will be 1200 pounds weight, which, at *6d.* the pound, will afford thirty pounds, and for fifteen acres, forty ſhillings the acre ; and when at *9d.* the pound three pounds the acre.

As there is little trouble in this ſort of farm management, ſuch profits ſhould not be diſregarded or overlooked in particular ſituations. In the diſtrict noticed above, it is ſtated that the uſual price, when ſold by the pound, is one ſhilling for tench, and ten-pence for carp. And that this is the beſt manner of diſpoſing of them that can be adopted. But when they are ſold by the number, as per hundred, &c. they are moſtly meaſured from the eye to the tail, and diſpoſed of in this manner.

Tench.

	£.	*s.*	*d.*
Under 12 inches - -	3	0	0
12 ——— - -	5	10	0
14 ——— - -	7	0	0

Carp.

	£.	*s.*	*d.*
Under 12 inches -	5	0	0
14 ———. - -	6	10	0
16 ———. - -	8	0	0

In what relates to the proper ſtocking and managing of ponds for the raiſing of fiſh, in the intention of deriving advantage from the ſale of them, much ſtill remains to be accompliſhed before the greateſt poſſible profit can be obtained.

In different ſituations the methods of ſtocking are extremely different. It is the practice in Berkſhire to ſtock with carp and tench in the proportion of one hundred to the acre, while in Suſſex they ſtock in the quantity of ſeventy five brace to the acre. Stocking in too large a proportion may be injurious to the profit, as fiſh require the food to be abundant in moſt caſes.

The ſorts of pond-fiſh moſt profitable to farming proprietors, are probably thoſe of carp, tench, perch, and occaſionally eels. But in thinly ſtocked ponds, the two laſt ſorts ſhould not be both admitted at the ſame time, as they devour young fry very largely. Where ponds are large, carp and tench anſwer well together ; but in thoſe of the ſmaller kind, the former is apt to deprive the latter of its food, in conſequence of being ſo much more powerful. Carp ſeldom affords much profit in ſmall ponds, but tench ſucceed well in thoſe of almoſt any dimenſions. Carp, perch, and eels, ſometimes anſwer pretty well together, and likewiſe tench with eels. Where the ponds are but ſmall, the beſt practice is perhaps to keep the carp and tench ſeparate.

Carp frequently injure themſelves by breeding, but this is not often the caſe with tench.

The ſituations in which fiſh-ponds can be made, in the intention of farm profit, are principally in the dips, hollows, and other parts of ground where the quality of the land is very bad, but where there is the convenience of plenty of water proper for the purpoſe.

In a national point of view, ponds of this ſort can hardly yet be conſidered of much importance, but they ſhould not be neglected by thoſe who are engaged in the improvement of landed property.

Though fiſh-ponds are numerous in many diſtricts of the kingdom, it is perhaps only in the counties of Suſſex and Surry that any thing like a ſyſtem has been eſtabliſhed for raiſing fiſh with the intention of profit ; but in theſe counties fiſh-ponds have long been formed for letting to dealers in pond-fiſh, and ſtocking in order to the diſpoſal of the produce as an article of farm-ſtock, like that of any other kind. It is not, however, improbable but that as the nature and management of pond-fiſh become more perfectly underſtood, ſuch a practice may be conſiderably extended.

FISH-TOWN, in *Geography*, a town of Africa, at the mouth of the river Calbari.

FISKEROE, an iſle or peninſula on the Laponic ſhore, part of which belongs to Ruſſian Lapland.

FISKO, a ſmall iſland of Sweden, between the iſland of Aland and the coaſt of Finland. N. lat. 60° 28′. E. long. 20° 45′.

FISMES, a town of France, in the department of the Marne, and chief place of a canton in the diſtrict of Rheims, ſituated on the Veſle ; 15 miles N.W. of Rheims. N. lat. 49° 18′. E. long. 3° 46′. The place contains 2129, and the canton 11,152 inhabitants, on a territory of 182½ kiliometres, and in 23 communes.

FISSATO, a ſea-port town of Africa, in the country of Tripoli; 90 miles N.W. of Tripoli. N. lat. 33° 50′. E. long. 12°.

FISSENIA, in *Ancient Geography*, a town of Aſia, in Meſopotamia, ſeated on the Baſil or Royal river, towards Babylonia.

FISSIDENS, in *Botany*, from *fiſſus*, cloven, and *dens*, a tooth, an Hedwigian genus of moſſes, diſtinguiſhed by its author, from his own *Dicranum*, only by the male flowers being axillary on the ſame plant with the female ones; a difference which, though corroborated by the habit in moſt caſes, not in all, we think too difficult to be of any practical uſe. See DICRANUM.

FISSILIA, from the fiſſile or eaſily cloven corolla. Juſſ. 260. Willd. Sp. Pl. v. 1. 194. Lamarck t. 28. An evergreen tree of the *iſle de Bourbon*, where it is called *bois de perroquet*, becauſe the ſmaller kinds of parrots are fond of the fruit. The *leaves* are alternate, on ſhort ſtalks, elliptic-lanceolate, entire, bluntiſh, thick and coriaceous, ſmooth, with one rib and a few ſlight veins. *Stipulas* none. *Flowers* axillary, ſomewhat racemoſe, occaſionally ſolitary, on longiſh ſmooth ſtalks, reſembling thoſe of an orange but ſmaller. *Fruit* a ſmall drupa, encompaſſed with the enlarged, cup-ſhaped, entire, permanent calyx.

This is the *Olax pſittacorum* of Vahl's Enum. v. 2. 33. "Leaves ovate-oblong or lanceolate, ſlightly veiny. Branches round." See OLAX, to which genus it is with indubitable propriety referred by Vahl, though they are placed in two very different natural orders by Juſſieu, who knew *Olax* but imperfectly. What he terms barren filaments in the flower, Linnæus, leſs authentically perhaps, takes for nectaries.

FISSUM-FOLIUM, a leaf that is cloven, or divided vertically more or leſs deeply. See LEAF.

FISSURA, in *Anatomy*, a name given to ſeveral openings, particularly in the bones of the head; as the ſuperior orbital fiſſure of the ſpheroid bone, the inferior-ſphenomaxillary fiſſure formed between the ſphenoid and ſuperior maxillary bones, &c.

FISSURA *Magna Sylvii*, a diviſion in the ſubſtance of the brain, ſeparating the anterior from the middle lobe; See BRAIN.

FISSURE, a term in *Surgery*. All practitioners and authors have, from the earlieſt times, underſtood by the word *fiſſure*, a ſolution of continuity in a bone, having the appearance of a hair. Hence the expreſſion *rima capillaris, capillary fiſſure*, which, in ſhort, is nothing more than a very fine, minute crack in a bone.

The old ſurgeons uſed to believe, that this ſort of fracture took place both in the flat and the long cylindrical bones; and it was M. J. L. Petit, who firſt brought into doubt the opinion, in as far as it related to bones of the latter claſs. The ſubject was noticed by this writer, in his "Traité des Maladies des Os." In this work, he repreſents fractures, ſaid to occur exactly in the direction of the length of the bones, as only imaginary. His reaſon for this ſentiment is, that there is no force capable of breaking a bone in this way, which would not much more eaſily occaſion a fracture of the tranſverſe kind.

The ſigns of a fiſſure, as ſtated by Fabricius ab Aquapendente, are very equivocal and fallacious: he obſerves: "quod ſi os ſecundum longitudinem fractum ſit, primò adeſt membri craſſities ultrà naturalem ſtatum, deinde dolor, tum membri inæqualitas." But all theſe ſymptoms, when they make their appearance, ought rather to be aſcribed to the effects of the contuſion, than to any other circumſtance. It is alſo evident, on reading Fabricius ab Aquapendente, that he meant by a longitudinal fracture, what is now called, an oblique one. Indeed as M. J. L. Petit notices, Fabricius would never have adviſed extenſion to be made for a fracture which was exactly in the direction of the length of a bone, ſince this practice is obviouſly not applicable to the caſe, and he would never have recommended making preſſure round the broken part, which could not be in a diſplaced condition, even were the bone actually fractured in a longitudinal manner. Duverney in his "Traité des Maladies des Os," has adduced no ſolid arguments in favour of the doctrine of longitudinal fractures.

The reader may find the preſent ſubject very judiciouſly inveſtigated at the beginning of M. J. L. Petit's work. It appears from the facts and reaſons there brought forward, that, on the bones of the extremities a fiſſure can only occur, in caſes of gunſhot-wounds, where the ſplinters ſometimes extend as far as the neareſt joint. Such fractures are not eaſy of detection. They are moſt frequently attended with ſymptoms, ariſing more from the violence and ſhock always occaſioned by gun-ſhot injuries, and the conſequent miſchief excited in the ſubſtance or medullary ſtructure of the bone, than from the particular nature of the fracture itſelf.

But though authors differ in opinion, in regard to fiſſures on the long cylindrical bones, they are all of one ſentiment in acknowledging the occurrence of ſuch fractures on the bones of the cranium, in conſequence of blows upon the head. Here the accident is often termed by Latin writers *ſciſſura*. The crack is either plainly perceptible, or ſcarcely diſcoverable; in which latter caſe, the expreſſion of *capillary fiſſure* is often uſed. In both caſes, the ſolution of continuity may take place, either preciſely in the place againſt which violence has been directed, or at ſome other part of the ſkull. Encyclopedie Méthodique; Partie Chirurgicale. Art. Fiſſure.

FISSURE, in *Geology* and *Mining*, generally ſignifies the ſame with *Fault*, which ſee; but Mr. W. Martin, a late, and generally a very correct writer, defines it (Outlines of the Knowledge of Extraneous Foſſils, p. 172.) to mean, a partial and ſuperficial rift, rarely extending through more than one ſtratum; which definition, by the notes in this page, is made to apply nearly to mineral veins; like thoſe in the Limeſtone diſtrict of Derbyſhire, and by which two things very different in their nature, and the mode and period of their formation, are confounded together, as we have obſerved, when treating of Faults.

FISSURE *Foſſils*, in *Mineralogy*, or venous or venigenous minerals, are thoſe found in veins or fiſſures, and which are generally cryſtallized in a more or leſs perfect ſtate; ſee VENIGENOUS *Foſſils*, RIDERS, VEINS, &c.

FISSURES, in the *Hiſtory of the Earth*, certain interruptions that horizontally or parallelly divide the ſeveral ſtrata of which the body of our terreſtrial globe is compoſed.

FISTELLA, or FEFZA, in *Geography*, a town of Morocco, the inhabitants of which are rich, courteous, and warlike; 150 miles N.E. of Morocco.

FISTER, a town of Norway, in the dioceſe of Bergen; 16 miles N.E. of Stavanger.

FISTRITS, or BYSTRZIT, *New*, a town of Bohemia in the circle of Bechin; 28 miles E. of Budwais. N. lat. 49° 3′. E. long. 15° 1′.

FISTRITZ, a river of Moravia which runs into the Marſch, near Olmatz.

FISTUCA, in *Antiquity*, an inſtrument of wood uſed in driving piles, and fitted with two handles. It was either raiſed with pullies fixed at the head of large beams, and then let fall again directly on the piles, or was wrought by the hand only.

FISTULA, *Lat.* a pipe, a flute, a flageolet, a whiſtle.

Fistula, in the *Ancient Muſic*, an inſtrument of the wind kind, reſembling our flute or flageolet.

The principal wind inſtruments of the ancients were the tibia and fiſtula; though how theſe were conſtituted, or wherein they differed, or how they were played on, does not at preſent appear. All we know is, that the fiſtula was at firſt made of reeds, and afterwards of other matters. Some had holes, ſome none; ſome again were ſingle pipes; others a combination of ſeveral; witneſs the ſyringa of Pan.

Fistula, *Liturgical*, was the pipe, being generally made of gold or ſilver, through which during ſeveral ages, perſons who communicated under both kinds, drank out of the chalice. The uſe of it was retained in the abbey of St. Dennis, near Paris, as long as it ſubſiſted, as likewiſe by the kings of France, when they received the ſacrament at their coronation.

Fistula *Panis*, Pan's pipe. See Syrinx and Siringa.

Fistula, in *Surgery*, has uſually been defined, "ſinus anguſtus, calloſus, profundus; acri ſanie diffluens;" or, as Dionis tranſlates it, "un ulcère profond, et caverneux, dont l'entrée eſt etroite, et le fond plus large; avec iſſue d'un pus acre et virulent; et accompagné de calloſités." In the words of Mr. Pott, a fiſtula is "a deep, hollow ſore, or ſinus, all parts of which are ſo hardened, or ſo diſeaſed, as to be abſolutely incapable of being healed while in that ſtate; and from which a frequent, or daily diſcharge is made of a thin, diſcoloured ſanies, or fluid."

A fiſtula generally leads down to ſome cavity, commonly ſituated in the cellular ſubſtance, between the integuments and muſcles, or in the interſpaces between the muſcles themſelves. The cavities with which fiſtulæ communicate are uſually termed *ſinuſes*. Theſe, in ſome meaſure, ſerve as receptacles for whatever matter is ſecreted by the parietes of the abſceſs, and when preſſure is made upon ſuch ſinuſes, a much larger quantity of ſanies, or matter, flows out of the external fiſtulous opening, than appearances would induce one to expect.

The reader will excuſe us from devoting much time to criticiſms on the ordinary definitions of a fiſtula; but we cannot refrain from obſerving that a fiſtula might be better, and more ſimply called a narrow track or paſſage, leading from the ſeat of an abſceſs, giving vent to more or leſs of the matter outward, and having little or no tendency to heal. However, in caſes of fiſtulæ in perinæo, and of thoſe of the parotid duct, the foregoing definition will not be altogether accurate, ſince the fiſtulous paſſage leads from parts where urine and ſaliva exiſt, inſtead of pus. In the preſent ſtate of ſurgery, ſo many diſorders are termed fiſtulous, which have no claim to the appellation, (according to the ſtrict ſenſe of the expreſſion,) not being accompanied with any calloſities or ſanious diſcharge, that perhaps a ſurgeon would be leſs liable to imbibe erroneous notions from the ſignification which we have ſuggeſted, than from the ancient one. We are ready to acknowledge, however, that almoſt all definitions are difficult, objectionable in ſome way or another, and expoſed to controverſy, and we gladly quit the ſubject ourſelves, ever ready to retract our own explanations in favour of better ones.

The ſinuſes which are formed in caſes of ulcers and abſceſſes are moſt frequently occaſioned by the confinement of purulent matter, which readily makes its way in different directions in the cellular ſubſtance, which is the ſofteſt and moſt yielding part of the texture of the body. If a timely opening be made into abſceſſes, the formation of fiſtulæ and ſinuſes is generally avoided. But though a puncture be made by the ſurgeon at a ſeaſonable period, if the aperture ſhould not be made in a depending ſituation, ſo that the maſs of pus cannot freely flow out, ſome of the matter will be continually oozing out in a ſlow way, prevent the part from healing, and be the cauſe of a fiſtula. The cavity of the abſceſs, in conſequence of being kept for a conſiderable time diſtended with matter, inſtead of contracting and granulating, will acquire a diſeaſed ſtate, in which a thin ſanious diſcharge will be emitted, and the parts loſe all tendency to get well of themſelves.

The foregoing obſervations are equally applicable to caſes, in which an abſceſs burſts of itſelf, in a place which is very unfavourable for the eſcape of the pus.

Another circumſtance under which fiſtulæ are neceſſarily produced, is when a dead portion of bone, or ſome extraneous body lodged in the fleſh, maintains a continual ſuppuration around it. In this ſort of caſe, the opening by which the abſceſs firſt breaks never cloſes as long as the ſecretion of pus within goes on; the matter is every now and then oozing out, and the track through which it paſſes becomes fiſtulous.

No term in ſurgery has been ſo much miſapplied as the word fiſtula; and ſince the expreſſion has always conveyed to the practitioner's mind the idea of a diſeaſe attended with a great deal of callous induration, this abuſe of language has too often led, eſpecially in former days, to methods of treatment equally unneceſſary, hurtful, and barbarous. Even at preſent, ſo many diſorders are called fiſtulæ without deſerving the name, at leaſt, without being accompanied with any callous hardneſs, that, as we have already ſaid, young ſurgeons would avoid imbibing many prejudices, by merely conſidering the phraſe "fiſtula," as implying an outlet for ſome diſcharge, which outlet, owing to ſome particular cauſe, has not much propenſity to heal. The truth of what we have here remarked will be better ſeen, when the ſubjects of fiſtula in ano, and fiſtula lachrymalis, are preſently treated of.

We ſhall next notice ſome of the modes of treatment which have been put into practice for the purpoſe of curing fiſtulous complaints. Some of the plans alluded to may now be ſaid to be exploded; but there is an advantage in knowing what has been done by our predeceſſors, and, for this reaſon, we ſhall enter into ſome details, which otherwiſe would not have been given.

In recent caſes of fiſtulæ, many writers have recommended what they call *vulnerary* injections to be made uſe of, and when the diſeaſe is in a more advanced ſtate, and the ſides of the ſinus from length of time are in a callous ſtate, eſcharotic injections and powders are preſcribed. Such applications, however, have ſeldom or never produced any real good effects, and the too frequent indiſcriminate employment of them has often rendered ſinuſes hard and callous, which previouſly were by no means indiſpoſed to heal.

In all caſes in which the ſides of a ſinus are in an indurated callous ſtate, ſome recommend laying open the cavity from one end to the other, and removing all ſuch parts as have become hardened, ſo as to convert the whole diſeaſed place into one wound, which is to be treated on common principles.

The ſimple diviſion of a fiſtula throughout its whole extent is, even at this day, the moſt approved plan of treatment generally ſpeaking; but the additional method of cutting out all the ſurrounding indurated parts has long been abandoned by all good ſurgeons. The abſurdity and bad effects of ſuch treatment were well explained by Pott, in his treatiſe on the fiſtula in ano, and, ſince his time, the lameſt practitioners in this country have not diſgraced themſelves by the performance of exciſions of this nature.

Though there cannot be a doubt, that dividing fiſtulæ throughout their whole extent is generally the moſt eligible mode of cure, it muſt be acknowledged that, in certain inſtances, the greatneſs of the pain, the diſagreeableneſs of the ſcar, and the degree of danger, are formidable objections.

For example, the practice of cutting thus extenſively is not applicable to caſes in which fiſtulæ extend a very conſiderable way up the rectum; and certainly no prudent ſurgeon would adviſe fiſtulæ to be cut open which run to an immoderate depth, and, as very often happens, below large blood-veſſels, nerves, and tendons.

In theſe laſt-mentioned, and ſeveral other kinds of fiſtulæ, the French ſurgeons are advocates for the employment of a ſeton. They obſerve that the object in the treatment of all fiſtulous diſeaſes, is to make the ſides of the ſinus adhere together, ſo that no cavity may remain. They ſtate, that the moſt effectual plan of fulfilling this indication is firſt to make an opening in the moſt depending part of the fiſtula, in order to give free vent to the matter; and, ſecondly, by a gentle irritation to excite a certain degree of inflammation over the inner ſurface of the cavity. It is well known that in the inflammatory ſtate, coagulating lymph is effuſed, and, becoming vaſcular, renders the ſides of the fiſtula permanently adherent together.

According to the French writers, the two indications, juſt now ſpecified, may be beſt fulfilled, in the majority of caſes, by introducing a ſeton from the orifice of the fiſtula down to the very bottom of the ſinus, where a counter-opening is to be made

The ſeton ſhould be made of ſilk or cotton, and more or leſs thick, according to the ſize of the fiſtula. The ſkein of ſilk or thread is to be gradually leſſened, as the cure advances, one or two threads being removed every two or three days. At length, when the cavity of the ſinus is almoſt filled up, and the diſcharge has conſiderably diminiſhed, the ſeton may be entirely removed. A moderately tight bandage over the dreſſings will then ſerve to complete the cure.

Setons are not generally preferred for the cure of fiſtulæ by Engliſh ſurgeons. Indeed it is obvious, they can only be uſed when the whole courſe of the fiſtula can be traced with a probe, and its termination is ſo ſituated that a counter-opening can be made into it. This may be ſaid never to be the caſe with fiſtulæ in ano.

The ſimple diviſion of fiſtulous ſinuſes is generally the moſt judicious mode of cure. It is only when a fiſtula runs under parts, which it would be dangerous or hurtful to cut, that the knife muſt give place to other means. A director, a crooked biſtoury, and a probe, are the inſtruments which are uſed in dividing fiſtulæ.

Many fiſtulæ are kept up by the preſence of extraneous bodies, dead pieces of bone, &c. In ſuch inſtances, it is manifeſt that the accompliſhment of a cure cannot be effected, either by injections, ſetons, or laying open the ſinuſes; but can only be brought about by the removal of the foreign ſubſtance, or diſeaſed portion of bone.

We ſhall now treat of the fiſtula in ano, fiſtula lachrymalis, and fiſtulæ in perinæo, all which are ſurgical diſeaſes of the greateſt importance.

Fiſtula in ano.—Clear and preciſe definitions of diſeaſes, and the application of ſuch names to them, as are expreſſive of their true and real nature, are (ſays that celebrated ſurgeon Mr. Pott) of more conſequence than they are generally imagined to be: untrue or imperfect ones occaſion falſe ideas; and falſe ideas are generally followed by erroneous practice.

The ſame writer remarks that it would be no difficult matter to produce inſtances of diſorders, whoſe treatment has, for a great length of time, been accommodated more to the titles impoſed upon them, than to their true and real character. Among theſe, the fiſtula in ano is mentioned as a moſt glaring proof.

“ The cuſtom of giving the appellation of fiſtula to every impoſthumation, and to every collection of matter formed near to the anus, has, by conveying a falſe notion of them, been productive of ſuch methods of treating them, as (though perhaps ſuited to ſuch idea) are diametrically oppoſite to thoſe which ought to be purſued; ſuch as have often rendered thoſe caſes tedious and painful, which might have been cured eaſily and expeditiouſly; and, conſequently, ſuch as have brought diſgrace on our art, and unneceſſary trouble on mankind.

“ A ſmall orifice or outlet, from a large or deep cavity, diſcharging a thin gleet or ſanies, made a conſiderable part of the idea which our anceſtors had of a fiſtulous ſore, wherever ſeated. With the term *fiſtulous*, they always connected a notion of calloſity; and, therefore, whenever they found ſuch a kind of opening yielding ſuch ſort of diſcharge, and attended with any degree of induration, they called the complaint a fiſtula. Imagining this calloſity to be a diſeaſed alteration made in the very ſtructure of the parts, they had no conception that it could be cured by any means but by removal with a cutting inſtrument, or by deſtruction with eſcharotics; and therefore they immediately attacked it with knife or cauſtic, in order to accompliſh one of theſe ends; and very terrible work, by their own accounts, they often made, before they did accompliſh it.

“ Several of the above-mentioned circumſtances ſo frequently attend collections of matter near to the rectum; and therefore, for want of proper attention to the true nature of the caſe, the cuſtom of calling them all fiſtulæ has generally prevailed, though without any foundation in truth or nature.

“ That abſceſſes, formed near the fundament, do ſometimes from bad habits, from extreme neglect, or from groſs miſ-treatment, become fiſtulous, is certain; but the majority of them have not, at firſt, any one character or mark of a true fiſtula; nor can, without the moſt ſupine neglect on the ſide of the patient, or the moſt ignorant miſmanagement on the part of the ſurgeon, degenerate, or be converted into one.

“ Collections of matter from inflammation, wherever formed, if they be not opened in time, and in a proper manner, do often burſt. The hole, through which the matter finds vent, is generally ſmall, and not often ſituated in the moſt convenient or moſt dependent part of the tumour: it therefore is unfit for the diſcharge of all the contents of the abſceſs; and, inſtead of cloſing, contracts itſelf to a ſmaller ſize; and, becoming hard at its edges, continues to drain off what is furniſhed by the undigeſted ſides of the cavity.

“ This is often the caſe in the moſt muſcular or fleſhy parts of the body, where the cellular and adipoſe membrane does not abound ; but is more particularly ſo in the neighbourhood of the anus, where that membrane is large in quantity, well ſtocked with fat, and not compreſſed by the action of any large or ſtrong muſcles."

After taking notice of the frequency of abſceſſes about the anus, and their being attended with conſiderable induration, which does not ſubſide, particularly when they have been allowed to burſt of themſelves, Mr. Pott remarks that the ſmallneſs of the accidental orifice, the hardneſs of its edges, its being found to be the outlet from a deep cavity, its diſcharging every day a thin, gleety, diſcoloured kind of matter, attended with great induration of the ſurrounding parts, are all of them circumſtances raiſing and confirming the idea of a true fiſtula.

" To this idea (ſays Mr. Pott) the general treatment of theſe caſes has therefore been made to accord : upon this has been built the prevailing doctrine of free exciſion, or as free deſtruction, without any regard to the original production of the complaint, its particular ſeat, its date, or any other attendant circumſtances; and without examining whether it would not admit a more eaſy and a more expeditious method of cure. In ſhort, this notion, that all ſinuſes near the rectum are neceſſarily fiſtulous, has occaſioned the preſcription of ſuch a manner of treating them, from their very firſt appearance as they can hardly ever ſtand in need of at any time; and a more ill founded ſuppoſition that the induration of the parts about may be owing to a diſeaſed calloſity, is urged as a reaſon for uſing them with more ſeverity than even ſuch a ſtate would require."

Mr. Pott next obſerves, that whoever would obtain a true notion of the diſeaſe in queſtion, muſt conſider it under all the forms in which it makes its appearance. Theſe, which are many and various, both with regard to aſpect, ſituation, and ſymptoms, are what ſhew the different nature of the complaint in different ſtates, and are the circumſtances which ought to regulate a ſurgeon's conduct in the cure of it.

Sometimes (ſays Mr. Pott) the attack is made with ſymptoms of high inflammation; with pain, fever, rigor, &c. the fever ſubſiding as ſoon as ſuppuration is fully eſtabliſhed.

" In this caſe, a part of the buttock, near to the anus, is conſiderably ſwollen, and has a large circumſcribed hardneſs. In a ſhort time, the middle of this hardneſs becomes red and inflamed ; and, in the centre of it, matter is formed.

" This, in the language of our anceſtors, is called in general a phlegmon ; but, when it appears in this particular part, a phyma.

" The pain is ſometimes great, the fever high, the tumour large, and exquiſitely tender; but however diſagreeable the appearances may have been, or however high the ſymptoms may have riſen before ſuppuration, yet, when that end is fairly and fully accompliſhed, the patient generally becomes eaſy and cool, and the matter formed under ſuch circumſtances, though it may be plentiful, yet is good.

" On the other hand the external parts, after much pain, attended with fever, ſickneſs, &c. are ſometimes attacked with conſiderable inflammation, but without any of that circumſcribed hardneſs which characterized the preceding tumour ; inſtead of which, the inflammation is extended largely, and the ſkin wears an eryſipelatous kind of an appearance. In this the diſeaſe is more ſuperficial, the quantity of matter ſmall, and the cellular membrane ſloughy to a conſiderable extent.

" Sometimes, inſtead of either of the preceding appearances, there is formed in this part what the French call *une ſuppuration gangreneuſe* ; in which the cellular and adipoſe membrane is affected in the ſame manner as it is in the diſeaſe called a carbuncle.

In this caſe, the ſkin is of a duſky red, or purple kind of colour, and although harder than when in a natural ſtate, yet it has by no means that degree of tenſion or reſiſtance which it has either in the phlegmon, or in the eryſipelas.

" The patient has generally at firſt a hard, full, jarring pulſe, with great thirſt, and very fatiguing reſtleſſneſs. If the progreſs of the diſeaſe be not ſtopped, or the patient relieved by medicine, the pulſe ſoon changes into an unequal, low, faultering one ; and the ſtrength and the ſpirits ſink in ſuch manner as to imply great and immediately impending miſchief. The matter formed under the ſkin ſo altered is ſmall in quantity, and bad in quality ; and the adipoſe membrane is gangrenous and ſloughy throughout the extent of the diſcolouration. This generally happens to perſons whoſe habit is either naturally bad, or rendered ſo by intemperance.

" In each of theſe different affections, (continues Mr. Pott,) the whole malady is often confined to the ſkin and cellular membrane underneath it ; and no other ſymptoms attend than the uſual general ones, or ſuch as ariſe from the formation of matter, or ſloughs in the part immediately affected. But, it alſo often happens, that, added to theſe, the patient is made unhappy by complaints ariſing from an influence, which ſuch miſchief has on parts in the neighbourhood of the diſeaſe ; ſuch as the urinary bladder, the vagina, the urethra, the hæmorrhoidal veſſels, and the rectum ; producing retention of urine, ſtrangury, dyſury, bearing down, teneſmus, piles, diarrhœa, or obſtinate coſtiveneſs : which complaints are ſometimes ſo preſſing, as to claim all our attention. On the other hand, large quantities of matter and deep ſloughs are ſometimes formed, and great devaſtation committed on the parts about the rectum, with little, or no previous pain, tumour, or inflammation.

" Sometimes the diſeaſe makes its firſt appearance in an induration of the ſkin near to the verge of the anus ; but without pain or alteration of colour, which hardneſs gradually ſoftens and ſuppurates. The matter, when let out, in this caſe, is ſmall in quantity, good in quality ; and the ſore is ſuperficial, clean, and well conditioned. On the contrary, it now and then happens, that, although the pain is but little, and the inflammation apparently ſlight, yet the matter is large in quantity, bad in quality, extremely offenſive, and proceeds from a deep crude hollow, which bears an ill-natured aſpect.

" The place, alſo, where the abſceſs points, and where the matter, if left alone, would burſt its way out, is various and uncertain. Sometimes it is in the buttock, at a diſtance from the anus ; at other times near its verge, or in the perinæum ; and this diſcharge is made ſometimes from one orifice only, ſometimes from ſeveral. In ſome caſes, there is not only an opening through the ſkin externally, but another through the inteſtine into its cavity ; in others there is only one orifice, and that either external or internal.

" Sometimes the matter is formed at a conſiderable diſtance from the rectum, which is not even laid bare by it ; at others it is laid bare only, and not perforated ; it is alſo ſometimes not only denuded, but pierced ; and that in more places than one. The original ſeat of this miſchief is, in ſome caſes, high up in the pelvis, near the lower vertebræ of the loins, and the os ſacrum ; and the matter comes from parts ſo diſeaſed, and ſo out of reach, that the caſe is hopeleſs from the firſt."

We ſhall here avoid inſerting a few remarks, which Mr.

Pott has next added, for they ſeem to reſt on doctrines which are now generally abandoned. The different caſes which have been mentioned ſhew, that there is a great variety of ſtates and circumſtances, and that the diſeaſe muſt of courſe have the treatment varied accordingly. When inflammation attacks the cellular ſubſtance ſurrounding the rectum, ſuppuration can very ſeldom be prevented from taking place. In conformity to the advice of Mr. Pott, therefore, the beſt practitioners ſeldom have any object of this kind in view; but, when called at an early period of the affection, endeavour to moderate the ſymptoms, promote ſuppuration, open the abſceſs, as ſoon as the matter is formed, and treat the ſore in ſuch manner as ſhall be likely to produce a ſpeedy and laſting cure.

Mr. Pott remarks: when there are no ſymptoms which require particular attention, and all that we have to do is to aſſiſt the maturation of the tumour, a ſoft poultice is the beſt application. When the diſeaſe is fairly of the phlegmonoid kind, the thinner the ſkin is ſuffered to become, before the abſceſs is opened, the better; as the induration of the parts about will thereby be more diſſolved, and, conſequently, there will be the leſs to do after ſuch opening has been made. This kind of tumour is generally found in people of full, ſanguine habits; and who, therefore, if the pain be great and the fever high, will bear evacuation, both by phlebotomy and gentle cathartics; which is not often the caſe of thoſe who are ſaid to be of bilious conſtitutions; in whom the inflammation is of larger extent, and in which the ſkin wears the yellowiſh tint of the eryſipelas: perſons of ſuch kind of habit, and in ſuch circumſtances, being in general ſeldom capable of bearing large evacuation.

According to Mr. Pott, the eryſipelatous inflammation generally makes its attack with nauſea, vomiting, ſlight rigour, heat, thirſt, and reſtleſſneſs.

"The quickneſs of the pulſe, and heat of the ſkin (ſays this diſtinguiſhed ſurgical writer) are indications for ſome degree of evacuation, and, indeed, ſometimes render it requiſite; but, it is a very prevailing opinion with many practitioners, that theſe evacuations ſhould be freely made, and frequently repeated: in ſhort, that the cure of this kind of inflammation is ſafely to be effected by them; which is ſo far from being true, that the practice has proved fatal to many. If, for inſtance, blood be drawn off in ſuch quantity, as that the patient's pulſe ſinks ſuddenly, or his ſtrength be conſiderably reduced by purging, it is no very uncommon thing for the inflammation to leave the part firſt affected; and for ſuch complaints to come on immediately, as ſoon prove deſtructive, and afford no opportunity to repair the miſchief which the evacuation has produced.

"When the inflammation is of this kind, the quantity of matter formed is ſmall, compared to the ſize and extent of the tumour; the diſeaſe is rather a ſloughy, putrid ſtate of the cellular membrane, than an impoſthumation; and, therefore, the ſooner it is opened, the better. If we wait for the matter to make a point, we ſhall wait for what will not happen; at leaſt, not till after a conſiderable length of time, during which, the diſeaſe in the membrane will extend itſelf, and conſequently, the cavity of the ſinus, or abſceſs, be thereby greatly increaſed.

"When, inſtead of either of the preceding appearances, the ſkin wears a duſky purpliſh, red colour; has a doughy, unreſiſting kind of feel, and is very little ſenſible; when theſe circumſtances are joined with an unequal, faultering kind of pulſe, irregular ſhiverings, a great failure of ſtrength and ſpirits, and inclination to doſe, the caſe is formidable, and the event generally fatal.

"The habit, in theſe circumſtances, (continues Mr. Pott) is always bad; ſometimes from nature, but much more frequently from gluttony and intemperance. What aſſiſtance art can lend muſt be adminiſtered ſpeedily; every minute is of conſequence; and, if the diſeaſe be not ſtopped, the patient will ſink. Here is no need for evacuation of any kind; recourſe muſt be immediately had to medical aſſiſtance; the part affected ſhould be frequently fomented with hot ſpirituous fomentations; a large and deep inciſion ſhould be made into the diſeaſed part; and the applications made to it ſhould be of the warmeſt, moſt antiſeptic kind."

Mr. Pott afterwards notices the occaſional occurrence of ſtrangury, dyſury, and a total retention of urine, when abſceſſes form in the neighbourhood of the rectum and bladder, particularly, when they are ſituated near the neck of the latter part. Such complaints may continue from the firſt attack of the inflammation till the abſceſs breaks, or they may only laſt a few hours.

Mr. Pott obſerves, that ſtrangury and dyſury in general are eaſily relieved by bleeding, gum arabic, and nitre. "But (ſays he) the total retention (of urine) is, while it continues, both fatiguing and alarming. They, who have not often ſeen this caſe, generally have immediate recourſe to the catheter, and for this they plead the authority of precept; but, the practice is ſo eſſentially wrong, and I have ſeen ſuch terrible conſequences from it, that I cannot help entering my proteſt againſt it.

"The neck of the bladder, from its vicinity to the parts where the inflammation is ſeated, and from its being involved in the ſame common membrane, does certainly participate, in ſome degree, of the ſaid inflammation. This will, in ſome meaſure, account for the complaint; but, whoever conſiders the extremely irritable ſtate of the parts compoſing that part of the urethra, (if I may be allowed ſo to call it,) and will, at the ſame time, reflect on the amazing and well-known effects of irritation, will be convinced, that the principal part of this complaint ariſes from that cauſe; and that the diſeaſe is, ſtrictly ſpeaking, ſpaſmodic. The manner in which an attack of this kind is generally made, the very little diſtenſion which the bladder often ſuffers, the ſmall quantity of urine ſometimes contained in it, even when the ſymptoms are moſt preſſing, and the moſt certain as well as ſafe method of relieving it, all tend to ſtrengthen ſuch opinion.

"But (proceeds Mr. Pott) whether we attribute the evil to inflammation, or to ſpaſmodic irritation, whatever can, in any degree, contribute to the exaſperation of either, muſt be palpably and manifeſtly wrong. The violent paſſage of the catheter through the neck of the bladder, (for violent in ſuch circumſtances it muſt be,) can never be right. I will not ſay, that it never ſucceeds; but I will ſay, that it can hardly ever be proper to make the attempt.

"If the inſtrument be ſucceſsfully introduced, it muſt, either be withdrawn as ſoon as the bladder is emptied, or it muſt be left in it: if the former be done, the ſame cauſe of retention remaining, the ſame effect returns; the ſame pain and violence muſt again be ſubmitted to under (moſt likely) increaſed difficulties. On the other hand, if the catheter be left in the bladder, it will often, while its neck is in this ſtate, occaſion ſuch diſturbance, that the remedy, (as it is called,) will prove an exaſperation of the diſeaſe, and add to the evil it is deſigned to alleviate. Nor, is this all; for the reſiſtance which the parts, while in this ſtate, make, is ſometimes ſo great, that if any violence be uſed, the inſtrument will make for itſelf a new rout in the neighbouring parts, and lay the foundation of ſuch miſchief as frequently baffles all our art—an accident, (ſays Mr. Pott,) which I have known to happen to thoſe, whoſe judgment and dexterity have never been doubted."

Mr. Pott remarks, that the true, ſafe, and rational method of relieving this complaint is by evacuation and anodyne relaxation : this not only procures immediate eaſe, but does at the ſame time ſerve another very material purpoſe, which is that of maturating the abſceſs. Loſs of blood is neceſſary ; the quantity to be determined by the ſtrength and ſtate of the patient. The inteſtines ſhould alſo be emptied, if there be time for ſo doing, by a gentle cathartic : but, (ſays Pott,) the moſt effectual relief will be from the warm bath or ſemicupium, the application of bladders with hot water to the pubes and perineum ; and, above all other remedies, the injection of clyſters, conſiſting of warm water, oil, and opium.

For the painful teneſmus, which is no uncommon attendant on inflammations about the rectum, Mr. Pott recommends a doſe of rhubarb, joined with ſome warm anodyne; and, in caſe this plan fails, he preſcribes ſtarch clyſters with opium.

The bearing down in women may be cured by the ſame means.

For the obſtinate coſtiveneſs, and piles, which ſometimes accompany abſceſſes about the rectum, Mr. Pott adviſes phlebotomy, laxative clyſters, and a low cool regimen, a ſoft poultice being externally applied, which ſoftens the indurated piles, and promotes ſuppuration.

We ſhall next follow Mr. Pott in conſidering this diſeaſe, when the firſt ſymptoms attending the inflammation are gone off, and matter is either formed and collected, ſo as to require being let out, or this laſt ſtep having being neglected, the pus has made its own way out.

Mr. Pott reduces all caſes of this claſs to two general heads:

1. Thoſe inſtances in which the inteſtine is not at all intereſted.

2. Thoſe in which it is either laid bare, or perforated.

When the matter is fairly formed, makes a point, and requires being let out, the opening ought always to be made where ſuch point is ſituated, where the ſkin is moſt thin, and the fluctuation moſt palpable.

Mr. Pott, after cenſuring the plan of opening abſceſſes about the anus, expoſes the abſurdity of the opinion once prevalent, that an abſceſs, opened by a knife, muſt be immediately examined and ſtuffed with dreſſings, while that, on which a cauſtic has been applied, muſt be let alone, until the eſchar is caſt off. "Let the one be treated as the other is, (obſerves this eminent ſurgeon,) and as they both ought to be, and the event will be found to be alike in each ; excepting this material difference in favour of the knife, that it will not neceſſarily occaſion any deſtruction of parts, loſs of ſubſtance, nor any deformity, which is at all comparable with what muſt follow the uſe of the cauſtic.

"In making the opening, the knife or lancet ſhould be paſſed in deep enough to reach the fluid, and, when it is in, the inciſion ſhould be continued upward and downward, in ſuch a manner as to divide all the ſkin covering the matter. By theſe means, the contents of the abſceſs will be diſcharged at once ; future lodgment of matter will be prevented ; convenient room will be made for the application of proper dreſſings ; and there will be no neceſſity for making the inciſion in different directions, or for removing any part of the ſkin compoſing the verge of the anus."

Mr. Pott has explained with great ability, that though all abſceſſes of this kind are called fiſtulæ, and have been ſuppoſed to effect the rectum, yet the place where the matter is formed is at ſuch a diſtance from the inteſtine, that the latter part cannot be at all concerned, and none of theſe caſes are, in the firſt inſtance, fiſtulæ. It does not follow, as a matter of courſe, that we have any thing to do with the rectum at all, not more than if it were not near the diſeaſe, which ſhould be regarded and treated as a common abſceſs.

It is accurately obſerved by the celebrated ſurgical writer, whoſe remarks are freely quoted in this article, that wherever matter is formed in conſequence of inflammation, it always leaves, upon being let out, a proportional hollow, and ſome degree of induration. The former of theſe is of different ſize, according to the quantity of matter, and the latter depends both on the degree of previous inflammation, and the more or leſs perfect ſuppuration of the abſceſs.

The idea, formerly attached to the two circumſtances of hollow and hardneſs, was, that the firſt aroſe entirely from loſs of ſubſtance ; the ſecond, from a diſeaſed alteration of the parts. Hence preceding ſurgeons, as ſoon as they had diſcharged the matter, uſed to fill and diſtend the cavity, with a view of obtaining a gradual regeneration of fleſh, and the dreſſings were generally of an eſcharotic quality, intended for the diſſolution of the hardneſs.

"The practice (ſays Mr. Pott) is a neceſſary conſequence of the theory. Whoever ſuppoſes diſeaſed calloſity, and great loſs of ſubſtance, will neceſſarily think himſelf obliged to deſtroy the former, and prevent the cavity formed by the latter from filling up too haſtily. On the other hand, he who conſiders this matter as it really is, that is, he who regards the cavity of the abſceſs as being principally the effect of the gradual diſtraction and ſuppuration of its ſides, with very little loſs of ſubſtance, compared with the ſize of the ſaid cavity ; and who looks upon the induration round about as nothing more than a circumſtance which neceſſarily accompanies every inflammation in membranaceous parts, eſpecially in thoſe which tend to ſuppuration, will, upon the ſmalleſt reflection, perceive, that the dreſſings applied to ſuch cavity ought to be ſo ſmall in quantity, as to permit nature to accompliſh that end which ſhe always aims at as ſoon as the matter is let out (I mean, ſays Pott, the approach of the ſides of the cavity toward each other); and that ſuch ſmall quantity of dreſſings ought to conſiſt of materials proper only to encourage eaſy and gradual ſuppuration.

"The fact is ſo obvious to common ſenſe, that it muſt appear to every one, who will coolly and impartially conſider it.

"What is the part in which the diſeaſe is ſeated ? and what are the alterations which ſuch diſeaſe produces ? The part is mere cellular membrane ; and the alteration is obſtruction and inflammation, ending in the formation of matter. But do theſe create any new body ? Do not the ſides of the abſceſs ſtill remain cellular and adipoſe membrane, only inflamed, thickened, hardened, and rendered purulent ? Can ſuch alteration require any thing more towards reſtoring the parts to a natural ſtate than a free ſuppuration from the parts ſo altered ? Or, can it make extirpation or deſtruction neceſſary ? Moſt certainly it cannot. How then is ſuppuration to be produced and maintained ? Not by thruſting in ſuch applications as by their quantity diſtend, and by their quality irritate and deſtroy; but by dreſſing lightly and eaſily with ſuch as appeaſe, relax, and ſoften."

When an abſceſs near the anus is opened, the cavity, as Mr. Pott obſerves, is found proportioned to the quantity of matter. If the hollow be immediately filled with dreſſings of any kind, the ſides of it will be prevented from approaching toward each other, or may even be farther ſeparated. But, if this cavity be not filled, or have little or no dreſſings of any kind introduced into it, the ſides immediately collapſe; and, coming nearer and nearer, do, in a very ſhort time, convert a large hollow into a ſmall ſinus. The ſame thing happens when the collection of matter has burſt of itſelf.

Mr. Pott acknowledges, that the ſinus will not always become perfectly cloſed, particularly in caſes of fiſtula in ano; but, ſtill he contends, that the conduct of nature is not the leſs evident, nor the hint, which art ought to borrow from her, the leſs palpable.

Whenever extenſive ulcers or cavities exiſt, whether in caſes of fiſtula in ano, or other diſorders, much will depend upon the patient's conſtitution, and the care taken of it. When the habit is good, or properly corrected, any dreſſings which are not offenſive in quantity or quality will prove effectual; but if the conſtitution be out of order, or badly treated, the ſurgeon may try (as Mr. Pott remarks) the whole farrago of externals, and only waſte his own and his patient's time.

This able writer explains, that all theſe caſes are at firſt mere abſceſſes; the conſequences of inflammation; and require no other treatment than what would be proper in the ſame kind of caſe in all other parts. Some few of them are ſo circumſtanced, with regard to the inteſtine, that it is quite unneceſſary to meddle with it at all; but whether that be the caſe or not; whether the diviſion of the rectum become a neceſſary part in the cure or not; they moſt certainly do not deſerve the name of fiſtulæ, nor require that ſort of treatment which fiſtulæ are ſaid and thought to ſtand in need of; though by being, from their very firſt appearance, ſuppoſed to be ſuch, they are frequently, by miſmanagement, rendered truly fiſtulous.

By light, eaſy treatment, ſays Mr. Pott, large abſceſſes, formed in the neighbourhood of the rectum, may ſometimes be cured without meddling with this inteſtine at all. But it much more frequently happens that the inteſtine, although it may not have been pierced by the matter, has yet been ſo denuded, that no conſolidation of the ſinus can be obtained except by laying the cavity of the abſceſs, and that of the inteſtine, into one.

Sometimes the practitioner may perceive the neceſſity for ſuch a diviſion at firſt: that is, on opening the abſceſs he may find the inteſtine ſo bare, that it is evident no cure can be accompliſhed without this operation. In other inſtances reaſonable hopes of ſucceſs may be entertained at firſt; but they may end in diſappointment.

Mr. Pott obſerves, that when the gut is found to be in ſuch ſtate, that there is no reaſon to expect a cure without its being divided, that operation had better, on many accounts, be performed at the time the abſceſs is firſt opened, than be deferred to a future one. When done, as it always may be done, the pain which the patient muſt feel when the abſceſs is opened will be ſo trivially increaſed, that the difference will hardly be diſtinguiſhed, either with regard to time or ſenſation. If the diviſion be delayed, the patient muſt either be under the continual apprehenſion of a ſecond cutting, or ſuffer one when he does not expect it.

The object of the operation is to divide the rectum from the verge of the anus as high as the top of the hollow in which the matter is formed, ſo as to lay the two cavities of the gut and abſceſs into one; and by means of an open, inſtead of a hollow or ſinuous ſore, to obtain a firm and laſting cure.

The beſt inſtrument for the operation is the curved, probe-pointed knife, which, being introduced into the ſinus, while the ſurgeon's fore-finger is in the inteſtine, will enable him to divide all that can ever require diviſion; and that with leſs pain to the patient, with more facility to the operator, as well as with more certainty and expedition, than any other inſtrument whatever. If there be no opening in the inteſtine, ſays Mr. Pott, the ſmalleſt degree of force will thruſt the point of the knife through, and thereby make one: if there be one already, the ſame point will find and paſs through it. In either caſe it will be received by the finger in ano; will thereby be prevented from deviating; and, being brought out by the ſame finger, muſt neceſſarily divide all that is between the edge of the knife and the verge of the anus; that is, muſt by one ſimple inciſion, which is made in the ſmalleſt ſpace of time imaginable, lay the two cavities of the ſinus and of the inteſtine into one.

With reſpect to the diſtinction between thoſe caſes in which the inteſtine is pierced by the matter, and thoſe in which it is not, although it may be uſeful when the different ſtates of the diſeaſe are to be deſcribed, yet, in practice, as Mr. Pott obſerves, when the operation of dividing the inteſtine becomes neceſſary, ſuch diſtinction is of no conſequence at all; it makes no alteration in the degree, kind, or quantity of pain, which the patient is to feel; the force required to puſh the knife through the tender gut is next to none; and, when its point is in the cavity, the caſes are exactly ſimilar.

Immediately after the operation, Mr. Pott recommends a ſoft doſſil of fine lint to be introduced from the rectum, between the divided lips of the inciſion, as well to repreſs any ſlight hemorrhage, as to prevent the immediate re-union of the ſaid lips; and the reſt of the ſore ſhould be lightly dreſſed with the ſame. This firſt dreſſing ſhould be permitted to continue, until a beginning ſuppuration renders it looſe enough to be taken away eaſily; and all the future ones ſhould be as light, ſoft, and eaſy as poſſible; conſiſting only of ſuch materials as are likely to promote kindly and gradual ſuppuration. Mr. Pott remarks, the ſides of the abſceſs are large; the inciſion muſt neceſſarily for a few days be inflamed; and the diſcharge will for ſome time be diſcoloured and gleety. This induration, and this ſort of diſcharge, are often miſtaken for ſigns of diſeaſed calloſity and undiſcovered ſinuſes; upon which preſumption, eſcharotics are freely applied, and diligent ſearch is made for new hollows. The former of theſe, as Mr. Pott relates, moſt commonly increaſe both the hardneſs and the gleet, and, by the latter, new ſinuſes are ſometimes really produced. Theſe occaſion a repetition of eſcharotics, and, perhaps, of inciſions; by which means, caſes which at firſt, and in their own nature, were ſimple and eaſy of cure, are rendered complex and tedious.

Mr. Pott cenſures, in ſtrong terms, the former cuſtom of applying to the wound the hydrargyrus nitratus ruber, and other eſcharotic powders. What, ſays this writer, would any patron of this method of dreſſing ſay to a man, who ſhall order a large tent, well charged with red precipitate, to be thruſt up the undivided, unwounded rectum of a perſon who, from any cauſe whatever, had an inflammation of the hemorrhoidal veſſel, and inſide of the ſaid inteſtine? Would he not ſay that ſuch tent would prove a fatiguing inflammatory ſuppoſitory? And would he not be right in ſaying ſo? Is then the rectum rendered leſs ſenſible and leſs irritable by being wounded? or, can that very application, which proves a painful ſtimulus to a gut not divided, become an eaſy digeſtive to one that is? If any man thinks that it will, Mr. Pott would adviſe him to make the experiment on himſelf; and an appeal might then be made to the teſtimony of his own unprejudiced ſenſations.

"In ſhort," obſerves this author, "to quit reaſoning, and ſpeak to fact only: in the great number of theſe caſes which muſt have been in St. Bartholomew's Hoſpital within theſe ten or twelve years, I do aver, that I have not met with one in the circumſtances before deſcribed, that has not been cured by mere ſimple diviſion, together with light, eaſy dreſſings; and that I have not in all that time uſed, for this purpoſe, a ſingle grain of precipitate, or of any other eſcharotic."

We have now to conſider the fiſtula in ano in that ſtate in which the matter has made its own way out, without the help of art.

The ſurgeon having omitted to open the abſceſs with a lancet, or knife, the matter makes its own way out by burſting the external parts ſomewhere near to the fundament, or by making a hole through the inteſtine into its cavity, or ſometimes by both. In either caſe, as Mr. Pott explains, the diſcharge is made ſometimes by one orifice only, and ſometimes by more. Thoſe in which the matter has made its eſcape by one or more openings through the ſkin only, are called *blind, external fiſtulæ;* thoſe in which the diſcharge has been made into the cavity of the inteſtine, without any orifice in the ſkin, are named *blind, internal;* and thoſe which have an opening both through the ſkin and into the gut, are called *complete fiſtulæ.*

Thus, as Mr. Pott remarks, all theſe caſes are deemed fiſtulous, when hardly any of them ever are ſo; and none of them neceſſarily. They are ſtill mere abſceſſes, which have ſpontaneouſly burſt, and, if properly treated, will not demand the kind of treatment applicable to a true fiſtula.

The ſame excellent writer informs us, that the moſt frequent caſes of all are the *blind external,* and the *complete fiſtulæ.* Each of theſe ſtates may be known by introducing a probe into the ſinus through the orifice in the ſkin, while the fore-finger is within the rectum.

Whether the caſe be what is called a complete fiſtula, or not; that is, whether there be an opening in the ſkin only, or one there and another in the inteſtine, the appearance to the eye is much the ſame. Upon diſcharge of the matter the external ſwelling ſubſides, and the inflamed colour of the ſkin diſappears; the orifice, which at firſt was ſloughy and foul, after a day or two are paſſed, becomes clean, and contracts in ſize; but the diſcharge, by fretting the parts about, renders the patient ſtill uneaſy.

Mr. Pott next obſerves, that as this kind of opening ſeldom proves ſufficient for a cure, (though it ſometimes does,) the induration, in ſome degree, remains; and if the orifice happens not to be a depending one, ſome part of the matter lodges, and is diſcharged by intervals, or may be preſſed out by the fingers of an examiner. The diſeaſe in this ſtate is not very painful; but it is troubleſome, naſty, and offenſive: the continual diſcharge of a thin kind of fluid from it creates heat, and cauſes excoriation in the parts about; it daubs the linen of the patient, and is at times very fetid. The orifice alſo ſometimes contracts, ſo as not to be ſufficient for the diſcharge, and the lodgment of the matter then occaſions freſh diſturbance.

Surgeons in former times uſed to adopt three modes of curing fiſtulæ which had burſt; *viz.* cauſtic, the ligature, and inciſion.

The fear of bleeding and a cutting inſtrument, and the idea of deſtroying calloſity, were the chief motives for the employment of the two firſt means. However, as they are now univerſally abandoned, we ſhall not waſte the reader's time in ſhewing the great objections to them.

With regard to the plan of curing fiſtulæ in ano in this ſtate, by inciſion, the ſame method ſhould be followed as the one already recommended in the caſe of a collection of matter formed juxta anum.

Notwithſtanding the opinions of ſome former very eminent ſurgeons, ſuch as Cheſelden, De la Faye, and Le Dran, that the mere diviſion of the inteſtine and ſinus would not effect a cure, and, that unleſs we cut out or extirpated a portion both of the ſaid inteſtine and the ſkin of the anus, durable relief would not be obtained, it was ably contended by Mr. Pott, and all experience ſtrongly ſupports him, that the deſtruction of any of the parts is not only unneceſſary, but injurious. As ſuch practice is now gone completely out of vogue, we need not take up any more time in expreſſing our diſapprobation of it.

When the fiſtula extends high up the rectum, further than the finger introduced within the anus can reach, it is found to be quite unneceſſary to divide the ſinus throughout its whole length, even were ſuch proceeding practicable and free from danger. If the ſurgeon fairly divide that part of the fiſtula and inteſtine which he can conveniently reach with his finger, he need not concern himſelf about the deeper part of the diſeaſe, as in general a cure will follow without further trouble, in relation to any operation. The experience of Pott taught him this important fact, and ſucceeding practitioners have daily opportunities of ſeeing the ſame truth confirmed.

Thus far we have followed Mr. Pott in conſidering the diſeaſe either as an abſceſs from which the matter has been let out by an inciſion made by a ſurgeon, or from which the contents have been diſcharged by one ſingle orifice, formed by the burſting of the ſkin ſomewhere about the fundament. We ſhall now purſue the ſame writer's plan, and conſider the caſe, in which, inſtead of one, there are ſeveral openings.

"This ſtate of the caſe," obſerves Mr. Pott, "generally happens when the quantity of matter collected has been large, the inflammation of conſiderable extent, the adipoſe membrane very ſloughy, and the ſkin worn very thin before it burſt. It is indeed a circumſtance of no real conſequence at all; but from being miſunderſtood, or not properly attended to, is made one of additional terror to the patient, and additional alarm to the inexperienced practitioner; for it is taught, and frequently believed, that each of theſe orifices is an outlet from, or leads to, a diſtinct ſinus or hollow; whereas, in truth, the caſe is moſt commonly quite otherwiſe. All theſe openings are only ſo many diſtinct burſtings of the ſkin covering the matter; and do all, be they few or many, lead and open immediately into the one ſingle cavity of the abſceſs: they neither indicate, nor lead to, nor are cauſed by, diſtinct ſinuſes; nor would the appearance of twenty of them (if poſſible) neceſſarily imply more than one general hollow.

"If this account be a true one, it will follow, that the chirurgic treatment of this kind of caſe ought to be very little, if at all, different from that of the preceding; and that all that can be neceſſary to be done, muſt be to divide each of theſe orifices in ſuch manner as to make one cavity of the whole. This the probe-knife will eaſily and expeditiouſly do; and, when that is done, if the ſore, or more properly its edges, ſhould make a very ragged, uneven appearance, the removal of a ſmall portion of ſuch irregular angular parts will anſwer all the purpoſes of making room for the application of the dreſſings, and for producing a ſmooth, even cicatrix after the ſore ſhall be healed.

"When a conſiderable quantity of matter has been recently let out, and the internal parts are not only in a crude, undigeſted ſtate, but have not yet had time to collapſe, and approach each other, the inſide of ſuch cavity will appear large; and if a probe be puſhed with any degree of force it will paſs, in more than one direction, into the cellular membrane by the ſide of the rectum. But, (continues Mr. Pott,) let not the unexperienced practitioner be alarmed at this, and immediately fancy that there are ſo many diſtinct ſinuſes; neither let him, if he be of a more hardy diſpoſition, go to work immediately with his director, knife, or ſciſſars; let him enlarge the external wound by making his inciſion freely; let him lay all the ſeparate orifices open into that cavity; let him divide the inteſtine lengthwiſe by means of his finger in ano; let him dreſs lightly and eaſily; let him pay proper attention to the habit of the patient; and wait and ſee what a few days, under ſuch conduct, will produce. By this he will frequently find, that the large cavity of the abſceſs will become ſmall and clean; that the induration round about will gradually leſſen; that the probe will not paſs in that manner into the cellular membrane; and, conſequently, that his fears of a multiplicity of ſinuſes were groundleſs. On the contrary, if the ſore be crammed, or dreſſed with irritating or eſcharotic medicines, all the appearances will be different, the hardneſs will increaſe, the lips of the wound will be inverted, the cavity of the ſore will remain large, crude, and foul; the diſcharge will be thin, gleety, and diſcoloured; the patient will be uneaſy and feveriſh, and if no new cavities are formed by the irritation of parts, and confinement of matter, yet the original one will have no opportunity of contracting itſelf, and may very poſſibly become truly fiſtulous."

Without poſitively denying that there is ever more than one ſinus extending along the ſame ſide of the rectum, Mr. Pott maintained, that for one inſtance in which the caſe is really ſo, forty are only ſuppoſititious ones. He allows that ſeparate openings in the ſkin, from the ſame cavity or ſinus, are common; but denies that perfectly diſtinct ſinuſes, running along the ſame ſide of the rectum, are at all uſual.

Sometimes the matter of an abſceſs, formed in the neighbourhood of the anus, inſtead of making its way through the ſkin, externally near the anus, or in the buttock, pierces through the inteſtine only. This is what is called a *blind internal fiſtula.* In this inſtance, when the matter has diſcharged itſelf, the ſwelling ſubſides, and the patient experiences ſome degree of relief. If the evacuation of the matter does not terminate in a cure, which ſometimes, though very ſeldom happens, ſome ſmall degree of induration generally remains in the place where the original tumour was. As Mr. Pott deſcribes, when this hardneſs is preſſed upon, a ſmall diſcharge of matter is frequently made per anum; and ſometimes the expulſion of air from the cavity of the abſceſs into that of the inteſtine may very palpably be felt and clearly heard. The ſtools, particularly if hard, and requiring force to be expelled, are ſometimes ſmeared with matter: and although the patient by the burſting of the abſceſs is relieved from the acute pain which the collection occaſioned, yet he is ſeldom free from a dull kind of uneaſineſs, eſpecially if he ſits for any conſiderable length of time in one poſture. Mr. Pott remarks, that the real difference between this kind of caſe, and that in which there is an external opening, with regard to the method of cure, is very immaterial; for an external opening muſt be made, and then all difference ceaſes. In this, as in the former, no cure can reaſonably be expected, until the cavity of the abſceſs, and that of the rectum, are made one; and the only difference is, that in one caſe we have an orifice at or near the verge of the anus, by which we are immediately enabled to perform that neceſſary operation: in the other, we muſt make one.

We have next to treat of that ſtate of the diſeaſe which really deſerves the epithet of fiſtulous, according to the common definition. Mr. Pott obſerves, that various cauſes may produce ſuch a condition of the parts concerned. Theſe cauſes are divided by this celebrated ſurgeon into two claſſes; *viz.* thoſe which are the effect of neglect, diſtempered habit, or of bad management, and which may be called, without any great impropriety, local diſeaſes; and thoſe which are the conſequence of diſorders, whoſe origin and ſeat is not in the immediate ſinus or fiſtula, but in parts more or leſs diſtant, and which, therefore, are not local complaints.

The former are generally cureable by proper treatment; the latter are frequently irremediable by any means whatever.

In the firſt deſcription of caſes, Mr. Pott ranks all thoſe which were originally mere collections of matter within the coats of the rectum, or in the cellular ſubſtance ſurrounding this inteſtine; but which, by being long neglected, groſsly managed, or by happening in habits which were diſordered, and for which diſorders no proper remedies were adminiſtered, ſuffer ſuch alteration, and get into ſuch ſtate, as to deſerve the appellation of fiſtulæ.

In the ſecond kind of caſes, Mr. Pott claſſes all thoſe in which the diſeaſe has its origin and firſt ſtate in the higher and more diſtant parts of the pelvis, about the os ſacrum, lower vertebræ of the loins, and adjacent parts; and are either ſtrumous, or the conſequence of long and much diſtempered habits; or the effect of, or combined with other diſtempers, local or general, ſuch as a diſeaſed neck of the bladder, or proſtate gland, or urethra; the lues venerea, &c.

Mr. Pott notices, that among the very low people who are brought into hoſpitals, we frequently meet with caſes of the firſt deſcription; caſes which at firſt were mere ſimple abſceſſes, but which, from uncleanlineſs, from intemperance, negligence, and diſtempered conſtitutions, become really fiſtulous.

In theſe examples the general effects of intemperance, debauchery, and conſtitutional diſeaſe, are to be corrected, or removed, before ſurgery can afford any material relief.

When theſe great objects have been attended to, the ſurgery required conſiſts in laying open and dividing the ſinus or ſinuſes in ſuch manner, that there may be no poſſible lodgment for matter, and that ſuch cavities may be fairly opened lengthwiſe into that of the rectum. If the internal parts of theſe hollows are hard, and do not furniſh good matter, Mr. Pott adviſes us to ſcarify them with the point of a knife, but not to uſe eſcharotic applications. When, either from the multiplicity of external orifices, or from the looſe, flabby, hardened, or inverted ſtate of the edges of the wound, near the anus, no hopes of healing the parts in an even way can be entertained, ſuch a portion of them may be cut away as will juſt ſerve that purpoſe. Mr. Pott recommends the dreſſings to be ſoft, eaſy, and light.

When the inſide of the ſinus is occupied with fungous fleſh, a ſlight touch of the lunar cauſtic may become neceſſary.

In the mean while, the remedies for the improvement of the ſyſtem muſt be continued, and local meaſures alone not truſted.

When the bad ſtate of the ſore ariſes from the manner in which it has been crammed, irritated, and eroded, leaving off ſuch treatment muſt of courſe be the means of bringing the diſeaſe into a better condition.

Mr. Pott remarks, that a patient who has been ſo treated has generally ſome degree of fever, has a pulſe, which is too hard and too quick, is thirſty, and does not get his due quantity of natural reſt. A ſore which has been ſo dreſſed has generally a conſiderable degree of inflammatory hardneſs round about; the lips and edges of it are tumid, full, inflamed, and ſometimes inverted; the whole verge of the anus is ſwollen; the hemorrhoidal veſſels are loaded; the diſcharge from the ſore is large, thin, and diſcoloured; and all the lower part of the rectum participates of the inflammatory irritation, producing pain, bearing-down, teneſmus, &c. *Contraria contrariis* (continues this able writer) is never more true than in this inſtance; the painful uneaſy ſtate of the ſore, and of the rectum, is the great cauſe of all the miſchief, both general and particular; and the firſt intention muſt be to alter that. All eſcharotics muſt be thrown out and diſuſed; and in lieu of them a ſoft digeſtive ſhould be ſubſtituted, in ſuch manner as not to cauſe any diſtenſion, or to give any uneaſineſs from quantity. Over this a poultice ſhould be applied. Theſe dreſſings ſhould be renewed twice a day; and the patient ſhould be enjoined abſolute reſt. At the ſame time attention ſhould be paid to the general diſturbance which the former treatment may have created. Blood ſhould be drawn off from the ſanguine; the feveriſh heat ſhould be calmed by proper medicines; the languid and low ſhould be aſſiſted with the bark and cordials; and eaſe in the part muſt at all events be obtained by the injection of anodyne clyſters of ſtarch and opium.

If, as Mr. Pott obſerves, the ſinus has not yet been laid open, and the bad ſtate of parts is occaſioned by eſcharotic or aſtringent applications, no operation of any ſort ſhould be attempted, until both the patient and the parts are eaſy, cool, and quiet. When this deſirable change has taken place, the ſinus may be ſucceſsfully divided, and, if requiſite, a ſmall portion of the ragged edges be taken away.

Lumbar abſceſſes ſometimes form ſinuſes, which run down by the ſide of the rectum, and burſt near the fundament. The diſcharge from theſe is generally large, fetid, thin, and ſharp. Hence, we cannot wonder that the ſinuſes and orifices become hard and callous; that is, truly fiſtulous. But it muſt be obvious to every one (ſays Mr. Pott) who will conſider it, that the ſurgical treatment of theſe ſores and ſinuſes can be of very little conſequence towards curing the diſeaſes from which they ariſe, and which are generally out of the reach of our inſtruments and applications. The proper treatment alſo of ſuch diſorders will be ſpoken of in another part of the Cyclopædia. See LUMBAR *Abſceſs*.

Cancers and cancerous ſores are ſometimes formed in the cavity, or the neighbourhood of the rectum and fundament, where they make moſt terrible havoc. See RECTUM.

Fiſtulous ſores, ſinuſes, and indurations about the anus, which are conſequences of diſeaſes of the neck of the bladder and urethra, and are named fiſtulæ in perinæo, require ſeparate and particular conſideration, into which we ſhall preſently enter. Pott's Treatiſe on the Fiſtula in Ano.

Fiſtula Lachrymalis.—Every one who has acquired that degree of anatomical knowledge which is eſſentially requiſite in a good ſurgeon, is well aware that the tears and ſebaceous fluid with which the ſurface of a healthy eye is naturally kept in a moiſt ſtate, are conveyed, as ſoon as they become ſuperfluous, through certain tubes or ducts, down into the noſe. We leave it to the anatomiſt and phyſiologiſt to determine, whether it is by ſome action like that of a ſyringe, or of a capillary tube, or whether it is by the muſcular power of the lachrymal paſſages themſelves, that the tears are made to deſcend from the eye into the cavity of the noſe. The ſecretion from the lachrymal gland, membranous lining of the eyelids, and Meibomian glands, conſtitutes what is commonly called the tears, the uſe of which is to lubricate the eye in its inceſſant motions, to keep the ſurface of the cornea in a moiſt, clean, bright ſtate, fitted for the tranſmiſſion of the rays of light, and laſtly, to waſh away any duſt or other hurtful particles, which may accidentally fall upon, and irritate the organ. Mr. Pott, in his excellent account of this ſubject, has obſerved, that this fluid (meaning the tears) is derived principally from a large gland, named the lachrymal, ſituated under the upper edge of the orbit, near the outer corner of the eye, which gland is of the conglomerate kind, and lies in a ſmall depreſſion of the os frontis. Its excretory ducts, or thoſe by which it diſcharges the ſecreted fluid, pierce the tunica conjunctiva, juſt above the cartilaginous border of the upper eye-lid.

When any irritating particles come into contact with the eye, a large quantity of fluid is immediately ſecreted by the lachrymal gland, and is as quickly diffuſed, by the motion of the eye-lids, over the ſurface of the eye; by which means, ſuch particles are waſhed and wiped off. Sometimes, alſo, as Mr. Pott remarks, the paſſions of the mind produce an immediate increaſe of this ſecretion, which is then ſtrictly called tears. A conſtant ſecretion of too large a quantity cauſes a diſeaſe, called *epiphora* (which ſee); and a deficiency of it makes the motions of the eye-lids difficult and painful.

Although the fluid, ſecreted by the lachrymal gland, is conſiderable in quantity; yet, when it is not ſuddenly produced by irritation from without, or paſſion within, it is ſo conſtantly and gradually carried off, as to create neither trouble, uneaſineſs, nor blemiſh.

The edge or border of each eye-lid, continues Mr. Pott, is formed by a thin cartilage, the figure and conſiſtence of which keep the lids properly expanded. Theſe cartilages are covered by a fine membrane, and are called cilia. Their internal edges do, upon every motion, ſweep over every point of the ſurface of the cornea. This motion, though almoſt imperceptible, unleſs attended to, is very frequently performed; and as the ſecretion of the fluid is alſo conſtant, the eye is by this means kept always moiſt, clean, and bright.

Mr. Pott next relates, that at the extremity of each of theſe cartilaginous borders of the eye-lids, on the ſide next the noſe, is a ſmall papilla or eminence; and in the middle of each of theſe is a ſmall hole, which, being ſituated in the cartilage, is not liable to collapſe while the parts are in a ſound ſtate, but remains always open. They are called the *puncta lachrymalia*, and their office is to receive the lachrymal fluid, as it runs off the corner, along the edges of the eye-lids, ſo as to prevent it from trickling down the cheek.

From each of the puncta lachrymalia proceeds a ſmall membranous tube. Theſe tubes ſoon enter, or rather expand into, a little ſort of pouch, placed near the inner angle of the eye, under the orbicularis palpebrarum muſcle. The bag in queſtion is named the lachrymal ſac, and its office is to receive all the lymph tranſmitted through the puncta and ducts. The upper part of the ſac lies in an excavation, formed partly by the naſal proceſs of the upper maxillary bone, and partly by the os unguis. The lower part of it is confined in a long channel, and forms a tube or duct, which, deſcending obliquely backward, communicates with the cavity of the noſe, behind the os ſpongioſum ſuperius, by an opening of rather different ſizes in different ſubjects.

This paſſage, ſays Mr. Pott, is called the *ductus naſalis*, and through it whatever is received by the lachrymal ſac from the puncta does, in a healthy and ſound ſtate of theſe parts, paſs into the noſe.

The membrane which lines the lachrymal ſac and naſal duct ſecretes a kind of mucus.

In the healthy ſtate, the fluid ſecreted by the lachrymal gland readily paſſes off through the puncta, ſac, and duct, into the noſe; but when they are in a diſeaſed ſtate, the caſe is otherwiſe. The membrane lining the ſac and duct is ſubject to inflammation, by which it is often ſo thickened as to render the paſſage more or leſs impervious. Hence, the lachrymal ſac becomes filled with its own mucus, and with the ſecretion tranſmitted into it from the eye; and when no more of this laſt fluid can enter the puncta lachrymalia, it falls over the eye-lid, down the cheek. The obſtruction continuing, and the mucus and tears ſtill lodging, the ſac is dilated, and that tumour in the inner corner of the eye, and that diſcharge from the puncta lachrymalia, upon preſſure, are occaſioned, which characteriſe the firſt ſtate of the fiſtula lachrymalis. See Pott's Obſervations on the Fiſtula Lachrymalis.

From what we have already ſtated, the reader muſt begin to ſuſpect that the term *fiſtula lachrymalis* neceſſarily means no callous, indurated diſeaſe, accompanied with an acrid, ſanious diſcharge; but merely a diſorder, conſiſting of an obſtruction in ſome part of thoſe paſſages through which the tears have to paſs into the noſe, and attended with different appearances in different perſons, and under different circumſtances. Here the phraſe "fiſtula" is ſometimes, in conſequence of ancient eſtabliſhed uſage, ſo unreaſonably employed, that it is applied to a certain ſtage of the diſeaſe, now treated of, in which there is even no ulcerated opening at all, nor any other circumſtance which, according to the dictates of common ſenſe, could bring into the mind the idea of a fiſtula.

When the obſtruction to the paſſage of the tears into the noſe is only ſuch as to occaſion a watering of the eye, and a conſequent neceſſity of wiping away the effuſed fluid, the diſorder is commonly named *epiphora;* but when a fluid, ſomewhat ſimilar to pus in appearance, accumulates in the lachrymal ſac, and regurgitates through the puncta lachrymalia, on the ſac being compreſſed, the complaint receives the name of *fiſtula lachrymalis.*

The eminent Scarpa, impreſſed with a conviction of the bad effects in practice reſulting from the uſe of terms which convey erroneous notions, has propoſed calling that ſtage of the diſeaſe which is attended with a diſcharge of a viſcid, curdly, yellowiſh matter from the puncta lachrymalia, when the lachrymal ſac is compreſſed, the *puriform diſcharge of the palpebræ.* The term *fiſtula lachrymalis* is reſtricted, by this author, to that ſtate of the complaint in which the lachrymal ſac is not only greatly diſtended, but ulcerated, and in a fungous ſtate on its internal ſurface; and in which there is alſo an external opening, occaſionally attended with a caries of the os unguis.

The varieties of the diſeaſe commonly called fiſtula lachrymalis are referred, by Mr. Pott, to five principal circumſtances, *viz.*

1. The degree of obſtruction in the naſal duct.
2. The ſtate of the cellular membrane covering the ſac.
3. The ſtate of the ſac itſelf.
4. That of the bone underneath.
5. The general ſtate and habit of the patient.

Sometimes the lining of the ſac and duct is ſo thickened, that the fluid cannot paſs through them into the noſe; and this forms the whole of the complaint. The cellular membrane on the outſide not being diſeaſed, there is no appearance of inflammation. In this caſe, as Mr. Pott deſcribes, the duct is ſtopped, and the ſacculus dilated, but without any alteration in the colour of the ſkin. A fulneſs appears in the corner of the eye next the noſe; and upon the application of a finger to this tumour, a clear, viſcid mucus is diſcharged through the puncta lachrymalia. The patient feels no pain, nor finds any inconvenience, except what is produced by the diſcharge of this mucus, and by the trickling of the tears down the cheek.

The ſame writer next notices, that, in ſome caſes, the mucus is not perfectly and always clear, but is ſometimes cloudy, and looks as if it had a mixture of milk or cream in it. At firſt waking, ſome of it is generally found in the corner of the eye; and the eye-laſhes, being ſmeared over with it during ſleep, moſt commonly adhere together in the morning.

Mr. Pott remarks that this is the moſt ſimple ſtate of the diſeaſe, and what the French have called the *hernia,* or *hydrops ſacculi lachrymalis.* It is frequently met with in children who have been ricketty, or are ſubject to glandular obſtructions; and, in this ſtate, it ſometimes remains for ſome years, ſubject to little alterations, as the health or habit ſhall happen to vary; the ſac being ſometimes more, ſometimes leſs, full and troubleſome. The mucus which is preſſed out is ſometimes more, ſometimes leſs, cloudy; and, now and then, it is attended with a ſlight ophthalmy, or an inflammation of the eye-lids, but which, by common care, is eaſily removed.

When the ſac is not much dilated, the diſcharge ſmall, and produced only by preſſure, the chief inconveniences are the weeping eye, and the gumming together of the eye-lids after ſleeping; but theſe, by being attended to, may be kept from being very troubleſome; and, if the diſeaſe makes no farther progreſs, may be ſo regulated as to render any more painful proceſs totally unneceſſary.

When the dilatation is conſiderable, ſays Pott, the ſwelling is more viſible, and the quantity of mucus is larger. It is alſo in this ſtate more frequently mixed and cloudy, and more troubleſome, from the more frequent neceſſity of emptying the bag. But if the patient be adult, it may, even in this more dilated ſtate of it, be kept from being very inconvenient.

If an inflammation comes on, the tumour is thereby conſiderably increaſed, the diſcharge is larger, as well during ſleep as upon preſſure; the ſkin covering it loſes its natural whiteneſs and ſoftneſs, becomes hard, and acquires an inflamed redneſs; and with the mucus a mixture of ſomething, which in colour reſembles matter, is diſcharged, eſpecially if the preſſure be made with any force, or continued for any time. This circumſtance, added to the painful ſenſation and inflamed appearance of the parts, has been productive of a ſuppoſition, that there is either an ulcer or an abſceſs within the ſac or duct; an opinion which Mr. Pott has taken great pains to refute.

We ſhall here introduce Scarpa's ſentiments concerning the manner in which the fluid which diſtends the ſac is formed. The viſcid, curdly, yellowiſh fluid, mixed with tears, which regurgitates from the puncta lachrymalia, is not altogether ſecreted by the ſac itſelf, as ſome have conjectured. The greateſt part of it paſſes into the ſac from the eye-lids, through the puncta lachrymalia, from which it regurgitates on preſſure being made on the ſac. This puriform fluid is chiefly ſecreted by the lining of the eye-lids, eſpecially by the lower eye-lid along the tarſus, and by the glands of Meibomius. The ſebaceous matter, which is furniſhed by theſe glands, is not only ſecreted more abundantly, but aſſumes an irritating quality. Beſides the ſebaceous fluid from the glands juſt now ſpecified, a thin mucus is effuſed from the lining of the eye-lids; which mucus greatly increaſes the quantity of viſcid matter which is ſpread over the eye and eye-lids.

It becomes manifeſt that the puriform fluid, which comes out of the lachrymal ſac, is derived from the ſources which have been pointed out, by turning the eye-lids, particularly the lower one, outward, and comparing their appearance with that of the ſound ones of the oppoſite ſide of the face. The lining of the former always ſeems redder than natural, and exhibits a villous appearance, particularly along the tarſus. The margin of the eye-lid is ſwollen, and marked with a great number of little varicoſe veſſels. The glands of Meibomius are more turgid and prominent than natural, and, when looked at with a magnifying glaſs, frequently ſeem to be ſomewhat ulcerated.

The villous texture, which the inſide of the eye-lids acquires in theſe caſes, is converted into an organ which ſecretes an unuſual quantity of a fluid like viſcid lymph, which, being blended with the ſebaceous ſecretion from the glands of Meibomius, makes the tenacious matter which is ſmeared over the eye-lids, and which, paſſing through the puncta lachrymalia, ſometimes diſtends the lachrymal ſac in a very extraordinary degree.

If the lachrymal ſac be emptied of this matter by means of preſſure, and the eye and inſide of the eye-lids be carefully waſhed, ſo that none of the glutinous ſecretion which iſſues from the ſac may remain upon them, and the inſide of the eye-lids be turned out half an hour afterwards, their inner ſurface, eſpecially that of the lower one, will be obſerved to be covered with a new effuſion of mucus, mixed with a ſebaceous ſecretion; which fluids have manifeſtly not regurgitated from the lachrymal ſac to the eye, but have been formed between the eye and eye-lids by the villous inſide of the laſt-named parts, and the glands of Meibomius.

As a further proof, that the lachrymal ſac has no other concern in this diſeaſe than that of receiving the tears and puriform fluid which are tranſmitted from the eye-lids, Scarpa mentions, that if the morbid ſecretion from the eye-lids be retarded or ſtopped, either by accident or the effect of applications, little or none of the viſcid, curdly fluid accumulates in the lachrymal ſac, or can be preſſed out of the puncta lachrymalia.

The membrane which lines the lachrymal ſac is one that has no ſebaceous glands, and is only calculated for the ſecretion of a thin mucus. A ſmall addition of this latter may be made to the puriform fluid and tears which are collected in the ſac, but the quantity cannot be conſiderable.

We ſhall now reſume the account of the different ſtates of the diſorder, as delivered by Mr. Pott. The inflammation of the integuments covering the ſac is a circumſtance which makes a conſiderable difference, both in the appearance of the diſeaſe and its requiſite treatment. In ſome caſes, it is confined merely to the ſurface of the tumour; in others, it ſpreads ſtill farther, affecting the eye-lids, cheek, and ſide of the noſe.

When the parts are in this ſtate, continues Mr. Pott, the mucus within the bag has generally the appearance of being matter, that is, it wears a deep yellow colour, and is of a more thin conſiſtence. If the puncta lachrymalia are naturally large and open, and the inflammation confined to the ſurface of the ſac, its contents will paſs off pretty freely, and the ſkin will remain entire. This is what the ancients called the *ſimple* or *imperfect anchylops*.

But, ſays Mr. Pott, when the ſkin covering the lachrymal bag has been for ſome time inflamed, or ſubject to frequently returning inflammations, it moſt commonly happens that the puncta lachrymalia are affected by it; and the fluid, not having an opportunity of paſſing off through them, diſtends the inflamed ſkin, ſo that at laſt it becomes ſloughy, and burſts externally. This was named the *perfect aigylops* or *ægylops*. The diſcharge which uſed to be made through the puncta lachrymalia, while the ſkin was entire, is now made through the new opening, and by excoriating the eye-lids and cheek, increaſes the inflammation, and gives the diſeaſe a much more diſagreeable appearance. In ſome, the matter burſts through a ſmall hole, and, after it has diſcharged itſelf, the tumour ſubſides, the neighbouring parts become cool, and, though the ſkin covering the ſurface of the ſac is ſloughy and foul, yet there is no reaſon to believe that the ſac itſelf is much diſeaſed below. In others, the breach is large, the ſkin remains hard and inflamed, and, from the appearance of the ſore, there is reaſon to ſuppoſe the whole inſide of the bag to be in a diſeaſed ſtate; and, in ſome caſes which have been much neglected, or irritated by ill treatment, the cavity of the ſac ſeems to be filled with a looſe, ill-natured fungus, which gleets largely, and produces inflammation and excoriation of all the parts about.

Mr. Pott obſerves, that there is another circumſtance which is ſometimes found to attend this diſorder, *viz.* a carious ſtate of the bones. The practitioners, in ancient times, uſed to ſuppoſe this complication was a very frequent one; and hence they ſo freely had recourſe to the cauſtic, cautery, and ſcalpra, in the treatment. But caries is now aſcertained to attend the complaint but ſeldom.

When the fiſtula lachrymalis is a ſymptom of the lues venerea, as it ſometimes is, the bones are indeed often carious; but then the fiſtula is not the original complaint, but produced ſecondarily, and is a conſequence of the diſeaſed ſtate of the os ethmoides and oſſa ſpongioſa of the noſe, and is not curable by any local means or applications, but depends entirely on the cure of the diſeaſe of which it is a ſymptom.

A very material difference, as Mr. Pott accurately explains, will be occaſioned both in the appearance of the diſorder, in the prognoſtic, and in the proper method of treatment, by the combination of other diſeaſes, either of the conſtitution, the parts themſelves, or adjoining ones. The patient, for example, is ſometimes ſubject to an habitual ophthalmy or lippitudo, which will increaſe the deformity, and give a good deal of additional trouble during the cure. Mr. Pott alſo obſerves, that an ozæna, or ſome other diſeaſe of the membrane and cells of the ethmoid bone, or a polypus within the noſe, may be combined with a fiſtula lachrymalis. Strumous complaints are other frequent attendants; and, if we may believe Mr. Pott, it ſometimes becomes cancerous.

We ſhall now proceed to ſpeak of the treatment of the diſeaſe; and, for the ſake of rendering this ſubject as eaſily intelligible as poſſible, we ſhall imitate the above-mentioned writer, by dividing the diſorder into four ſtates.

The firſt conſiſts of a ſimple dilatation of the ſac, and an obſtruction of the naſal duct, diſcharging, upon preſſure, a mucus either quite clear or a little cloudy.

In the ſecond, the tumour is ſomewhat larger; the ſkin which covers it is in an inflamed ſtate, but entire; and the diſcharge made through the puncta lachrymalia is of a pale yellow or purulent colour.

In the third, the ſkin covering the ſac is become ſloughy, and burſt, by which means the ſwelling is in ſome meaſure leſſened; but the mucus which, while the ſkin was entire, uſed to be preſſed out through the puncta lachrymalia, now diſcharges itſelf through the new aperture. The naſal duct, both in this and the preceding ſtate, is not otherwiſe diſeaſed than by the thickening of its lining.

In the fourth, the paſſage from the lachrymal ſac into the noſe is totally obliterated; the inſide of the former being either ulcerated or filled up with a fungus, and attended ſometimes with a caries of the bone underneath.

In the firſt or moſt ſimple ſtate of the diſeaſe, *viz.* that of mere obſtruction, without inflammation, various plans have been deviſed with a view of reſtoring the parts to their natural ſtate and uſe, without making any wound at all. The chief of theſe methods have been the introduction of a probe, the injection of a fluid, and a conſtant compreſſion, made on the outſide of the ſac, in the corner of the eye.

A French ſurgeon, named Anel, invented a probe of ſo ſmall a ſize as to be capable of paſſing through one of the puncta lachrymalia, down into the noſe. As the inſtrument was thus puſhed through the lachrymal ſac and naſal duct, M. Anel conceived that it would be able to break any ſmall obſtruction which might be met with.

The ſame gentleman alſo invented a ſyringe, furniſhed with a very minute pipe, which admits of being introduced into one of the puncta lachrymalia; and in this manner any fluid may be injected into the ſac and duct, in order to clear away any thickened mucus or matter, which may be the cauſe of the tears not finding their way, as they ought to do, down into the noſe.

With regard to the introduction of a ſmall probe through one of the puncta lachrymalia, Mr. Pott obſerves that the plan has a very plauſible appearance, but is unequal to the taſk aſſigned: the very ſmall ſize of the probe, its flexibility, and the little reſiſtance which it is capable of making, are manifeſt deficiencies in the inſtrument. He allows that ſuch a probe may be paſſed through one of the puncta down into the noſe; but he contends, that the pain which it gives, and the inflammation which it often excites, are much greater than any benefit which does or can ariſe from it. As for the idea, that this probe may be of uſe in removing any obſtruction in the puncta lachrymalia, it is an unfounded one; for ſuch an obſtruction is ſeldom met with at all, and never can exiſt in this ſtate of the fiſtula lachrymalis, one principal ſymptom of which is a diſcharge into the inner corner of the eye, when preſſure is made on the ſac. This diſcharge is made from the ſac, through the puncta, and proves that the latter are open. The obſtruction really forming the diſeaſe is one that hinders any thing from paſſing from the ſac into the noſe, and not from the eye into the ſac.

On the ſubject of the ſcrew, which Fabricius of Aquapendente invented, for making preſſure on the lachrymal ſac, we need only ſay, now that it has gone into perpetual diſuſe, that though it anſwered the purpoſe of compreſſing the ſac very well, it did not operate in any way whatever on the obſtruction in the naſal duct, the primary cauſe of the diſeaſe.

M. Anel's ſyringe is entitled to a much higher ſhare of recommendation than has been given to his probe. Indeed, the plan of injecting fluids through one of the puncta lachrymalia into the lachrymal ſac, for the purpoſe of removing any ſlight, recent obſtruction in the naſal duct, is what receives the ſanction of all the beſt ſurgeons and oculiſts of the preſent day. It is evident, however, that it is a method which can only be adopted while there is no ulcerated opening in the ſac, and only then, with much hope of ſucceſs, as long as the ſtoppage in the naſal duct is ſlight, and ſuch as would be occaſioned by the lodgment of thickened mucus.

Before entering upon the deſcription of the manner in which the eminent Mr. Ware employs Anel's ſyringe for the cure of the epiphora, or firſt ſtage of the fiſtula lachrymalis, it is proper to acquaint the reader that, in the year 1780, ſir William Blizard made the propoſal of injecting quickſilver inſtead of water into the lachrymal ſac, by means of a pipe ſmall enough to be introduced through one of the puncta lachrymalia, and fixed on the end of a long glaſs tube. In ſhort, the inſtrument is exactly like what anatomiſts commonly uſe for injecting the lymphatics. The glaſs tube being filled with the mercury, as high as the practitioner may deem neceſſary, and the little pipe introduced into one of the puncta lachrymalia, the quickſilver deſcends by its ſpecific gravity into the lachrymal ſac, as ſoon as a little ſcrew is turned, and, by reaſon of its weight, is, in ſir W. Blizard's opinion, more calculated than water propelled from a ſyringe for removing the obſtruction in the naſal duct. The force with which the mercury acts depending entirely on its weight, it muſt be manifeſt that the higher the column of the metal is made, the greater muſt be the power with which it operates.

There cannot be a doubt that ſir William Blizard's method is an exceedingly good one; but perhaps it has no real advantage over the uſe of the ſyringe, ſince the fluid injected by this inſtrument is one which is always ready at hand, and operates with as much power as mercury, when the practitioner chooſes to propel it with force into the lachrymal ſac.

Mr. Ware made a trial of ſir William Blizard's method, but at length preferred the employment of Anel's ſyringe. With this he uſually injects warm water through the lower punctum lachrymale into the lachrymal ſac, while a finger is put over the lower punctum, in order to prevent the fluid from making its way outward. The lachrymal ſhould alſo be now and then compreſſed, for the purpoſe of promoting the deſcent of the water down into the noſe. In particular inſtances, Mr. Ware has uſed the injection three times a day; but, in general, much leſs frequently. This gentleman relates, that his practice has been attended with conſiderable ſucceſs.

Mr. Ware commonly commences his method of treatment by injecting ſome water through the inferior punctum lachrymale, and he repeats the operation four or five days in ſucceſſion. If, in this ſpace of time, none of the water ſhould paſs through the duct into the noſe, and the watering of the eye be as troubleſome as it was before the injection was employed, he commonly orders the angular vein to be opened, or a leech to be applied near the lachrymal ſac. However, Mr. Ware is careful in forbidding the leech to be put on either of the eye-lids, leſt it ſhould occaſion an extravaſation of blood in the adjacent cellular membrane.

About the time when blood is taken away from the vicinity of the eye, Mr. Ware is in the habit of changing the injection, and trying the effects of a weak, vitriolic, or anodyne lotion. In ſome inſtances alſo, when, after ſeveral attempts, he has not been able to inject any part of the liquid through the duct, he has introduced a golden probe, about as large as a briſtle, through the ſuperior punctum lachrymale, and, attending to the direction of the duct, he has inſinuated the end of the inſtrument through the obſtruction, and conveyed it fully into the noſe. Immediately after doing this, Mr. Ware has found, that a liquid, injected through the inferior punctum, has paſſed without any difficulty into the noſe; and, by repeating theſe operations a few ſucceſſive days, the pervious ſtate of the paſſage has been re-eſtabliſhed, and a cure accompliſhed.

On ſome other occaſions, Mr. Ware has adviſed a ſtrongly ſtimulating ſternutatory to be ſnuffed up the noſe, about an hour before bed-time. Thus a large diſcharge has been excited from the Schneiderian membrane, which diſcharge, according to Mr. Ware's account, has had the effect of materially contributing to remove the ſtoppage in the naſal duct.

Very few caſes preſent themſelves which are not remediable by ſome of the above means. In certain examples which have been attended with a fœtid diſcharge, Mr. Ware has corrected this bad quality, by injecting a vitriolic lotion into the lachrymal ſac.

The celebrated Scarpa of Pavia, who has lately publiſhed ſome excellent obſervations on the diſeaſes of the eyes, has ſet forth the doctrine, that the primary and principal cauſe of the fiſtula lachrymalis does not exiſt either in the lachrymal ſac or the naſal duct, as ſurgeons have hitherto ſuppoſed, but in the morbid ſtate of the eye-lids. Hence the ſame writer contends, that every method of treatment which is merely calculated to heal the ulceration of the ſac, or remove the obſtruction in the naſal duct, cannot accompliſh a permanent cure of the diſeaſe, without the employment of ſuch other remedies as are proper for correcting the diſeaſed ſecretion from the eye-lids.

In the firſt ſtage of the fiſtula lachrymalis, called by Scarpa "il fluſſo palpebrale puriforme," this ſurgeon's practice conſiſts in fulfilling two indications; *viz.* firſt, that of checking the ſecretion from the lining of the eye-lids, and the glands of Meibomius, from which diſeaſed fluid he thinks that the fiſtula lachrymalis originates; ſecondly, that of diligently waſhing out the lachrymal paſſages throughout their whole extent.

For the firſt object, Scarpa recommends the uſe of Janin's ophthalmic ointment, which is compoſed of half an ounce of hog's lard, two drams of prepared tutty, the ſame quantity of Armenian bole, and one dram of the calx hydrargyri alba. The lard, after being waſhed three times with roſe water, is to be well mixed with the other ingredients, after they have been made into a fine powder.

When this ointment is firſt uſed, it is to be rendered weaker by the addition of a larger proportion of lard than what is above-mentioned. A bit of the ointment, about the ſize of a barley-corn, is to be put on the end of a blunt probe, and applied between the eye-lids and eye-ball, near the external angle, every morning and evening, and all the edges of the palpebræ are alſo to be ſmeared with the ſame application. The patient is then to ſhut his eye, and gently rub his eye-lids, in order to diffuſe the ointment all over their internal ſurface. A compreſs and bandage are next to be applied. At the end of two hours the eye may be uncovered, and waſhed with cold water. A collyrium of zincum vitriolatum, and mucilage of quince ſeeds, is alſo to be uſed three or four times a day.

When there are ſmall excoriations upon the edges of the eye-lids, Scarpa recommends the unguentum hydrargyri nitrati to be applied at bed-time to the little ſores. When this remedy fails, he ſays the argentum nitratum muſt be gently rubbed along the margin of the eye-lids, and the eye immediately afterwards waſhed with new milk.

Juſt before every time of making theſe applications to the eye-lids, Scarpa, in order to fulfil the ſecond indication above ſpecified, adviſes ſome plantain-water, containing a little ſpirit of wine, to be injected into one of the puncta lachrymalia, by means of Anel's ſyringe.

With regard to the truth of the theory advanced by Scarpa, concerning the primary cauſe of the fiſtula lachrymalis, we cannot help having our doubts; but of the practice which we have been deſcribing we have to expreſs our entire approbation. If the origin of the diſeaſe always depended on the morbid ſecretion from the lining of the eye-lids and the glands of Meibomius, why do we not have a fiſtula lachrymalis as an attendant on numerous ophthalmies in which we know and ſee that ſuch ſecretion is in a diſeaſed ſtate? Beſides, in the practice of ſurgery, we have moſt poſitive evidence that the ductus naſalis very frequently becomes obſtructed by the preſſure of polypi and other tumours in its vicinity; and although this cauſe cannot be aſſigned as the ordinary one of the diſorder, yet it proves that a fiſtula lachrymalis may ſometimes originate without the ſecretion of the eye-lids being concerned in its production. Experience alſo ſhews that colds which inflame and thicken the Schneiderian membrane, ſometimes bring on obſtructions in the naſal duct. Nor is the ſtatement of Scarpa altogether correct, when he obſerves that the diſeaſe can never be permanently cured by remedies which only operate in clearing away the obſtruction in the duct, without acting upon the diſeaſed inner ſurface of the eye-lids. We have daily proofs that the epiphora, the incipient ſtate of the fiſtula lachrymalis, or, as Scarpa terms it, the palpebral puriform diſcharge, can be cured by merely injecting warm water, with Anel's ſyringe, through the lower punctum lachrymale.

The ample experience of Mr. Ware is a confirmation of what we have juſt now remarked.

Much, however, as we have differed from Scarpa in relation to the primary cauſes of the fiſtula lachrymalis, we entertain the moſt favourable opinion of that part of his practice which ariſes out of his theory. We allude to the plan of applying ſome ſuch ointment as Janin's, or the unguentum hydrargyri nitrati, to the edges and inſide of the eye-lids. Scarpa's deſcription of the diſeaſed ſtate in which the inner ſurface of theſe parts is found, is perfectly accurate, and whether ſuch ſtate be regarded with him as a cauſe, or with us only as an effect, there can be no doubt that ſomething ſhould be done to rectify it.

We have now to ſpeak of the treatment of the ſecond and third ſtages of the fiſtula lachrymalis, or of thoſe in which the ſkin covering the lachrymal ſac is either inflamed or burſt.

This part of ſurgery has only attained its preſent improved ſtate within the few laſt years; and Mr. Pott, who wrote ſo well on every ſurgical ſubject which attracted his notice, has recommended in his works a mode of treating theſe ſtates of the fiſtula lachrymalis much leſs ſimple and efficacious than what modern ſurgeons now univerſally prefer. For inſtance, when the ſac is burſt, he directs the opening, if neceſſary, to be enlarged with a knife, and, in other caſes, an inciſion to be made through the ſkin into that cavity. He then adviſes us to diſtend the wound moderately with dry lint, or prepared ſponge, ſo as to be able, in two or three days, to aſcertain the ſtate of the inſide of the ſac, and of the ductus naſalis. When the former is not ſloughy nor diſeaſed, and the obſtruction in the latter ſlight, a cure will ſometimes enſue, according to Mr. Pott, on a free diſcharge taking place, and ſuperficial dreſſings being applied to the ſore.

When this method is not attended with ſucceſs, Pott adviſes us to render the naſal duct pervious, by introducing a probe, a piece of catgut, or a bougie, from the wound down into the noſe. When one of theſe inſtruments will not paſs all the way down at once, it is to be gently introduced again and again until a paſſage is obtained.

About the year 1781, Mr. Wathen tried the effect of introducing a cannula into the naſal duct. His object was not only to form a communication between the eye and the noſe, but, by letting the wound heal over the inſtrument, to hinder the obſtruction from returning afterwards. In this way many cures were effected; but, after a time, the method was found to be ſubject to difficulties. The tubes, as Mr. Ware relates, frequently changed their poſition in the duct; ſometimes they roſe too high; at other times they ſunk too low; and, in conſequence of theſe accidents, the tears often became obſtructed again, and all the old ſymptoms returned.

A French oculiſt, M. Pellier, invented ſome cannulæ, which had two projecting edges; one at the top forming a kind of brim, and another about the middle of the inſtrument. The intention of theſe was to keep the tube from aſcending or deſcending, after granulations had occupied the ſpace between the two projecting brims.

Notwithſtanding the favourable accounts which have been given of cannulæ for the cure of the fiſtula lachrymalis, Mr. Ware has experienced much diſappointment from their uſe; and, among the objections to them, mentions the difficulty which ſometimes attends the attempt to withdraw them from the duct, in which they have become fixed.

For the ſecond and third ſtages of the fiſtula lachrymalis, the treatment which now obtains univerſal preference is that which Mr. Ware introduced into practice. Whenever a patient applies to this gentleman for relief, on account of an obſtruction in the naſal duct, he always thinks it right to endeavour to free the canal from any thickened mucus which may be lodged there, by injecting ſome warm water through the lower punctum lachrymale. At the ſame time he tries, when neceſſary, the effect of other remedies, mentioned in his writings on the epiphora. But if no benefit be perceptible after employing theſe means about a week or ten days; or if, from the long continuance of the obſtruction, ſuch treatment cannot be expected to ſucceed; he recommends the operation which we are about to deſcribe. However, with reſpect to children, Mr. Ware adviſes it to be deferred till they are eight or nine years old.

If the diſeaſe has not occaſioned any external opening in the lachrymal ſac, or if there is an opening which is not ſituated in a right line with the longitudinal direction of the naſal duct, Mr. Ware adviſes a puncture to be made into the ſac, at a ſmall diſtance from the internal commiſſure of the eye-lids, and nearly in a line drawn horizontally from this commiſſure towards the noſe. This opening is to be made with a very narrow ſpear-pointed lancet. The blunt end of a ſilver probe, which muſt be rather ſmaller than the probes commonly uſed by ſurgeons, ought next to be introduced into the wound, and be gently, but ſteadily, puſhed on in the direction of the naſal duct, with a force ſufficient to overcome the obſtruction in this canal, and until there is reaſon to believe that it has freely entered into the cavity of the noſe. Mr. Ware remarks that the poſition of the probe, when thus introduced, will be nearly perpendicular; its ſide will touch the upper edge of the orbit; and the ſpace between its bulbous end in the noſe and the wound in the ſkin will uſually be found in a full grown perſon to be about an inch and a quarter, or an inch and three-eighths. The probe is then to be withdrawn, and a ſilver ſtyle, of a ſize nearly ſimilar to that of the probe, but rather ſmaller, about an inch and three-eighths in length, with a flat head, like that of a nail, but placed obliquely, in order that it may be cloſe on the ſkin, is to be introduced through the duct in place of the probe, and to be left, for a continuance, in this ſituation. For the firſt day or two after the ſtyle has been introduced, Mr. Ware informs us that it is ſometimes adviſable to waſh the eye with a weak ſaturnine lotion, for the purpoſe of obviating any tendency to inflammation, which may have been excited by the operation. However, the ſame gentleman obſerves that this inflammation is in general ſo ſlight, that he has ſeldom found it neceſſary to uſe any application for its removal. The ſtyle ſhould be withdrawn once every day for about a week, and afterwards every ſecond or third day. Each time ſome warm water ſhould be injected through the duct into the noſe, and the inſtrument be then replaced in the ſame manner as before. Mr. Ware next blackens the head of the ſtyle with ſealing wax.

On the firſt trials of this method, Mr. Ware entertained no expectation that any relief would be obtained till the uſe of the ſtyle was left off. He had the gratification of finding, however, that the watering of the eye ceaſed as ſoon as the ſtyle was introduced, and the ſight became proportionally better and ſtronger.

In caſes in which there is no external opening in the lachrymal ſac, or no opening which will anſwer the purpoſe, Mr. Ware only makes a puncture of juſt ſufficient ſize to admit the end of the probe or ſtyle. This aperture ſoon changes into a fiſtulous orifice, through which the ſtyle may be paſſed without the leaſt pain. In ſhort, ſays Mr. Ware, in about a week or ten days, the treatment becomes ſo eaſy, that the patient, or any friend, is fully competent to do what is neceſſary. It merely conſiſts in withdrawing the ſtyle two or three times a week, occaſionally injecting ſome warm water, and then replacing the inſtrument in the ſame poſition which it held before.

With reſpect to the time which the ſtyle ſhould be worn, no determinate rule can be laid down. Mr. Ware acquaints us that ſome perſons, who find no inconvenience from the ſtyle, and are afraid to leave it off, wear it for years. Many others leave it off in about a month or ſix weeks, and continue quite well.

The ſores which are frequently met with over the lachrymal ſac generally heal as ſoon as the tears begin to find a paſſage down into the noſe. Two examples, however, are related by Mr. Ware, in which the ulcerations did not heal until the patient had taken a weak ſolution of the hydrargyrus muriatus and bark.

The fourth and laſt ſtage into which the fiſtula lachrymalis is divided, is that in which the natural paſſage from the ſac into the noſe is ſo diſeaſed as to be quite obliterated, or in which bones are carious.

In either of theſe circumſtances the object to be attempted is to form an artificial paſſage for the deſcent of the tears into the noſe.

Mr. Pott has explained, in a very clear manner, that the upper and hinder part of the lachrymal ſac is firmly attached to the os unguis, a ſmall and very thin bone juſt within the orbit of the eye. This bone is ſo ſituated, that if it be by any means broken through or removed, the two cavities of the noſe and of the orbit communicate with each other; conſequently, the os unguis forms the partition between the hinder part of the lachrymal bag, and the upper part of the cavity of the noſe. It is, ſays Mr. Pott, by making a breach in this partition, that we attempt the formation of an artificial paſſage for the lachrymal fluid.

For making a perforation in the os unguis Mr. Pott always employed a curved trocar, the point of which was turned obliquely downward from the angle of the eye towards the inſide of the noſe. Some make the breach in the bone with a knife; others with ſome ſuch inſtrument as a gimblet. As ſoon as the communication between the ſac and inſide of the noſe is made, the circumſtance will be indicated by a diſcharge of blood from the noſtril, and air from the wound, upon blowing the noſe.

Without lengthening this article by detailing how the ancients uſed to make the breach in the os unguis with the actual cautery, which the celebrated Scarpa even now prefers, or by explaining how practitioners a very few years back were wont to maintain the breach open by cramming in tents, prepared ſponge, a piece of bougie, &c. we ſhall proceed at once to deſcribe what is generally regarded as the beſt plan of keeping the artificial opening pervious.

Here we have to make the reader acquainted with an improved mode of treatment, for which the public and the profeſſion are indebted to the ingenuity of Mr. Ware. After the perforating inſtrument is withdrawn, this gentleman adviſes us to introduce a nail-headed ſtyle, about an inch in length, through the new aperture, in the ſame manner in which ſuch an inſtrument is paſſed through the naſal duct, in caſes in which the obſtruction is not ſo great as to prevent its paſſing in this direction. The ſtyle may alſo be left in the opening made in the os unguis, with as much ſafety as in the natural ductus naſalis, and this for as long a time as may be deemed requiſite for removing all chance of the new paſſage becoming cloſed again. Pott on the Fiſtula Lachrymalis. Ware on the Epiphora and Fiſtula Lachrymalis. Scarpa ſulle Principali Malattie degli Occhi. Venezia, 1802.

Fiſtulæ in Perinæo.—Very often, in conſequence of various irritations affecting the urethra, inflammations and abſceſſes are occaſioned around this canal. Theſe collections of matter may burſt inwardly into the urethra, or externally, or in both ways, in which latter caſe more or leſs of the urine flows out of the opening, whenever the patient has need of diſcharging this fluid. Sometimes the artificial paſſage through which the urine is evacuated heals up, after the irritation in the urethra is leſſened. In other inſtances, the cauſe of the preternatural opening remains unremoved, and the urine paſſing into the abſceſs by the inner orifice, and, making its eſcape by the external one, keeps up a conſtant irritation in the ſore, prevents the ſides of the paſſage from uniting, and converts them into a hard callous ſubſtance, the inner ſurface of which, as Mr. Hunter has remarked, loſes the diſpoſition to union, and aſſumes the nature of an outlet. Every opening which is thus cauſed, which partakes of this nature, and is ſituated in the perinæum, or even in the ſcrotum, is, with the general conſent of ſurgeons, denominated a *fiſtula in perinæo.*

The kind of irritation in the urethra moſt frequently occaſioning fiſtulæ in perinæo, is that which attends the obſtruction produced by ſtrictures in this canal. When this latter diſeaſe is very bad, and the urethra conſiderably obſtructed, nature frequently endeavours to procure relief by ulceration on the inſide of that part of the urethra which is between the bladder and the ſtricture The urine then paſſes into the looſe cellular membrane of the ſcrotum and penis, and the irritating quality of this fluid becomes a cauſe of ſuppuration wherever it is extravaſated, and even of mortification, firſt, of all the cellular ſubſtance, and then, of ſeveral portions of the ſkin. If the patient continues to live, all theſe ſloughs are detached, and the ſores contract, till nothing but the fiſtulous aperture remains, through which the urine makes its eſcape. In ſome examples the urine inſinuates itſelf into the corpus ſpongioſum urethræ, is diffuſed all over this ſubſtance, even into the glans penis, and produces a ſloughing of all the parts in which it is lodged.

In irritable conſtitutions, in old perſons, and in ſubjects whoſe ſyſtems have long been under the influence of the Eaſt or Weſt India climate, fiſtulæ in perinæo ſeem to be more eaſily excited. We have often ſeen, in ſuch patients, abſceſſes and openings, through which the urine flowed, occaſioned by gonorrhœas, which could not be regarded as ſevere ones, and by ſtrictures which had not made ſufficient obſtruction in the paſſage even to render the perſons themſelves conſcious of having any ſtoppage of this kind at all.

Mr. Hunter adviſes us to treat inflammations which occur in the vicinity of the urethra in the ſame manner as inflammations in other parts. Reſolution is very deſirable, though hardly to be expected, when a ſtricture is the cauſe, in which caſe ſuppuration almoſt inevitably enſues. When matter is formed, the ſooner an external opening is made into the abſceſs the better, as by this means we may ſometimes, though not often, prevent it from burſting inwardly into the urethra. Mr. Hunter recommends the external opening to be made large.

In certain inſtances it happens, when the collection of matter burſts internally, that the ſtricture is removed by the ulceration, and is thus fortunately cured. But when the ſtricture continues, as it almoſt always does, an attempt muſt be made to deſtroy it by ſome of the methods which will be deſcribed in a ſubſequent part of the Cyclopædia. (See STRICTURE.) While the urine paſſes through the artificial paſſage no cure can be hoped for.

From what has been already delivered, it muſt be obvious, that in every inſtance in which a ſtricture is known or ſuſpected to have occaſioned the abſceſs and fiſtula in perinæo, it is proper to examine the urethra with a bougie. If the obſtruction has been more or leſs deſtroyed by ulceration, ſo that this inſtrument, of a certain ſize, can be paſſed; its employment ſhould be almoſt inceſſantly continued, and its ſize regularly increaſed as faſt as circumſtances will allow, in order to procure a free paſſage onward to the bladder. Some practitioners, in the ſame kind of caſe, would prefer the uſe of bougies armed with cauſtic; but this ſubject more properly belongs to the article in which ſtrictures will be conſidered.

Some practitioners recommend hollow bougies to be worn after the ſtricture is in part removed, with a view of preventing the urine from paſſing into the artificial opening. Mr. Hunter remarks, that this inſtrument allows the urine to dribble away continually; but that its orifice may be ſtopped up, and the urine only allowed to flow when the patient has an inclination to make the evacuation. The hollow bougie, according to the ſame great ſurgeon, becomes, under certain circumſtances, the worſt inſtrument poſſible; for if its canal is not of a ſize ſufficient to let the water paſs as freely as the contraction of the bladder requires, the fluid will eaſily paſs by the ſide of the bougie, and not being able to get more forward than the remaining part of the ſtricture, will of courſe run into the abſceſs in the perinæum. In order to avoid this diſagreeable occurrence as much as poſſible, the hollow bougies ſhould be as large as the ſtrictured part will allow, and their ſides ſhould be as thin as poſſible, ſo that their cavity may be the wider. On theſe accounts the elaſtic gum catheters ought to be preferred to common hollow bougies, made with ſpiral wire, covered with waxed cloth.

Mr. Hunter himſelf entertained doubts whether the abſceſs in the perinæum was really prevented from healing by the paſſage of the urine through it, and, conſequently, he had no very high opinion of the uſe of hollow bougies. He obſerved, that after lithotomy the parts healed very readily, when they were free from diſeaſe. Hence he ſupected that in abſceſſes, and ſores in the perinæum, the want of diſpoſition to heal aroſe from the ſtrictures not being ſufficiently ſubdued, or the deeper parts not being in a healthy ſtate.

When ſuppurations in the perinæum are neglected, and no attempt is made to cure the ſtricture, the latter ſometimes cloſes entirely, no bougie can be paſſed through it, and all the urine paſſes through the artificial paſſage. For ſuch inſtances cauſtic bougies are ſuch as ought to be employed.

In caſes in which ſuppuration takes place in the perinæum, in conſequence of ſtrictures in the urethra, the ſurgeon ſhould not limit his attention to the removal of the latter affection only; he ſhould alſo make uſe of every means which is proper for diminiſhing the local inflammation. Bleeding, and expoſing the parts to the ſteam of hot water, are meaſures fraught with peculiar efficacy. All practitioners likewiſe acknowledge the great benefit which is derived from the uſe of opium, adminiſtered both by the mouth and in glyſters. Irritation and ſpaſm will be moſt effectually relieved by conjoining with the foregoing treatment the employment of the warm bath.

In ſome examples matter forms in the perinæum, and burſts both internally and externally, ſo that a paſſage is made, through which the urine eſcapes; but in conſequence of the abſceſs being circumſcribed by the adheſive inflammation, which ſhuts up the cavities of the cellular ſubſtance, the urine does not become diffuſed.

The avoidance of ſuch an extravaſation, however, is frequently not in the power of the ſurgeon; an unfortunate truth, becauſe ſloughing and abſceſſes generally ariſe in every place into which the irritating fluid inſinuates itſelf.

As the miſchief continues to increaſe as long as the urine cannot find a free vent outward, and is, conſequently, injected more and more into the cellular membrane, the practitioner muſt not be guilty of delay. It very often happens that all the methods related above prove inſufficient, or unproductive of the prompt relief which is urgently demanded. In this circumſtance the ſurgeon muſt try by other means to unload the bladder, and prevent the increaſing extravaſation in the cellular membrane of the perinæum, ſcrotum, and adjacent parts. Theſe two great deſirable objects may be effected by making an opening into the urethra, ſomewhere beyond the ſtricture; though the nearer to it the better.

With this view, Mr. Hunter adviſes a director or ſtaff to be introduced into the urethra, as far as the ſtricture, and an inciſion made down upon the end of the inſtrument. The cut is then to be lengthened a little towards the anus, ſo as to open the urethra juſt beyond the obſtruction.

In caſes in which the ſtricture happens to be ſituated oppoſite the ſcrotum, we are recommended by Mr. Hunter to make an opening into the urethra in the perinæum. It is obvious that in ſuch inſtances we cannot have the ſtaff to guide us, and we muſt be directed by our knowledge of anatomy. A cannula is then to be paſſed from the wound to the ſtricture, and another cannula from the glans penis alſo to the obſtruction, ſo as to meet the other tube. A perforating inſtrument is then to be puſhed from one cannula into the other, by which means the ſtricture will be penetrated. The next ſtep is to withdraw the two tubes, and introduce a gum-catheter, which is to be worn till the wound is healed.

Theſe proceedings, however, are only to be conſidered as proper in certain very urgent caſes. In others, the increaſing diffuſion of urine may be ſtopped by merely making an opening into the urethra, ſomewhere between the ſtricture and bladder; and, indeed, in the generality of inſtances, a diligent uſe of bougies, and making depending apertures for the diſcharge of the urine, which becomes extravaſated, will remove all occaſion for more ſevere meaſures.

Nor ſhould the important conſiderations which we have juſt been ſpeaking of monopolize all the practitioner's attention. Other matters alſo require his care. That inflammation, which is conſtantly excited wherever the urine is extravaſated, ſhould be diminiſhed as much as poſſible. Fomentations and poultices ſhould be applied, and the ſame ſcarifications and inciſions which ſerve to let out the urine, and prevent its ſpreading further in the cellular ſubſtance, will alſo ſerve to give vent to whatever pus may be collected. When there are ſloughs, which is too frequently the caſe, the inciſions ſhould of courſe rather be made in the inſenſible dead parts than in the living ones. However, the advantage of having a depending opening ought even to be paramount in the ſurgeon's mind, to the falſely humane motive of not ſubjecting the patient to pain. By ſubmitting to requiſite operations, it is true the latter ſuffers for a time, but it is equally obvious that he would certainly ſuffer much more, and perhaps ultimately die, were ſuch operations neglected. It is frequently the caſe in ſurgery, that thoſe proceedings which to an unthinking perſon ſeem bold, bloody, and cruel, are in reality, with regard to what the patients muſt feel, the moſt tender and humane, and, with regard to his ſafety, the moſt diſcreet. Were the ſurgeon's knife not uſed when diſeaſes require it, the patient certainly would not feel the ſharp edge of the inſtrument; but he could not in this way elude pain, which would be tenfold greater, when reſulting from the increaſing ravages of the diſeaſe, than when inflicted by the ſurgeon, with this material difference, that in one inſtance it is ſuffering for the chance of a recovery; in the other, it is ſuffering in all probability to die.

In caſes of old fiſtulæ in perinæo, in which the dangers ariſing from an extravaſation of urine are over, either common or armed bougies are to be uſed for the purpoſe of making the urethra as free from obſtruction as poſſible. When the ſtrictures give way, and the urine can flow freely forward, the fiſtulous openings in the perinæum often ſpontaneouſly heal.

When the urethra is completely free from ſtrictures, and yet the fiſtulæ in perinæo do not heal, the ſinuſes are to be laid open like all others which have no diſpoſition to get well. One great object in performing ſuch operations is, to cut as little as poſſible of the ſound urethra. On this account, Mr. Hunter adviſes us to find the inner orifice of the fiſtulæ, if poſſible, by introducing a ſtaff, which is to meet the end of a probe paſſed through the fiſtulæ into the urethra. Surgeons ought to underſtand, that though fiſtulæ in perinæo often have ſeveral external openings, they ſeldom or never have more than one internally, with which they communicate with the urethra. A director is the moſt convenient inſtrument when the ſtraight courſe of the fiſtula will allow it to be introduced. When the fiſtulous paſſage is tortuous, a probe is beſt, becauſe it can be bent into any ſhape.

The probe or director being introduced ſo as to meet the ſtaff, the ſurgeon is carefully to lay open the ſinus, through which it paſſes, and he is to do this till he has cut as far as the ſtaff.

When no probe nor director can be made to enter ſo far as to touch the ſtaff, the ſurgeon muſt lay open as much of the ſinus, as what the inſtrument enters, and then endeavour to find the continuation of the fiſtula.

As ſoon as the fiſtulous ſinuſes are all laid open down to their termination in the urethra, a gum catheter ſhould be introduced, and worn at firſt almoſt without intermiſſion. However Mr. Hunter recommends the catheter to be diſuſed, as ſoon as the ſores become ſtationary, as it ſometimes has the effect of preventing them from healing.

The ſame eminent ſurgeon alſo adviſes us to dreſs the wounds at firſt down to the bottom. If this prudent method were neglected, the ſuperficial parts might cloſe, while the deeper ones remained unhealed, and freſh abſceſſes and fiſtulæ be the conſequence.

Fistula, *Salivary*. See Salivary *Fiſtula*.

Fistula *Pulmonis*, in *Anatomy*, a term uſed by ſome writers for the *aſpera arteria*.

Fistula *Sacra*, is that part of the back-bone which is perforated.

Fistula *Urinaria*, the ſame with the urethra.

FISTULAR, or Fistulous, is applied by the ſurgeons to wounds and ulcers which degenerate into fiſtulas.

Fistular is alſo applied to the leaves of plants which are round and hollow within; as the leaves of leeks, &c.

Fistular *Flowers*, among *Herbaliſts*, are thoſe made up of many ſmall, long, hollow flowers, like pipes.

FISTULARIA, in *Ichthyology*, a genus of abdominal fiſhes, the ſnout of which is cylindrical; jaws diſtant from the eyes; gill-membrane with ſeven rays; body round, and gradually tapering from the jaws to the tail.

Species.

Tabacaria. Tail bifid, and ending in a ſetaceous proceſs. Linn. *Petimbuaba*, Marcg. *Tobacco-pipe fiſh*, Will.

A very ſingular ſpecies, found in the ſeas of America and Japan. The uſual length of this fiſh appears to be from twelve to eighteen inches, excluſive of the briſtle-form proceſs which proceeds from the extremity of the body between the two lobes of the caudal fin, and in general meaſures rather more than one-fourth the length of the body. Some writers, however, aſſure us that the tobacco-pipe fiſh grows to the length even of three or four feet.

The ſhape is that of an eel, the ſkin ſmooth, of a livid brown colour above, and ſilvery beneath; the back and ſides are marked with longitudinal ſeries of blue ſpots, diſpoſed on each ſide the middle of the back in two diſtinct lines; the lateral line is ſtraight, and the fins pale red. In ſome examples of this fiſh the tail exhibits two of the above-mentioned filiform appendages inſtead of one; whether this ought to be conſidered as an accidental circumſtance, or as a criterion of ſexual difference is uncertain; Dr. Bloch obſerves that the ſnout of thoſe with two appendages to the tail is ferrated. According to the remarks of Count de Cepéde the ſpine of this fiſh is very peculiar in ſtructure, the firſt vertebra being of immoderate length, the three next much ſhorter, and the reſt gradually decreaſing as they approach the tail. The ſpecies ſubſiſts on ſmaller fiſhes, marine inſects or worms, &c. which the ſtructure of its ſnout enables it to obtain, by introducing that part into the cavities of the rocks.

Chinensis. Tail rounded, and without the long appendage. Linn. *Chineſe trumpet fiſh*.

A native of the Indian ſeas, and poſſeſſing the ſame habits as the former. Its general ſhape reſembles that of the common eel. The head is elongated, ſomewhat bony, and compreſſed at the ſides; the ſnout tubular and rather broad; mouth ſmall; eyes rather large; and the body covered with ſcales of moderate ſize. The prevailing colour is reddiſh-brown, of a pale hue, with three or four whitiſh ſtripes extending from the gills to the tail; the upper part of the body variegated with duſky ſpots, and the fins pale yellow.

Paradoxa. Body reticulate with prominent lines; tail lanceolate. Gmel. Pallas. *Paradoxical fiſtularia*.

A ſpecies apparently deſcribed in the firſt inſtance by Seba, and ſince with yet greater accuracy by Pallas. This fiſh is of the ſmaller kind, being only from two or three inches in length, or four inches at the utmoſt. The body is whitiſh-aſh, with obſolete brown rivulets; the firſt dorſal fin and tail blackiſh; compreſſed, and ſpinous at the interſections of the lines. The back is triangular, and the belly towards the ventral fins nearly of the ſame figure; behind them narrower, and equally ſix-ſided; tail compreſſed, and ſeven-ſided. The head is rather ſmall; eyes large, at the baſe of the ſnout, and with a triangular ſpine on each ſide before the orbit. The ſnout is remarkably long, ſtraight, horny, and terminated in a mouth of ſmall dimenſions. The nape is armed with three ſpines; the gill-openings are ſhallow, ſmall, and radiated with a few prominent lines. The firſt dorſal fin is long, reclined, and banded with black; the pectoral fins are very broad; the ventral remarkably large, with the rays deeply cleft and divided, and connected by means of a lax membrane in the form of a longitudinal pouch.

FISTULATOR, *Lat.* a piper.

FISTULOUS Ulcer. See Fistula.

FIT, in *Medicine*, an acceſs, exacerbation, or paroxyſm of diſeaſe. The term is applied particularly to intermittent or periodical diſeaſes; as we ſay an ague-fit, the cold or hot fit of the ſame complaint; and alſo to all ſudden or violent diſturbances of the ſyſtem, as to the attack of apoplexy, epilepſy, hyſteria, &c. The word fits, when uſed without any epithet, applies principally to hyſterical attacks in women, to the convulſions of children, and, among the vulgar, to epilepſy. See Convulsions, Epilepsy, and Hysteria; alſo Cold *Fit*.

Fits *of eaſy reflection* and *eaſy tranſmiſſion*. See Light.

Fits *of the mother*. See Hysteric *affection*.

FITAQUE, or Filoqui, in *Geography*, a town of Japan; 30 miles E. of Jeddo.

FITCHBURG, a poſt-town of America, in Worceſter county, Maſſachuſetts; 25 miles N. of Worceſter. It contains 1390 inhabitants.

FITCHEE, or Fichee, in *Heraldry*, is when the lower part of any croſs is ſharpened into a point fit to fix into the ground. Thus, he bears azure, a croſs-potent fitchee.

The origin hereof M'Kenzie aſcribes to the primitive Chriſtians, who uſed to carry their croſſes with them wherever they went: and when they ſtopped at any place in a journey, fixed them in the ground.

FITCHES, in *Agriculture*, a common name often applied by farmers to vetches. Crops of this ſort are grown in the field both as a green food for live-ſtock, and their produce in ſeed. They are moſtly ſown broadcaſt over the land, and harrowed in by a light harrow; but occaſionally in drills at narrow diſtances.

The ſeaſons for putting the crops into the ground are either the autumn or ſpring, according as they are wanted.

They are occaſionally likewiſe cultivated as a green crop, for being turned into the ſoil as a manure. This is uſually done juſt before they come into bloſſom, when they are in their moſt luxuriant ſtate. See Manure.

When uſed green for ſoiling cattle, they are an excellent food; and when given in the pod extremely fattening. See Tares and Vetches.

FITCHET, a name uſed in ſome places for the weaſel; called alſo the *fitchel* and the *foumart*. See Viverra *Putorius*.

FITSIL Head, in *Geography*, a cape of Scotland, on the W. coaſt and S. extremity of Mainland, one of the Shetland iſlands. N. lat. 59° 50′. W. long. 1° 44′.

FITTING-OUT, in *Naval Language*, the act of providing a ſhip with a ſufficient number of men, to navigate and arm her for attack or defence ; as alſo of furniſhing her with proper maſts, ſails, yards, ammunition, artillery, cordage, anchors, and other naval furniture, together with ſufficient proviſions for the ſhip's company. See Crew.

FITTRE', or Fiddri, in *Geography*, a country of Africa, otherwiſe called Luſſi, and Couga or Cougu, ſituated on the borders of a large lake to the ſouth of Begarmee. It is governed by a ſultan, and his dominions have been much diminiſhed by the encroachments of the ſultans of Begarmee and Wadey. The inhabitants live in ſmall tents, and are ſaid to be in a low degree of civilization. They have no ſalt, except what they procure from the aſhes of goſſab. The lake is ſituated 210 miles S. of Bornou. N. lat. 15° 50'. E. long. 22° 30'.

FITZ, a French term, literally denoting *ſon* ; ſometimes given by way of addition to the natural ſons of the kings of England ; as James *Fitz-Roy*, duke of Grafton, &c.

FITZHERBERT, *Sir* Anthony, in *Biography*, a learned lawyer and judge, who flouriſhed in the reign of Henry VIII. was the younger ſon of Ralph Fitzherbert, eſq. of Norbury, in the county of Derby. He was educated at Oxford, and purſued his ſtudies, as preparatory to the practice at the bar, in one of the inns of court in the metropolis. He attained the degree of ſergeant at law in 1511, and received the honour of knighthood about the ſame time. In 1523 he was appointed one of the juſtices of the court of Common Pleas, in which office he paſſed the remainder of his life, and was diſtinguiſhed by many valuable legal works, as well as by ſuch an honourable diſcharge of the duties of his office, as made him eſteemed an oracle of the law. In the diſcharge of his duty he feared no man, and oppoſed the arbitrary proceedings of Wolſey in the height of his power. On his death-bed he is ſaid to have exacted a promiſe from his children that they would neither accept grants, nor make purchaſes of lands of the diſſolved religious foundations, to which they conſtantly adhered. He died in the year 1538, leaving a numerous poſterity. His principal writings are, "The grand Abridgment," a collection of caſes abridged: "The office and authority of Juſtices of Peace;" "The office of Sheriffs, Bailiffs of Liberties, Conſtables, &c." and "The new Natura Brevium." He is ſuppoſed to have been the author of a work entitled "Of the ſurveying of Lands;" and alſo of "The book of Huſbandry." Biog. Brit.

Fitzherbert, Thomas, grandſon of ſir Anthony, was born in the county of Stafford in the year 1552, where he received the early parts of his education, after which he went to Oxford to purſue his ſtudies. On account of his rigid adherence to the catholic principles, in which he had been brought up, he expoſed himſelf to occaſional reproofs from his ſuperiors, and at length became an object of perſecution, and was committed to priſon in the year 1572. Harſh meaſures rarely make a man leſs tenacious of his principles ; and, upon his liberation, he became more active in promulgating the doctrines of popery than he had ever been, till at length he was obliged to ſeek ſafety in concealment. In the year 1580 he connected himſelf cloſely with ſome Jeſuits ſent into England as miſſionaries, aſſiſting them as far as he was able with money and advice. By this conduct he incurred the penalties of "præmunire," and, alarmed at the riſks he was every day running, he went to France. This was in the year 1582 ; he intereſted himſelf very much in behalf of Mary queen of Scots ; and when the death of that unfortunate princeſs rendered his exertions no longer of any avail, he went to Madrid to implore the protection of Philip II. in behalf of the catholics, and their religion in England. From Madrid he went to Rome, took a lodging near the Engliſh college, and obſerved the ſame devotions as the inmates of that houſe, and ſpent the remainder of his time in writing books in defence of the catholic religion. In 1614 he became a member of the ſociety of Jeſus, was admitted to prieſt's orders, and almoſt immediately afterwards removed to Flanders, to preſide over the Engliſh miſſion there. Here he diſplayed great learning and talent, and acquired ſo much eſteem by his behaviour and conciliating manners, that he was invited to accept the rectorſhip of the Engliſh college at Rome, the duties of which he diſcharged with high reputation for twenty-two years. He died at Rome in the year 1640, at the very advanced age of eighty-eight. As an author his works are numerous, but being chiefly on controverted points of religion, they have little claim to notice. Biog. Brit.

Fitzherbert *Iſland*, in *Geography*, a ſmall iſland in the Florida ſtream, at the entrance of the gulf of Mexico. N. lat. 24° 40'. W. long. 81° 50'.

FITZHUGH's Sound, a narrow channel of the N. Pacific ocean, between Calvert's iſland, and the W. coaſt of North America.

FITZJAMES, James, in *Biography*, duke of Berwick, natural ſon of king James II. by Arabella, ſiſter to the great duke of Marlborough, was born in 1671 at Moulins, in France, where his mother was, in her return from the baths of Bourbon. He was educated for the military profeſſion, and diſtinguiſhed himſelf at an early age at the ſiege of Buda and battle of Mohatz in 1686 and 1687. On his return his father conferred upon him the title of duke of Berwick, &c. with the order of the garter. At the revolution he accompanied the abdicated king to France, and afterwards went over to Ireland to command in the abſence of lord Tyrconnel. He ſuſtained important commands at the ſiege of Londonderry and the battle of the Boyne, and when all was loſt in that country he returned, and ſerved in the armies of France. In the ſervice of Louis XIV. he diſtinguiſhed himſelf in a very high degree, and in 1703 he was appointed commander-in-chief of the troops ſent into Spain to the aſſiſtance of Philip V. and intent ſolely upon his duty as a general, he in a ſingle campaign reduced a number of important places. As a reward for his great proweſs, and for the many victories which he had obtained, he was made marſhal of France in 1706. In the ſame year he returned to the command in Spain, and ſignalized his military ſkill by a campaign, in which, without fighting a battle, he obliged the enemy to evacuate Caſtile, "conducting them," ſays his biographer, "from poſt to poſt as a ſhepherd leads his flock." In 1707 he obtained a ſignal victory over the Engliſh and their allies, for which he received the higheſt honours in rank and titles that the crown of Spain could confer. He was afterwards entruſted with the army on the Rhine, oppoſed to that of the empire, and in 1710 he commanded in Dauphinè, where with great ſkill he foiled all the attempts of the duke of Savoy with a ſuperior army to break into France. He was now created a duke and peer of France by the title of Fitz-James. Notwithſtanding his attachment and obligation to France, in the year 1719 he obeyed the orders of Louis, in taking the command of an army deſtined to invade that country, and ſoon made himſelf maſter of Fontarabia. He was afterwards commander-in-chief of the troops in the ſouth-weſtern provinces of France ; and in the year 1730 was made governor of Straſburg. War being renewed between the empire and France, he was appointed general of the French army in Germany, and, in 1734, undertook the ſiege of Philipſburgh, during which he was killed by a cannon-ſhot on June 12th, at the age of ſixty-three. He was naturally of a cold, reſerved, and auſtere temper, but he was a man of principle, ſincere, upright, and diſtintereſted. He made few promiſes and profeſſions of friendſhip, but no man performed more ſervices to his friends. He avoided all intrigues, and never ſpoke ill of any man. As a general his great talent was in defenſive war, and he deſired nothing ſo much as to have a good fortification to defend. He eſtimated his own merit with modeſty, but ſuch was the public and general opinion of him, that his death was regarded by the French, in whoſe cauſe he died, as a great national calamity. Moreri.

FITZROY Island, in *Geography*, a ſmall iſland near the N.E. coaſt of New Holland; 5 miles N.E. of cape Grafton.

FITZSTEPHEN, William, in *Biography*, who flouriſhed in the 12th century, was deſcended from a noble Norman family, and born in London. When he had made a conſiderable progreſs in literature at home, he went to France to complete his ſtudies. Upon his return he entered into the monaſtic ſtate at Canterbury, and by his learning and talents obtained the notice and patronage of the archbiſhop, Thomas Becket. To this prelate he became attached by habits of intimacy and ſtrict friendſhip, adhering moſt zealouſly to him and his cauſe in the different reverſes of his fortune. After the murder of Becket he exhibited his attachment by drawing up a life of that prelate in the Latin language. The life of the archbiſhop is introduced by a deſcription of the city of London, and a detail of the manners and cuſtoms of the inhabitants in that period. This is ſaid to be the earlieſt account extant of London, and is to be ſeen in Stowe's Survey. Fitzſtephen died in the year 1191.

FITZWILLIAM, in *Geography*, a townſhip of America, in Cheſhire county, New Hampſhire, about 16 miles E. of Connecticut river, and ſeparated from Royalſton in Maſſachuſetts by the ſtate line; incorporated in 1773, and containing 1240 inhabitants.

FIVE Bonnets, a cluſter of ſmall iſlands in the Mergui Archipelago. N. lat. 10° 29′.

Five *Brothers*, a cluſter of ſmall inſlands in lake Huron. N. lat. 44° 55′. W. long. 83° 28′.

Five *Fathom bank*, a ſhoal in the Eaſt Indian ſea. S. lat. 5° 53′. E. long. 119° 2′.

Five *Fingers' point*, a cape on the S.W. coaſt of New Zealand, forming the north cape of the ſouth entrance into Duſky bay; the rocks of which bear ſome reſemblance to the five fingers of the hand, whence its name. The land of this point is a narrow peninſula ſtretching off from Reſolution iſland, of a moderate and equal height, and wholly covered with wood.

Five *Iſland harbour*, a bay on the W. coaſt of the iſland of Antigua. N. lat. 17° 13′. W. long. 61° 35′.

Five *Nations* of North America, ſo called by Engliſh writers, are the Iroquois of the French, being the Mohawks, Oneydoes, Onondagas, Cayugas, and Sennekas, forming five clans joined in an old confederacy of offence and defence.

Five-*leaved Graſs*, *Cinquefoil*, in *Heraldry*, is uſed by ſuch as would introduce a blazon by herbs and flowers inſtead of metals and colours, to ſignify *vert*, or *green*.

FIVEL, in *Geography*, a river of Holland, which runs into the Ems, near Delfzyl, and gives name to a ſmall country on its banks between Groningen and the mouth of the Ems, containing 25 ſmall towns and villages.

FIUMARA di Muro, a town of Naples, in Calabria Ultra; 8 miles N. of Reggio.

FIUMARELLA, La, a river of Naples, which runs into the gulf of Squillace, 2 miles S. of Cantazaro.

FIUME. See St. Veit.

Fiume *Freddo*, a town of Naples, in Calabria Citra; 11 miles W.S.W. of Coſenza.

FIUMICINO, a ſea-port in the dominions of the Pope, at the mouth of the Tiber, with a cuſtom-houſe, where veſſels pay for their goods on board; 2 miles S.W. of Porto.

FIXATION, the act of fixing, or of rendering a thing firm and fixed.

Fixation is applied in the general to any proceſs that fixes and binds together what, of its own nature, is volatile; and enables it to ſuſtain the loſs of fire for ſome conſiderable time.

Geber defines fixation an operation whereby a volatile thing, *i. e.* a thing that cannot endure the fire, is rendered capable of enduring it. In the general, fixation is the changing of a volatile body into a fixed one.

Fixation, among *Alchemiſts*, denotes a peculiar preparation of mercury, whereby it is to be put in a condition to bear the fire without evaporating, or the hammer without flying or ſeparating.

The alchemiſts hold, that if they had the true ſecret of fixing mercury, without the addition of any foreign, leſs heavy and ſolid ingredient, they could make gold, or at leaſt ſilver.

M. Homberg had a long proceſs of many months to prepare an oil from the fæcal matter of human excrements; which he imagined would have fixed mercury into ſilver; but it failed.

FIXED Air. See Air, Carbonic *Acid*, and Gas.

Fixed *Bodies*, in the general, are thoſe which neither the fire nor any corroſive has ſuch effect on, as to reduce or reſolve them into their component elements; *i. e.* abſolutely to deſtroy them.

Chauvin holds it not ſufficient to denominate a body fixed that it can withſtand the fire or any one agent, but it ſhould withſtand all. He contends, that fixity ſhould not be reſtrained, as it uſually is, to an exemption from evaporation; but from deſtruction, or reſolution into primary elements: in this ſenſe, gold, precious ſtones, and glaſs, and even ſulphur, and mercury itſelf, are properly fixed bodies; for mercury and ſulphur retain their nature notwithſtanding all their evaporation.

The chemiſts divide all natural bodies into fixed and volatile; *i. e.* ſuch as bear the utmoſt force of the fire without diſſipating or ſpending themſelves in fume, and ſuch as do not.

Of fixed bodies, the principal are platina, gold, ſilver, precious ſtones, particularly the diamond; ſalts, &c.

Of all metals, gold and ſilver alone are fixed; *i. e.* on remaining a long time expoſed to the moſt intenſe flame, they, alone, loſe nothing of their weight.

Whence this property ſhould ariſe is difficult to ſay. If the reader is not contented with the cauſes enumerated under Fixity, he may add the following one from Boerhaave, *viz.* the homogeneity and equality of the parts. The parts, *e. gr.* of gold being all homogeneous and equal, will equally ſuſtain each other, and leave equal pores between them; through which pores, when fuſed, the fire finding an eaſy equal paſſage, goes off, without carrying any thing of the metal with it: or rather the particles of gold being of all others the moſt ſolid and heavy (as appears from the weight of that metal) and of all others the moſt ſtrongly united bound together (as appears from the immenſe ductility of that metal), the force of the fire is not ſufficient to overcome ſo powerful a reſiſtance; the ſolidity of the particles, and their freedom from air, prevents their being rarefied, or ſet farther apart, which might leſſen their ſpecific gravity, and diminiſh their *vis coheſionis;* ſo that what has the chief effect in the raiſing of fumes and vapours, *viz.* the rarefaction or expanſion of the body being here precluded, the metal maintains its natural weight and tendency to the centre.

Mr. Boyle, the Prince of Mirandola, M. Homberg, and others, have made numerous experiments on gold, ſilver, &c. to ſee how far their fixity extended; in theſe pure gold, kept in an intenſe heat for two months, loſt nothing ſenſible of its weight: ſilver, under the like circumſtances, and the like time, loſt one-twelfth part of its weight: but Mr. Boyle attributes this to the metal's not being fine and pure.

Indeed, by the great burning-glaſſes of Meſſrs. Tſchirnhauſen and Villette, the moſt fixed bodies, as gold itſelf, are rendered volatile, and loſe of their weight; ſo that there is no body in all nature abſolutely fixed.

Fixed *Ecliptic*, a certain imaginary plane, which never changes its poſition in the heavens from the action of any of the parts of the ſolar ſyſtem on each other; but, like a centre of inertia, remains immoveably fixed. The exiſtence of ſuch a plane is demonſtrated by Laplace, who has ſhewn the method of determining it from the ſituations, velocities, &c. maſſes of the planets, and other bodies of the ſolar ſyſtem. The rule for determining it is as follows.

If at any inſtant of time whatever, and upon any plane paſſing through the centre of the ſun, we draw ſtraight lines to the aſcending nodes of the planetary orbits referred to this plane; and if we take on theſe lines, reckoning from the centre of the ſun lines equal to the tangents of the inclinations of theſe orbits to this plane; and if, at the extremities of theſe lines, we ſuppoſe maſſes equal to the maſſes of the planets, multiplied reſpectively into the ſquare roots of the parameters of their orbits, and by the coſines of their inclinations; and laſtly, if we determine the centre of gravity of this new ſyſtem of bodies, then the ſtraight line, drawn from the centre of the ſun to this point, will be the tangent of the inclination of the invariable plane to the aſſumed plane; and continuing this line to the heavens, will there mark its aſcending node.

Whatever changes the ſucceſſion of ages may produce in the planetary orbits, and whatever be the plane to which they are referred, the plane determined by this rule will always be the ſame. It is true, its poſition depends on the maſſes of the planets; but thoſe which have ſatellites have the greateſt influence on its poſition, and the maſſes of the others will ſoon be ſufficiently known to determine it with exactneſs. In adopting the values and the elements of their orbits, as given under Element, we find that the longitude of the aſcending node of the invariable plane was $102^\circ\,56'\,56''.1$ at the commencement of 1750, and at the ſame time its inclination to the ecliptic was $1^\circ\,35'\,40''.9$. In this computation we have neglected the comets, which, nevertheleſs, ought to enter into the determination of the invariable plane, ſince they make part of the ſolar ſyſtem. It would be eaſy to include them in the preceding rule, if their maſſes, and the elements of their orbits, were known. But in our preſent ignorance of the nature of theſe objects, we ſuppoſe their maſſes too ſmall to influence the planetary ſyſtem, and this is the more probable, ſince the theory of the mutual attraction of the planets ſuffices to explain all the inequalities obſerved in their motions. But if the action of the comets ſhould become ſenſible in length of time, it ſhould principally affect the poſition of the plane which we ſuppoſe invariable, and in this point of view, the conſideration of this plane will ſtill be uſeful, if its variations could be recognized, which would be attended with great difficulties.

The ſituation of this fixed ecliptic is at preſent nearly half way between the orbits of Jupiter and Saturn, and it is inclined in a ſmall angle to the plane of the earth's orbit or true ecliptic.

The property by which it is determined is that the ſum of the areas deſcribed by the *radii vectores* of the bodies of the ſyſtem multiplied reſpectively by the maſſes of theſe bodies, is a *maximum.*

Fixed *Line of defence*, a line drawn along the face of the baſtion, and terminating in the curtain. See Defence.

Fixed *Nitre*, a preparation of ſaltpetre, made by fuſing it in a crucible, and then inflaming it, with throwing in a few coals; and thus again and again, till no more flame or detonation ariſe; then letting it cool, they pulverize and diſſolve it in water, and afterwards evaporate it into a fine white ſalt, which ſerves to draw the tinctures out of vegetables. This ſalt, *per deliquium*, yields what they call the *liquor of fixed nitre.*

Fixed *Salts*, are thoſe extracted or gained from bodies by calcination and lotion. See Salts.

They are called fixed, becauſe the fire was not able to ſublime or raiſe them; as thoſe carried off in the courſe of calcination by the vehemence of fire are called *volatile.*

The aſhes of all plants yield fixed ſalts. See Lixivium.

Fixed *Signs of the Zodiac*, according to ſome, are the ſigns Taurus, Leo, Scorpio, and Aquarius.

They are ſo called becauſe the ſun paſſes them reſpectively in the middle of each quarter, when that ſeaſon is more ſettled and fixed than under the ſign which begins and ends it.

Fixed *Stars* are ſuch as conſtantly retain the ſame poſition and diſtance with reſpect to each other.

By which they are contra-diſtinguiſhed from erratic or wandering ſtars, which are continually ſhifting their ſituation and diſtance.

The fixed ſtars are what we properly and abſolutely call ſtars; the reſt have their peculiar denomination of planet and comet.

FIXEN, among *Sportſmen*. See Vixen.

FIXES is a name given by the workmen in gold and ſilver to a ſolution in ſilver, from its uſe in carrying down and fixing the heterogeneous acids mingled with aquafortis.

FIXITY, or Fixedness, in *Philoſophy*, the quality of a body which denominates and renders it fixed; or a property which enables it to endure the fire and other violent agents.

According to Chauvin, fixity conſiſts in this; that the component principles of the body are ſo cloſely united or cohere ſo ſtrongly, and are mixed in ſuch proportion, that they cannot eaſily be divided either by fire or any other corroſive menſtruum, or their integral parts ſeparated and carried off in vapour: for a body may be ſaid to be fixed in two reſpects.

Firſt, when, on being expoſed to the fire, or a corroſive menſtruum, its particles are indeed ſeparated, and the body rendered fluid, but without being reſolved into its firſt elements. The ſecond, when the body ſuſtains the active force of the fire or menſtruums, whilſt its integral parts are not carried off in fumes. Each kind of fixity is the reſult of a ſtrong or intimate coheſion between the particles mixed.

Fixity, or *Fixedneſs*, in *Chemiſtry*, is, in a peculiar manner, uſed for the affection oppoſite to volatility; *i. e.* the property whereby bodies bear the action of the fire, without being diſſipated in fumes.

The principal cauſes of fixity, or the qualifications that contribute moſt to the rendering a body fixed, according to Mr. Boyle, are, 1. That its corpuſcles be ſingly of a certain proportionable bulk, too big and unwieldy to be carried by heat, or buoyed up in the air. 2. That they have alſo a proper degree of weight or ſolidity. 3. That their figure be ſuch as unfits them for evaporation or flying off; ſome being branched, others hooked, &c. ſo that being entangled with one another, they cannot eaſily be extricated, looſened and ſeparated. To theſe may be added a fourth circumſtance, *viz.* the nearneſs of the particles, and their being contiguous in a great many points, or large extent of ſurface, which produces a ſtronger force of attraction and coheſion.

FIXLMILLNER, Placidus, in *Biography*, was born at a village near Lintz, in Auſtria, in May, 1720. He was educated by his uncle, Alexander, who was abbot of Kremſmunſter, to whom that inſtitution was indebted for the eſtabliſhment of a ſchool and obſervatory. At a very early period he uſed to take much delight in delineating mathematical figures. At a proper time he went to Salzburgh, where he went through a courſe of philoſophy, and attended the mathematical lectures of profeſſor Stuart, who had this peculiarity in his mode of teaching, that he never made uſe of figures, and yet gave ſo clear an idea of the different propoſitions as rendered the comprehenſion of them eaſy. In the year 1737, he took the vows of a monaſtic life, and applied himſelf diligently to the ſtudy of philoſophy and mathematics. Nor was he leſs aſſiduous in laying a ſolid foundation in the modern and oriental languages, hiſtory, and antiquities. He obtained the degree of doctor in theology, and in 1745 took prieſt's orders at his monaſtery. He alſo undertook the profeſſorſhip of eccleſiaſtical law at the ſchool belonging to the monaſtery, which was frequented by the young nobility from Auſtria; an office which he diſcharged for forty years. He was about the ſame time made dean of the higher ſchools, and regent of the young nobility. His general knowledge of the law rendered him a fit perſon to be conſulted in regard to law-ſuits; and, on a ſimilar account, he was appointed "Notarius Apoſtolicus in Curia Romana." As his high reputation brought many ſtudents to Kremſmunſter, he did not confine himſelf to the public hours of teaching, but repeated his lectures privately, and was always ready to aſſiſt his hearers, and to give them every explanation in his power. Notwithſtanding his diligence and zeal in the way of education, it was not on this that his fame was built; but his attachment to aſtronomy rendered him moſt conſpicuous, and known in foreign countries. His uncle, Alexander, reſolved, in the year 1747, to found an eſtabliſhment in his monaſtery, for the purpoſe of diſſeminating mathematical knowledge. With this view, he fitted up an apartment to contain the neceſſary inſtruments, and for making experiments of every kind. He alſo cauſed an obſervatory to be built in his garden, and in the courſe of time Fixlmillner was appointed aſtronomer, retaining at the ſame time his office as profeſſor of the eccleſiaſtical law. His application to the ſtudy of this ſcience was ſo intenſe, that he made the moſt rapid progreſs in it, and publiſhed ſeveral works, in a few years, of great merit. His ſervice, however, to practical aſtronomy conſiſts chiefly in his having made and collected, at the deſire of Lalande, a great many obſervations on Mercury, and thereby enabled the French aſtronomer to conſtruct his tables of that planet. This ſervice Lalande publickly acknowledged, and likewiſe inſerted his obſervations in the ſupplemental volume to his aſtronomy. Fixlmillner was alſo one of the firſt aſtronomers who calculated the orbit of the Herſchel planet, and conſtructed the tables which were adapted to it. He was the perſon who proved the truth of profeſſor Bode's conjecture, that the thirty-fourth ſtar of Taurus, obſerved by Flamſtead in the year 1690, was the new planet; and by applying Flamſtead's obſervations to calculation, he produced a theory which fully agreed with the phenomena of it. It would take us much beyond the limits allowed for the article, were we to attempt recording all that this active aſtronomer did for his favourite ſcience. He had alſo an uncommon genius for mechanics, and invented many practical helps to obſervation; ſuch as a new micrometer, and a machine for grinding concentric circles on glaſſes with great accuracy. His indefatigable induſtry injured his health; and he died in Auguſt, 1791, in the 71ſt year of his age. He was ſimple, uniform, and conſtant, like the laws of nature which he ſtudied and illuſtrated: his character diſplayed that mildneſs and integrity, which never fail to inſpire eſteem and love. He lived in great harmony with his monaſtic brethren; and it was a day of general joy to the whole eſtabliſhment, when, in the year 1788, he celebrated the fiftieth anniverſary of his reſidence in it. Gen. Biog.

FIXTELA, in *Geography*, a town of Morocco, 4 miles from Tefza.

FIZES, Anthony, in *Biography*, an eminent phyſician of Montpellier, was the ſon of Nicholas Fizes, profeſſor of mathematics in that univerſity, and was born in the year 1690. He received his early education entirely from his father, who deſtined him his ſucceſſor in the mathematical chair. But in the courſe of his attendance in the claſſes of the college, he acquired a great diſpoſition to the ſtudy of medicine, which he purſued with ſo much ardour and advantage, that his father was induced to yield to his ſolicitations; and, notwithſtanding the mediocrity of his income, ſent Anthony to complete his medical education at Paris, under the tuition of Du Verney, Lemery, and the two Meſſrs. De Juſſieu. On his return to Montpellier, he employed himſelf in obſerving diſeaſes in the hoſpital de la Charité, and in public teaching. On the death of his father, he was appointed joint profeſſor of mathematics with M. De Clapiers, and ſoon became his ſole ſucceſſor. He held the mathematical chair until the labours of his medical courſe, and the extenſion of his practice, compelled him to reſign it. In 1732, the medical profeſſorſhip in the univerſity became vacant by the reſignation of M. Deidier, and Fizes was elected his ſucceſſor. He fulfilled the duties of this chair with great propriety, but with little eclât. It was in the practice of his profeſſion that his ſuperiority was particularly conſpicuous, for he poſſeſſed an extraordinary talent for obſervation. Being endowed likewiſe with a ſound judgment, and an uncommon memory, he appreciated at once the character of the moſt complicated diſeaſe; and was above all admired for the accuracy of his prognoſtics. Theſe qualifications placed him at the head of his profeſſion at Montpellier: his fame extended to the metropolis, and he was invited to the office of phyſician to the duke of Orleans. His age was now, however, advanced; and the fear of the jealouſy which this high appointment might produce among his brethren, led him to make ſome efforts to be permitted to decline this honour. He removed to Paris, nevertheleſs; but, unuſed to the intrigues, and railleries, and cabals of a court, he was unhappy in his ſituation: his health began to fail, and he was induced to requeſt permiſſion to reſign his office, and returned to Montpellier, after reſiding fourteen months at Paris, honoured with the protection of the prince, and the friendſhip of M. Senac, Aſtruc, Bordeu, &c. He was accuſed of a little miſanthropy on this occaſion; but he was an enemy to adulation and ſelfiſhneſs, and ſeemed to revolt from every ſpecies of artificial politeneſs. He reſumed the functions of his profeſſorſhip at Montpellier, but for a ſhort period; for he was carried off by a malignant fever in the courſe of three days, and died on the 14th of Auguſt, 1765, aged about 75 years. His works were principally eſſays on different points of theory and practice: 1. "De Hominis Liene ſano," Montpellier, 1716; 2. "De naturali Secretione Bilis in Jecore," ibid. 1719; 3. "Specimen de Suppuratione in Partibus mollibus," ibid. 1722; 4. "Partium Corporis humani Solidarum Conſpectus Anatomico-Mechanicus," ibid. 1729; 5. "De Cataracta;" 6. "Univerſæ Phyſiologiæ Conſpectus," ibid. 1737; 7. "De Tumoribus in Genere," ibid. 1738; 8. "Tractatus de Febribus," ibid. 1749. The greater part of the writings of Fizes were collected in one quarto volume, and were publiſhed at Montpellier in 1742. Eloy.

FLABELLUM, in *Eccleſiaſtical Hiſtory*, the flapper or fan which was heretofore uſed in the Latin, as it is ſtill in the Greek church, to keep off flies from the prieſt and the altar, during divine ſervice. At preſent it is only uſed in the Latin church, in the ſolemn proceſſions of the pope, when two attendants carry enormous large flabella or fans, made of peacock's feathers, and fixed on poles, one on each ſide of the chair in which the pope is carried, to drive away flies, and to keep off the rays of the ſun.—This was alſo one of the names of the vane or weather-cock, on the top of a church, as we learn from the following paſſage in the Annales Wintonienſes: "Anno 1248, cecidit flabellum de turri S. Swithuni, quando claſſicum veſpertinum pulſabatur, et fere contrivit Joannem Monachum."

FLACCIDITY, in *Medicine*, &c. a diſorder of the fibres or ſolid parts of the body, oppoſite to rigidity.

FLACCOURT, F. De, in *Biography*, director-general of the French Eaſt India company, commanded, in 1648, an expedition to the iſland of Madagaſcar, where he continued ſeveral years; and, during his reſidence there, he drew up a particular hiſtory of the country, which he printed in one volume quarto, with plates deſigned by himſelf, and dedicated to the ſuperintendant Fouquet. Nouv. Dict. Hiſt. See Flacourtia.

FLACCUS, C. Valerius, a Roman poet, who flouriſhed in the reign of Veſpaſian, and died at an early age, in the time of Domitian. From an epigram in Martial, it ſhould ſeem that he was in no affluent condition; for he adviſed him as a friend to quit the muſes for the more gainful purſuits of the forum. The work on which his fame reſts as a poet is entitled "Argonauticon," in eight books. It is in imitation of the Greek poem of Apollonius Rhodius on the ſame ſubject, and may rank among the moſt reſpectable of the Latin epics after the Æneid, the manner and ſtyle of which he aims at copying. The beſt edition of it is that of Burmann, 1724, in 4to. It contains ſublime and ſplendid paſſages, and is free from the bombaſt and extravagance of moſt of the ſecond race of Latin poets; but it is in general deficient in poetical ſpirit, and is likewiſe wanting in plan and contrivance. Rom. Hiſt.

Flaccus, a Roman muſician, who ſet the comedies of Terence to muſic.

FLACHSTADT, in *Geography*, a ſmall iſland in the North ſea, about 40 miles from the coaſt of Norway. N. lat. 68°.

FLACIUS, or Francowitz, Matthias, in *Biography*, was born at Albona in Iſtria, in the year 1520. His father, who was a literary man, undertook the education of his ſon; but dying while the youth was quite young, he fell into hands who were either incapable of affording him aſſiſtance, or negligent of the charge committed to their care. But by his own application, and ſome occaſional aſſiſtance which he received from a learned Italian, he made conſiderable progreſs in claſſical literature and the belles lettres. He went to Venice, and ſtudied under Baptiſta Egnatius; and when he was but 17 years of age, he felt a ſtrong inclination for theological purſuits, and, from his ſtraightened circumſtances, was deſirous of entering a monaſtery; but he was diſſuaded from the plan, and went to Baſil, where he ſtudied ſome months, and embraced the opinions of the reformers. From Baſil he proceeded to Tubingen, where he received the inſtructions of the celebrated Camerarius; and in 1541, he became the diſciple of Luther and Melancthon, the latter of whom gave him very ſubſtantial proofs of his regard and liberality. After he had taken his degree, he married, and was appointed public profeſſor of Wittemberg. During the war between the confederate proteſtants and the emperor Charles V., the ſcholars were diſperſed from the Saxon ſeminaries, and Flacius went to Brunſwick, where he obtained a high reputation by his lectures; and upon the termination of hoſtilities in 1547, he returned to Wittemberg, to reſume his former ſituation in that univerſity. In the year 1548, a controverſy took place among the followers of Luther, in which Flacius ſuſtained a leading part, and diſplayed much bigotry and intolerance. It originated in the debates among the Saxon divines concerning the expediency of ſubmitting to the famous edict of Charles V., called the *interim*. Melancthon and others concurred in the opinion, that in matters of an indifferent nature compliance was due to the imperial edicts; and in this claſs they placed many things which had appeared of the higheſt importance to Luther, among which were the doctrine of juſtification by faith alone, the neceſſity of good works to ſalvation, the number of the ſacraments, extreme unction, and certain rites and ceremonies relative to church diſcipline. On the other hand, the defenders of the primitive doctrines of Lutheraniſm, with Flacius at their head, attacked with much bitterneſs and fury theſe accommodating divines, and accuſed them of apoſtacy from the true religion. Among other abſurd notions which Flacius, in the heat of argument, avowed, was this, that original ſin was not an *accident*, but the very *ſubſtance* of human nature. The odium which he excited by embracing this ſtrange notion, rendered it neceſſary that he ſhould relinquiſh a profeſſorſhip at Jena, which he had held five years: he accordingly withdrew to Ratiſbon, where he continued to publiſh many books. In the year 1567, he was invited, with ſome other Lutheran miniſters, to Brabant, to model ſome churches in that country on the principles of the Augſburg confeſſion; but they were ſoon diſperſed by the bloody perſecution under the duke of Alva, when he removed to Straſbourg, and afterwards to Frankfort on the Maine. The number of his adherents had greatly declined in Germany; and he died in 1575, when he had completed the 55th year of his age. He was a man of excellent talents, great learning, and overbearing zeal againſt popery; but his turbulent, factious, and quarrelſome temper rendered his good qualities of little avail. He was author of many works, which are enumerated at large by Moreri: the principal are, "Clavis Sacræ Scripturæ,"

"Scripturæ," in 2 vols.; and "Centuriæ Eccleſiaſticæ Hiſtoriæ Magdeburgenſes," in 3 vols. folio. Moreri. Bayle.

FLACOURTIA, in *Botany*, ſo named by L'Heritier, in memory of Stephen de Flacourt, a native of Orleans, ſuperintendant of a colony for ſome time eſtabliſhed by the French in Madagaſcar, and author of an account of that iſland, publiſhed in quarto at Paris in 1658, and at Troyes in 1661. He was the firſt who gave a hiſtory of the rich natural productions of that country, and though, as Haller obſerves, not a deep naturaliſt, he was certainly not deſtitute of obſervation. He deſcribes many new and rare plants, eſpecially ſuch as are uſeful for food, giving figures of the leaves only. L'Herit. Stirp. Nov. 59. Schreb. 702. Mart. Mill. Dict. v. 2. Ait. H. Kew. v. 3. 413. Juſſ. 291. Claſs and order, *Dioecia Polyandria*, *Dryander*. *D. Icoſandria*, L'Herit. Nat. Ord. *Tiliaceæ*, Juſſ.

Gen. Ch. Male, *Cal.* Perianth of one leaf, in five or more deep, roundiſh, obtuſe, nearly equal, aſcending ſegments. *Cor.* none. *Stam.* Filaments numerous, from 50 to 100, rather longer than the calyx, capillary, ſpreading, equal, inſerted into a central hemiſpherical receptacle; anthers roundiſh, of two cells. *Piſt.* wanting, though ſometimes the abortive rudiments of one are diſcernible.

Female, *Cal.* Perianth inferior, of five or more roundiſh, erect, cloſed leaves, downy on their inſide. *Cor.* none. *Stam.* none. *Piſt.* Germen ſuperior, ovate, ſeſſile, rather longer than the calyx; ſtyle none; ſtigma ſtellated, of from five to nine ſpreading, oblong, obtuſe, furrowed rays. *Peric.* Berry globular, becoming angular by drying, umbilicated, of many cells. *Seeds* two in each cell, one over the other, obovate, compreſſed, with a furrow on the upper edge.

Eſſ. Ch. Male, Calyx in five deep ſegments. Corolla none. Stamens very numerous.

Female, Calyx of ſeveral leaves. Corolla none. Stigma radiated. Berry ſuperior, of many cells. Seeds in pairs.

F. *Ramontchi* is the only known ſpecies. L'Herit. Stirp. Nov. 59. t. 30. Lamarck t. 826. Native of Madagaſcar, where, according to Flacourt, it is called *Alamoton*, and according to Poivre *Ramontchi*. This is a *ſhrub* eight or ten feet high. *Branches* ſpreading, alternate, round, ſmooth, leafy, dotted, armed with ſtraight lateral ſpines. *Leaves* alternate, on ſhort downy ſtalks, ſpreading, ovate, acute, ſmooth, veiny, with many ſhallow ſerratures, often purpliſh at the edges. *Stipulas* none. *Flowers* ſmall, few, in terminal cluſters; the male ones chiefly conſpicuous by their yellow anthers; the female appearing before the freſh leaves come out. *Fruit* like a ſmall plum, at firſt green, then of a fine red, and finally of a deep violet, ſweet and eatable, but leaving a ſlight acrimony in the mouth. *Seeds* bitteriſh, like the kernel of a cherry. An iſland on the coaſt of Madagaſcar, 10 leagues to the ſouth of Foul point, was named by the French *iſle aux prunes*, plum iſland, becauſe they found it covered with buſhes of Ramontchi.

Propagation and Culture.—This ſhrub flowers in our ſtoves in June and July, but has not yet produced any fruit. L'Heritier ſays both ſexes bloſſomed at Paris, where the plant was kept in the green-houſe, but he had never happened to ſee them both in one ſummer. It is propagated by cuttings or layers, but has little beauty or utility to recommend it to our care in this country.

FLADABUNA, in *Geography*, a ſmall iſland near the N.W. coaſt of Scotland; 7 miles N. from the iſle of Skye. N. lat. 57° 42′. W. long. 6° 19′.

FLADDA, a ſmall iſland of Scotland, near the N.E. coaſt of the iſland of Skye. N. lat. 57° 37′. W. long. 6° 8′. —Alſo, a ſmall iſland of Scotland, one of the Treſhanniſh iſlands, weſt of that of Mull. N. lat. 56° 32′. W. long. 6° 24′.

FLADDA *Iſles*, three ſmall iſlands among the weſtern iſlands of Scotland, about 1 mile W. from the iſland of Sandera. N. lat. 56° 52′. W. long. 7° 32′.

FLADHUNA, an inconſiderable iſland of Scotland, to the north of Huniſh, not far from Skye, and at ſome diſtance from the coaſt, which was formerly inhabited. In its vicinity are ſix or ſeven rocks, one of which is about 300 paces in circuit, and flat on the ſummit, with a deep well in it.

FLADSTRAND, a ſea-port town of Denmark, in North Jutland, and dioceſe of Aalborg, on the eaſt coaſt, with a harbour defended by three forts. The chief employment of the inhabitants is fiſhing; 30 miles N.N.E. of Aalborg. N. lat. 57° 27′. E. long. 10° 32′.

FLADUNGEN, a town of Germany, in the biſhopric of Wurzburg; 40 miles N. of Wurzburg. N. lat. 50° 35′. E. long. 10° 20′.

FLAG, a general name, including colours, ſtandards, ancients, banners, enſigns, &c. which authors frequently confound with each other.

The faſhion of bearing the flags pointed or triangular, which now obtains, Roderic. Toletanus aſſures us, came from the Mahometan Arabs or Saracens, upon their ſeizing of Spain, before which time all the enſigns of war were ſquare, ſtretched, or extended, on croſs pieces of wood, like church-banners; on which account they were called in Latin *vexilla*, q. d. *velilla*, *à veli diminutione*, as is remarked by Iſidore.

The pirates of Algiers, and thoſe throughout the coaſt of Barbary, are the only people who bear an hexagonal flag. It is gules, charged with a Moreſk head, coifed with its turban, &c. though this be expreſsly contrary to their law, which prohibits the making any image or repreſentation of a man, founded on an opinion, that they who make them ſhall be obliged at the day of judgment to find ſouls for them, and that in defect hereof they ſhall be damned. But this portrait which they carry is that of Hali, Mahomet's ſon-in-law, to whoſe party the Africans all retain, who ordered that his effigy ſhould be expreſſed on their flags and ſtandards, believing himſelf ſo formidable to the Chriſtians, that the bare ſight of his image would carry undoubted victory over them. Leunclavius.

FLAGS, in the *Military Art*, are ſmall banners of diſtinction ſtuck in the baggage-waggons of the army, to diſtinguiſh the baggage of one brigade from another, and of one battalion from another, that they may be marſhalled by the waggon-maſter-general, according to the rank of their brigades, to avoid the confuſion that otherwiſe might ariſe. See COLOURS and STANDARDS.

FLAG is more particularly uſed in *Sea-Language*, for the colours, ancients, ſtandards, &c. born on the top of the maſts of veſſels, to notify the quality of the perſon who commands the ſhip, of what nation it is, and whether it be equipped for war or trade.

In the Britiſh navy flags are either red, white, or blue, and are diſplayed from the top of the main-maſt, fore-maſt, or mizen-maſt, according to the rank of the admiral. The firſt flag in Great Britain is the royal ſtandard, which is only to be hoiſted when the king or queen are aboard the veſſel. The ſecond is that of the anchor of hope, which characteriſes the lord high admiral, or lords commiſſioners of the admiralty; and the third is the union flag, in which the croſſes of St. George and St. Andrew are blended: this laſt is appropriated to the admiral of the fleet, who is the firſt military officer under the lord high admiral.

The admiral or commander in chief carries his flag on the main-maſt; the vice-admiral carries his on the fore-maſt; and the rear-admiral his on the mizen-maſt.

The next flag after the union is that of the white ſquadron, at the main-maſt; and the laſt which characteriſes an admiral is the blue, at the ſame maſt-head. For a vice-admiral, the firſt flag is the red; the ſecond, the white; the third, the blue, at the flag-ſtaff on the foremaſt. The ſame order proceeds with regard to the rear-admirals, whoſe flags are hoiſted on the top of the mizen-maſt; ſo that the loweſt flag in our navy is the blue on the mizen-maſt. When a council of war is held at ſea, if it be on board the admiral, they hang a flag on the main-ſhrouds; if in the vice-admiral, in the fore-ſhrouds; and if in the rear-admiral, in the mizen-ſhrouds. The flags borne on the mizen are particularly called gallants. See Mast, &c.

The flag of the French nation is blue, charged with a white croſs, and the arms of France.

Beſides the national flag, merchant ſhips frequently bear leſſer flags on the mizen-maſt, with the arms of the city where the maſter ordinarily reſides, and on the fore-maſt with the arms of the place where the perſon who freights them lives. See *Table of Flags*.

Flag, *to heave out the*, is to put out or hang abroad the flag.

Flag, *to hang out the white*, is to aſk quarter; or it ſhews when a veſſel is arrived on a coaſt that it has no hoſtile intention, but comes to trade, or the like. The red flag is a ſignal of defiance and battle.

Flag, *to lower*, or *ſtrike the*, is to pull it down or take it in, out of reſpect or ſubmiſſion, when a weaker party meets a more powerful one.

By an ordinance of Philip II. king of Spain, 1565, the captains are peremptorily commanded to periſh rather than lower their royal flag when once hung out.

The way of leading vanquiſhed ſhips in triumph is to tie the flags to the ſhrouds, or the gallery in the hind part of the ſhip, and let them hang down towards the water, and to tow the veſſels by the ſtern. It was thus the Romans uſed thoſe of Carthage, as Livy relates.

Flag-*officers*, thoſe who command the ſeveral ſquadrons of a fleet; as admirals, vice-admirals, and rear-admirals.

The flag-officers in our ſea pay, are the admiral, vice-admiral, and rear-admiral, of the white, red, and blue.

Flag-*ſhip*, a ſhip commanded by a general or flag-officer, who has a right to carry a flag, in contradiſtinction to the ſecondary veſſels under the command thereof.

Flag-*ſtaves*, are the ſtaves ſet on the heads of the top-gallant maſts, ſerving to let fly and unfurl the flag.

Flag, in *Natural Hiſtory*, a genus of harſh and rough ſtones, compoſed of a viſible grit of a laminated ſtructure, and ſplitting only horizontally or into plates. M. da Coſta diſtributes them into alkaline flag, or laminated ſand-ſtones, and ſuch as are not acted upon by acids. Of the former kind are the aſhen-coloured flag, the laminæ of which are numerous and very viſible, and ſo thin as ſometimes not to exceed the thickneſs of brown paper; ſo that in a piece of half an inch thick ſeven or eight perfect laminæ are often diſcernible: this, by being burnt, becomes extremely friable, and of a white colour: it is dug in ſeveral parts of the kingdom, and is frequently uſed to cover houſes inſtead of tiles, though it is very unfit for the purpoſe, as it bears the weather badly, and crumbles after froſts; and the aſhen brown-coloured flag, of a more compact texture, and heavier than the former, though compoſed like that of an irregular grit cemented by a coarſe ſpar; this becomes friable by being burnt, but ſuffers no change of colour: there are quarries of it at Burford in Oxfordſhire, where it is uſed to ſlate houſes, for pavements, &c. Neither this nor the former will ſtrike fire with ſteel.

The flag or ſlate-ſtone, common in Northumberland and ſome of the neighbouring counties, is called by ſome Carliſle and white flag. It is a white foſſile ſtone, eaſily ſplitting into thin plates, and is full of ſmall ſpangles of a fine glittering talc. It is alſo common in Yorkſhire and the neighbouring places; it varies a little in colour, being ſometimes grey, ſometimes browniſh, and ſometimes merely whitiſh. Its ſtrata are very thick, but they eaſily ſeparate into laminæ of about half an inch thick, and the workmen ſeldom attempt to ſplit it any thinner; the upper ſtrata, however, grow gradually thinner, and the bottom ones are ſo thick as not to be uſed for ſlates. Theſe they raiſe, however, and uſe for tanners' vats, the pavements of floors, and ciſterns for water.

The Stunsfield ſlate is of a pale browniſh colour, very hard and heavy, and its flats or the ſurfaces of the laminæ are always thick ſet with ſmall bivalves, but few or none are imbedded in its ſolid ſubſtance: it burns to a browner colour. This flag-ſtone is dug out of the quarries at Stunsfield in Oxfordſhire, in the winter ſeaſon, and laid in large maſſes in the open air till ſummer, and thus rendered fiſſile: the plates into which it is ſplit are the common ſlating-ſtone in thoſe parts: the upper ſtratum of the quarries is a ſoft gritty laminated ſtone, violently fermenting in aqua-fortis, uſed as a ſort of whet-ſtone; neither of theſe two laſt ſpecies will readily ſtrike fire with ſteel. The pale, whitiſh, brown-coloured flag is of a compact and uniform ſtructure: and the grit that forms it is ſo intimately blended with marine bodies, and ſaturated and cemented to ſuch a degree with fine ſparry matter, that the gritty texture of the ſtone is hardly viſible. No part of it is changed by burning, except the ſhells that are lodged in it. It will not ſtrike fire with ſteel. There are ſeveral ſtrata of this ſtone in the neighbourhood of Bath, where it is uſed as ſlate for covering houſes. The deep, duſky, lead-coloured flag is extremely hard and heavy, of a compact texture, compoſed of a ſmall grit, which is cemented together by an earthy, ſparry, and cryſtalline ſubſtance: its flat ſurfaces are beſpangled with great numbers of fine talcky particles; the plates are generally very regular and thin, not exceeding the tenth part of an inch in thickneſs, and cohere ſo firmly together as not to be eaſily ſeparated. This ſtone readily ſtrikes fire with ſteel, and, being burnt, acquires a reddiſh-brown colour. It is dug in ſeveral parts of Italy, and much uſed in building. The firſt, ſecond, and fifth ſpecies above mentioned are deſtitute of any brightneſs; the fourth has, interiorly, ſome ſmall degree of luſtre; but the third and laſt are very bright and glittering. Of flags which are not acted upon by acids there are the following ſpecies: the flag of ſullied white colour, which is compoſed of a large irregular cryſtalline grit cohering looſely together, and cemented with a terrene cryſtalline ſubſtance: the flat ſurfaces of the plates are covered with great quantities of ſmall ſpangles of ſilver talc, which render them very bright and dazzling. This ſtone is very heavy, and pretty hard, and the laminæ are generally very regular and thin; a flag of two inches thick, having often fourteen or fifteen plates: it will not ſtrike fire with ſteel: when burnt, it acquires a clearer white colour, with a ſlight reddiſh hue, and becomes very friable. It is dug in ſeveral parts of the kingdom, and uſed much as ſlate, for pavements, &c.

The bright and glittering flag is the hardeſt ſtone of this genus, and generally variegated with white and purple, and often the plates have one of theſe colours only. It is of a compact texture, and thickly ſpangled with ſmall laminæ; ſtrikes fire with ſteel, and acquires a paler colour by being burnt. It is much uſed in Italy, where it is dug for pavements. The brown coloured flag is compoſed, like the others, of an irregular grit, cemented by a cryſtalline ſubſtance; it is moderately hard and heavy; its flat ſurfaces are covered with ſmall ſpangles of a ſilvery talc, and its laminæ are thin and numerous: it burns to a pale reddiſh colour. It is dug in England, and very commonly in Sweden, but not applied to any particular uſe. Da Coſta's Foſſils, p. 144—148. Hill's Hiſt. of Foſſils, p. 433, &c.

Flag, or *Flag-flower*, in *Botany*. See Iris.

Flag, in *Gardening*, the common name of a ſort of ruſh termed ſedge. It alſo ſignifies the upper part of the ſurface, turf, or ſward, which is often pared off for fuel. It is likewiſe a term ſometimes applied to the furrow-ſlice, eſpecially in ſward lands when they are ploughed up. See Paring and Burning.

Flag, *Corn*, in *Botany*. See Gladiolus.

Flags, *Petrified*, in *Natural Hiſtory*, is a name which we often meet with among the deſcriptions of organic remains; but later naturaliſts conſider their occurrence among the relics of the primitive plants as very rare, and that not more than two or three ſpecies, which can without heſitation be referred to the family *Algæ*, have yet been diſcovered, and theſe probably of extinct ſpecies. The *fucus veſiculoſus* has been deſcribed as found foſſil, in marl, wherein ſhells were depoſited, but probably, as the latter were pronounced to be marine exuviæ, the other, on a cloſer examination, might prove to be an extinct ſpecies of flag.

Flag, *Sweet-ſcented*. See Acorus.

Flag-*water*, in *Gardening*, a plant of the weed kind, often abounding in watery ſituations, where it might be collected with great advantage in the view of manure. See Manure.

Flag-*worm*, the common name of a miſchievous worm or grub found in ley-ground on its being firſt broken up.

Flags, in *Falconry*, are the feathers in a hawk's wing near the principal ones.

FLAGELLANTES, in *Eccleſiaſtical Hiſtory*, a ſect of wild fanatics, who chaſtiſed and diſciplined themſelves with whips in public.

The ſect of the Flagellantes had its riſe in Italy in the year 1260; its author was one Rainier, a hermit; and it was propagated from hence through almoſt all the countries of Europe. It was in all probability no more than the effect of an indiſcreet zeal. A great number of perſons of all ages and ſexes made proceſſions, walking two by two with their ſhoulders bare, which they whipped till the blood ran down, in order to obtain mercy from God, and appeaſe his indignation againſt the wickedneſs of the age. They were then called the *devout*; and having eſtabliſhed a ſuperior, he was called the *general of the devotion*. Though the primitive Flagellantes were exemplary in point of morals, yet they were joined by a turbulent rabble, who were infected with the moſt ridiculous and impious opinions; ſo that the emperors and pontiffs thought proper to put an end to this religious phrenzy, by declaring all devout whipping contrary to the Divine law, and prejudicial to the ſoul's eternal intereſt.

However, this ſect revived in Germany towards the middle of the next century, and rambling through many provinces, occaſioned great diſturbances. They held, among other things, that flagellation was of equal virtue with baptiſm, and the other ſacraments; that the forgiveneſs of all ſins was to be obtained by it from God, without the merits of Jeſus Chriſt; that the old law of Chriſt was ſoon to be aboliſhed, and that a new law, enjoining the baptiſm of blood to be adminiſtered by whipping, was to be ſubſtituted in its place; upon which Clement VII. by an injudicious as well as unrighteous policy, thundered out anathemas againſt the Flagellantes, who were burnt by the inquiſitors in ſeveral places; but they were not eaſily extirpated. They appeared again in Thuringia and Lower Saxony in the fifteenth century, and rejected not only the ſacraments, but every branch of external worſhip, and placed their only hopes of ſalvation in faith and flagellation, to which they added other ſtrange doctrines concerning evil ſpirits. Their leader Conrad Schmidt and many others were committed to the flames by German inquiſitors, in and after the year 1414. Moſheim's Eccl. Hiſt. vol. iii. p. 94, &c. 206 and 277, &c.

FLAGELLARIA, in *Botany*, from the long, flexible, rod-like branches. Linn. Gen. 177. Schreb. 239. Willd. Sp. Pl. v. 2. 263. Mart. Mill. Dict. v. 2. Juſſ. 41. Gærtn. t. 16. Lamarck, t. 266. Claſs and order, *Hexandria Trigynia*. Nat. Ord. *Tripetaloideæ*, Linn. *Aſparagi*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, of ſix equal, ovate, permanent leaves; the three outer ones ſharpeſt. *Cor.* none. *Stam.* Filaments ſix, thread-ſhaped, almoſt as long as the calyx; anthers oblong. *Piſt.* Germen ſuperior, ovate, very ſmall; ſtyle ſhort, in three diviſions; ſtigmas ſimple, ſpreading, flattiſh, permanent. *Peric.* Drupa roundiſh, of one cell, ſeated on the withered calyx, and crowned with the ſtigmas. *Seed* globoſe.

Eſſ. Ch. Calyx in ſix deep ſegments. Corolla none. Drupa with one ſeed.

Obſ. Juſſieu remarks that there are three ſeeds in the germen, only one of which is perfected in the fruit. We cannot perceive why Gærtner has raiſed any doubts about the identity of his own plant, which by every thing that we can diſcover, is preciſely that of Linnæus.

F. *indica*. Linn. Sp. Pl. 475. Am. Acad. v. 1. 396. Lour. Cochinch. 211. (Palmijuncus lævis; Rumph. Amb. v. 5. 120. t. 59. f. 2. Panambu-valli; Rheede Mal. v. 7. 99. t. 53.) Native of the Eaſt Indies, as well as of Africa. The *ſtems* climb by means of the tendril which terminates each leaf, as in *Glorioſa*. *Flowers* numerous, white, in a compound terminal panicle, many of them abortive. *Fruit* red, the ſize of a currant, of no uſe in food or medicine. Loureiro ſays the leaves are aſtringent, and eſteemed vulnerary.

The author laſt mentioned deſcribes another ſuppoſed ſpecies by the name of F. *repens*, which is moſt evidently, by his deſcription, as well as his quotation of Rumphius, book 9. t. 184. f. 1, no other than *Pothos ſcandens* of Linnæus, than which few plants are more different from *Flagellaria*.

FLAGELLATION, Whipping, a voluntary diſcipline, or penance, frequently practiſed by the ancient penitents. It is a maxim of the civil law, that whoſoever cannot pay with his purſe, muſt pay with his body; and the practice of flagellation was adopted by the monks, as a cheap, though painful, equivalent. By a fantaſtic arithmetic, a year of penance was taxed at 3000 laſhes; each century of laſhes was ſanctified with the recital of a pſalm, and the whole pſalter, with the accompaniment of 15,000 ſtripes, was equivalent to five years; and ſuch were the ſkill and patience of a famous hermit, St. Dominic of the iron cuiraſs (St. Dominic Loricatus), that in ſix days he could diſcharge an entire century, by a whipping of three hundred thouſand ſtripes. His example was followed by many penitents of both ſexes; and as a vicarious ſacrifice was accepted, a ſturdy diſciplinarian might expiate on his own back the ſins of his benefactors. Theſe compenſations of the purſe and the perſon, introduced, in the 11th century, a more honourable mode of ſatisfaction, the merit of military ſervice, which was followed by the croiſades. See CROISADES, DISCIPLINE, INDULGENCE, and PENANCE.

The parliament of Paris prohibited all public flagellations by an arret of 1601. See FLAGELLANTES.

FLAGELLATION is a term more peculiarly appropriated to the ſufferings of Jeſus Chriſt, when whipped and ſcourged by the Jews; from the Latin, *flagellum*, *a ſcourge*, or *whip*.

We ſay, a painting of the flagellation; or ſimply, a flagellation, to denote a picture or print repreſenting this torment inflicted on the ſaviour of the world.

In this ſenſe we ſay the flagellation of ſuch a painter, &c.

FLAGELLATION, *Feaſt of.* See DIAMASTIGOSIS.

FLAGELLIFORMIS CAULIS, in *Botany*, a long and pliant ſtem as in *Periploca græca*, and many other plants. See CAULIS, where this term is accidentally omitted. The common jaſmine is a good example of it.

FLAGEOLET, a FLAJOLET, a kind of little flute; or a muſical inſtrument of the flute kind, uſed chiefly by ſhepherds and country people.

It is uſually made of box, or ſome other hard wood, ſometimes of ivory. It has ſix holes or ſtops, beſides that at bottom, the mouth-piece, and that behind the neck.

The ambit of the flageolet, according to the ſcale exhibited by Merſennus, is two octaves from *g ſol re ut* upwards.

FLAHERTI, RODERIC, in *Biography*, an Iriſh antiquarian and hiſtorian, who publiſhed at London, A. D. 1685, a book under the ſingular and myſtic title of "Ogygia, or Rerum Hibernicarum Chronologia," containing chronological memoirs upon the antiquities of the kingdom of Ireland; compiled, as he obſerves, "ex pervetuſtis monumentis fideliter inter ſe collatis eruta, atque e ſacris et profanis litteris primarum orbis gentium, tam genealogicis, quam chronologicis ſuffulta præſidiis." This work, a quarto volume containing about 600 pages, he dedicated to the then duke of York, afterwards king James II. of England. The author commences his hiſtory from the deluge, continues it to the year of Chriſt 428, and has divided it into three parts. The firſt deſcribes the iſland, its various names, inhabitants, extent, kings, the manner of their annual election, &c. The ſecond is a kind of chronological parallel of the Iriſh affairs with the events that happened during the ſame period in other countries. The third is a more ample detail of particular tranſactions in the ſame kingdom. To this is added a profeſſedly exact chronological table of all the Chriſtian kings who have ruled over Ireland, from A.D. 482 till A. D. 1022; and a brief relation of the moſt prominent hiſtoric features of the iſland, till the time of Charles II. in 1685. To this ſucceeds a chronological poem, which forms a ſummary of Iriſh hiſtory to the ſame period. At the end is a very curious catalogue of the Scottiſh kings, Iriſh, who have reigned in the Britiſh iſles. In his genealogical remarks on the regal houſe of the Stewarts, the author attempts to prove they were originally an Iriſh family. It is ſurpriſing, that neither the author nor his work has been noticed by Macpherſon or Whitaker in their controverſy reſpecting the peopling of Hibernia, and the origin of the Caledonians; although he is particularly noticed by O'Hallaran in his Hiſtory of Ireland. See Moreri, Grand Dict. Hiſt.

FLAIL, in *Rural Economy*, a well known implement or tool made uſe of in threſhing different ſorts of corn. It conſiſts of a hand-ſtaff, and a ſhort beating part, which are attached to each other by a ſtrong thong of leather, paſſing through loops or ſtaples fixed on the ends of the different pieces. Since the introduction of machines for threſhing, the flail method has been much leſs had recourſe to, except upon farms of ſmall extent, as being more laborious and troubleſome, and leſs expeditious in the execution of the work. See THRESHING *Machine*.

FLAIR, in *Sea Language*. The ſeamen ſay that the work doth *flair-over*, when a ſhip being houſed in near the water, ſo that the works hang over a little too much, and thus is let out broader aloft than the due proportion will allow.

FLAIRS, in *Ichthyology*, a name given by ſome to the ſkate, a ſpecies of raja.

The ancient Greeks called this *batos*, when they ſpoke of the male, and of the female, *batis*.

FLAKE, in the *Cod-fiſhery*, a ſort of ſcaffold or platform, made of hurdles, and ſupported by ſtanchions, and uſed for drying cod-fiſh in Newfoundland. Theſe flakes are uſually placed near the ſhores of fiſhing-harbours. See FISHERY.

FLAKE, in *Gardening*, a name gived by floriſts to thoſe flowers of the carnation kind which have only two colours, and very large ſtripes, all of which go quite through the leaves.

FLAKE, *White*, in *Painting*, is lead corroded by means of the preſſing of grapes, or a ceruſe prepared by the acid of grapes. It is brought here from Italy, and far ſurpaſſes, both with regard to the purity of its whitneſs and the certainty of its ſtanding, all the ceruſe or white lead made with us in common. It is uſed in oil and varniſh painting, for all purpoſes where a very clean white is required. The white flake ſhould be procured in lumps as it is brought over, and levigated by thoſe who uſe it, becauſe that which the colourmen ſell in a prepared ſtate is levigated and mixed up with ſtarch, and often with white lead, and worſe ſophiſtications.

FLAMANT, or FLAMINGO, in *Ornithology*. See PHOENICOPTERUS *ruber*.

FLAMANVILLE, in *Geography*, a ſea-port town of France, in the department of the Channel, with a good harbour, 10 miles S.W. of Cherburg,

FLAMBEAU, or FLAMBOY, a luminary made of ſeveral thick wicks, covered over with wax, ſerving to burn at night in the ſtreets; as alſo at funeral proceſſions, illuminations, &c.

Flambeaux differ from links, torches, and tapers. See TORCH.

They are made ſquare, ſometimes of white wax, and ſometimes of yellow; they uſually conſiſt of four wicks or branches near an inch thick, and about three feet long, made of a ſort of coarſe hempen yarn, half twiſted. They are made with the ladle, much as torches or tapers are, *viz.* by firſt pouring the melted wax on the top of the ſeveral ſuſpended wicks, and letting it run down to the bottom; this they repeat twice. After each wick has thus got its proper cover of wax, they lay them to dry; then roll them on the table, and ſo join four of them together by means of a red-hot iron.

When joined, they pour on more wax till the flambeau is brought to the ſize required, which is uſually from a pound and a half to three pounds.

The laſt thing is to finiſh their form or outſide, which they do with a kind of poliſhing inſtrument of wood, by running it along all the angles formed by the union of the branches.

The flambeaux of the ancients were different from ours. They were made of woods, dried in furnaces, or otherwiſe. They uſed divers kinds of woods for this purpoſe; the wood moſt uſual was pine. Pliny ſays, that in his time they frequently alſo burnt oak, elm, and hazle. In the ſeventh book of the Æneid, mention is made of a flambeau of pine; and Servius, on that paſſage, remarks, that they alſo made them of the cornel tree.

FLAMBO, in *Natural Hiſtory*, a name given by ſome to a long anguilliform fiſh, called *cavagiro*. See Cepola *tænia*.

FLAMBOROUGH, in *Geography*, a townſhip of England, in the Weſt Riding of Yorkſhire, on the coaſt of the German ſea, containing about 730 inhabitants; 3 miles N. of Burlington.

Flamborough *Head*, a lofty cape or promontory of England, on the E. coaſt of the county of York. N. lat. 54° 8′. W. long. 0° 2′.

This promontory is formed of lime-ſtone of a ſnowy whiteneſs, and ſtupendous height, viſible far off at ſea. A light-houſe has been lately erected on this head, in which is exhibited a triangular revolving light, diſtinguiſhed from the revolving lights of Tinmouth and Cromer by ſhewing a face every two minutes, one of them being coloured red.

Flamborough, a factory of the Hudſon bay company, on the ſouth-weſtern ſide of Hudſon bay.

Flamborough, a townſhip in Upper Canada, diſtinguiſhed by E. and W. Flamborough, in the Weſt Riding of the county of York, and lying W. of the Miſſaſaga lands, and fronting Dundas ſtreet.

FLAME, (*flamma*, Latin,) is the actual burning, attended with heat and light, of a volatile combuſtible ſubſtance; and this ſubſtance may be either a comminuted ſolid, (*viz.* a powder,) or a vapour, or a gas.

The powder of roſin, and of other brittle reſinous bodies, the farina of ſeveral plants, and ſome other powdered combuſtibles, when projected through the flame of a candle, or of a piece of burning paper, inſtantly take fire, and the flame ſpreads through the whole powdery cloud. Powders of this ſort are uſed at the play-houſes for repreſenting a flaſh of lightning or other ſudden light. Powdered roſin, and the powder of lycopodium, have been found to produce this effect equally well; yet the latter, when it may be procured, is by far preferable to the former, and that on account of its being an unadheſive light powder, eaſily bruſhed off from any thing, whereas the powdered roſin ſticks to, and ſoils every thing that it happens to fall upon.

The vapour of certain inflammable fluids, ſuch as ſpirit of wine, ether, ſpirit of turpentine, &c. are inſtantly inflamed by the contact of a candle, or other flaming body, or by a ſpark of electricity, and continue to burn as long as there is a ſufficient ſupply of it.

The inflammable gaſes, when they are extricated either by the action of heat, or otherwiſe, from ſubſtances that contain them, may alſo be inflamed, and will burn in a ſimilar manner. Thus, if iron filings and diluted ſulphuric acid be placed in a bottle, an efferveſcence takes place, together with a copious production of hydrogen gas, which comes out in a ſtream from the aperture of the bottle, and it may be inflamed either by a lighted candle, paper, wood, &c. or by paſſing an electric ſpark through it. Thus alſo, when coals are lighted in a common fire, the heat ſoftens their bituminous parts, and expels the inflammable gaſes, which burn and conſtitute the flame, as every body muſt daily experience. But beſides the inflammable gaſes, heat expels from coals an aqueous vapour, a thick fluid like tar, and ſome gaſes that are not of a combuſtible nature, and thoſe products are neither equal nor conſtant, that is, ſometimes ſome of them predominate, and ſometimes the other. The conſequence of which is, that the flame of coals is continually wavering both in ſhape and intenſity of colour. It frequently ſhifts from one place to another, and what gave a beautiful white light a few ſeconds before, has become a ſtream of denſe and dark ſmoke. It may be hardly worth obſerving that the changeable inclination of the flame is owing to the motion of the air, which runs towards the fire in various directions.

The like thing takes place in the combuſtion of wood, and vegetable matter in general. The heat extricates the volatile and inflammable materials which take fire, and produce the flame.

In the combuſtion of charcoal, and of coak, (*viz.* charred mineral coal,) the flame and the ſmoke are very trifling, becauſe the operation of charring has previouſly expelled from thoſe materials a great portion of their volatile ingredients.

With reſpect to the proceſs of the combuſtion, the ſame requiſites are neceſſary with the combuſtion of volatile ſubſtances, which produce the flame, as with the combuſtion of ſolids; *viz.* the combuſtible muſt be heated to a certain degree, a fire muſt be communicated, and the combuſtion can only take place in contact with oxygen gas, or with ſubſtances which contain oxygen. See Combustion.

Thus, we have given a general ſketch of the nature of flame; but there are ſeveral remarkable particulars belonging to every part of the above-mentioned proceſs, which are highly deſerving of notice, and which, of courſe, we ſhall now endeavour to point out ſucceſſively.

The purpoſes for which mankind employs fires, or combuſtion in general, are either for the uſe of the heat, or for the uſe of the light. The heat is ſubſervient to the numerous and important purpoſes of cooking victuals, of warming apartments, and thus rendering inhabitable ſuch climates, as otherwiſe the human ſpecies could not live in; of giving exiſtence to all metallurgic operations, to the making of glaſs, of lime for building, &c. &c. The light is ſubſervient to purpoſes equally important. In ſhort, it enables human beings to follow their operations, during the abſence of the day-light nearly, if not full as well, as in the day-time. The flame of a ſingle candle animates a family; every one follows his occupations, and no dread is felt of the darkneſs of night. Were it not for artificial light, how great a portion of the advantages of induſtry, and of real comfort, would the human ſpecies be deprived of.

When heat is wanted, then rough ſolid combuſtibles are uſed, which give it in abundance, and at a cheap rate; but when light is wanted, then the pureſt and the moſt uniform combuſtibles muſt be uſed, otherwiſe an inadequate effect is produced, and a conſiderable quantity of materials is expended. In ſome uncivilized countries, ſlender faggots of ſome kind of reſinous wood are uſed by way of candles. When lighted at one end they burn gradually, and afford a good deal of light, but it is unſteady, and encumbered with a good deal of ſmoke. Beſides, theſe faggots are readily burnt out, and muſt be quickly replaced by new ones.

At preſent, in all civilized countries, the principal combuſtibles that are uſed for the production of a bright and luminous flame, are wax, the fat of animals, under the general name of tallow, oil, either of fiſh or of vegetables, and the inflammable gas of coals, which has but lately been introduced, at leaſt in this country. The extenſive conſumption of theſe materials, and the ſucceſſive increaſe of their price, has obliged the induſtrious to deviſe the beſt means of producing the greateſt effect with the leaſt poſſible quantity of materials.

Wax, tallow, and oils muſt be rendered volatile before they will produce a flame, but for this purpoſe it is ſufficient to volatilize a ſmall quantity of any of them, ſucceſſively; for this ſmall quantity will ſuffice to give a uſeful flame, and hence we muſt admire the ſimple, yet wonderful contrivance of a common candle or lamp. This contrivance contains a conſiderable quantity of the combuſtible ſubſtance, ſufficient to laſt ſeveral hours; it has likewiſe, in a particular place, a ſlender piece of ſpongy vegetable ſubſtance, called the *wick*, which in fact is the fire place, or laboratory where the whole operation is conducted. The wick which, in the formation of the candle, or preparation of the lamp, has been partly or entirely ſoaked in the wax, or tallow, or oil, is ſet fire to by the approach of ſome other ſubſtance actually burning; this heat renders volatile and inflames that part of the wax, oil, &c. which is in the wick, and at the ſame time ſoftens that which is next to it; the firſt portion of the wax, &c. being thus conſumed, the wick is, in conſequence of its capillary attraction, enabled to imbibe more materials for the maintenance of the flame, and ſo on in ſucceſſion until the whole is exhauſted.

There is a circumſtance frequently attending the firſt lighting of a candle, which demands a ſhort explanation in this place. It is, that at firſt the candle ſometimes burns dimly, and looks as if it would go out. The method of reviving the flame in ſuch caſes is to lift up the candle perpendicularly with a quick motion, three or four times ſucceſſively, which immediately revives the light. The reaſon of the firſt dimneſs is that the wax or tallow, by being too cold or too hard, is not melted by the combuſtion of that ſmall portion which is in the wick, and of courſe cannot ſupply the waſte of the wick; but by the lifting up of the candle, the air beats down the flame upon the wax or tallow adjoining to the wick, which melts it, and enables it to run up into the pores of the wick, where it is rendered volatile, and is inflamed, &c.

That part of the combuſtible which is ſucceſſively rendered volatile by the heat of the flame is not all burnt, but part of it eſcapes in the form of ſmoke through the middle of the flame, becauſe that part cannot come in contact with the oxygen of the ſurrounding atmoſphere; hence it follows, that with a large wick and a large flame, this waſte of combuſtible matter is proportionately much greater than with a ſmall wick and a ſmall flame. In fact, when the wick is not greater than a ſingle thread of cotton, the flame, though very ſmall, is, however, peculiarly bright, and free from ſmoke; whereas in lamps with a very large wick, ſuch as are often ſuſpended before butcher's ſhops, or with thoſe of the lamp lighters, the ſmoke is very offenſive, and in great meaſure eclipſes the light of the flame.

In order to avoid this inconvenience, the ingenious Mr. Argand made that famous contrivance of a lamp, which now juſtly goes by his name. He made the burner or wick thin and circular, with a free paſſage for the air through the middle. In this conſtruction a very thin and circular flame comes in contact with a vaſt quantity of air both within and without the circle, in conſequence of which none of the volatilized oil eſcapes without burning, and the flame is very brilliant and active. This ſhews the reaſon of what is commonly ſaid of this lamp, namely, that it conſumes its own ſmoke. With reſpect to the original conſtruction, and the ſucceſſive improvements of this admirable lamp, we muſt refer the reader to the article LAMP.

Inſtead of a circular form, the wick has alſo been made thin and oblong; but though this conſtruction has ſome advantage over the common lamp, yet it is far inferior to Argand's. A circular or an oblong wick has likewiſe been tried in wax or tallow candles, but the attempts have not been attended with any remarkable advantage.

Another conſequence of the want of oxygen in the middle of the large flame of a lamp or candle, is the formation of a coaly concretion at the extremity of the wick. This ariſes from the coaly or groſſer particles of the combuſtible which are too heavy to become volatile, and at the ſame time do not come in contact with the oxygen which is neceſſary for their combuſtion; hence they accumulate and ſpread out ſomewhat like a fungus. If the wick be inclined a little, ſo that the end of it may juſt project out of the flame, which always goes ſtraight upwards; then no coaly concretion is formed. In the lamps which illuminate the ſtreets of London, the wick lies nearly horizontal, in conſequence of which they ſeldom contract any coaly concretion.

Of the three principal materials for producing a uſeful bright flame, *viz.* wax, tallow, and oil, the firſt and ſecond are moſtly uſed within doors in this country; but the fiſh oil, the combuſtion of which is attended with an unpleaſant ſmell, is moſtly uſed for ſtreet lamps and other out of doors purpoſes; excepting indeed when Argand's lamps are uſed, for in theſe the oil gives no bad ſmell. Oil of olives burns without any offenſive ſmell; therefore much uſe is made of it for lamps in private houſes in thoſe countries where it may be had at a cheap rate, as in Italy, the ſouth of France, &c.

Beſides the above, a new material has of late been attempted to be introduced in this country, for the purpoſe of lighting houſes, ſtreets, manufactories, &c. the material is the inflammable gas of coals. Every body muſt know, that when coals are burning in a common fire place, a flame more or leſs luminous (according as it is more or leſs encumbered with incombuſtible ſmoke and vapour) iſſues from them; and they frequently emit ſome very beautiful ſtreams of a flame remarkably bright. All this, as we have already mentioned, ariſes from the gaſes which are extricated from the coals by the heat. It was natural to imagine that ſuch gas might be received in proper reſervoirs, and might afterwards be forced out of ſmall apertures, which being lighted might ſerve, as the flames of candles, to illuminate a room or other place. The trial was eaſily made, and it was attended with the deſired effect. The principle of the apparatus and of the operation is as follows: The coal is placed in large iron veſſels, called retorts, to the apertures of which iron pipes are adapted, which terminate in a veſſel, or veſſels, called gaſometers, or reſervoirs, which are inverted in water. The retorts thus charged are placed upon the fire, the action of which extricates the gas from the coals that are within the retorts, together with an aqueous vapour, a thickiſh fluid, or tar, &c. Theſe products are conveyed through the above-mentioned pipes under the gaſometers where the gas is waſhed, and remains ready for uſe. There are then other ſmaller pipes from the gaſometer, which branch out into ſmaller ramifications, until they terminate into the places where the lights are wanted. The extremities of the pipes have ſmall apertures, out of which the gas iſſues, and the ſtreams being lighted at thoſe apertures, will burn with a clear and conſtant flame as long as the ſupply of gas continues. All the pipes which come from the gaſometer are furniſhed with ſtop-cocks, in order both to prevent the uſeleſs waſte of gas, and to regulate the ſizes of the flames.

The method of producing the gas being thus contrived, the next ſtep was to determine how far ſuch lights might be employed, conſiſtently with expence, ſafety, &c. A few ſhops in London were lighted with it, but the uſe was ſoon diſcontinued, as it was ſaid, principally on account of the unpleaſant ſmell. A propoſal, and ſome attempts were made for lighting ſome of the ſtreets of London by means of this coal gas; but either the myſterious nature of the propoſals, or the expence attending the operation, or ſome other cauſe of obſtruction, has not as yet allowed the adoption of the plan. Other attempts of the like nature have been made elſewhere, but of their ſucceſſes we have no authentic account; excepting however of one, which was laid before the Royal Society by the operator, Mr. Murdock, and is publiſhed in the Philoſophical Tranſactions for the year 1808. The preciſion with which the particulars are ſtated in Mr. Murdock's account, and the eſſential uſe of which ſuch ſtatements may be to a vaſt number of perſons, who are now engaged in ſimilar examinations in this new branch of civil economy, induce us to tranſcribe the moſt eſſential part of the account in the preſent article; reſerving to add what future improvements may come to our notice to the article Gas *Lights*.

"Theſe facts and reſults, Mr. Murdock ſays, were made, during the preſent winter, at the cotton manufactory of Meſſrs. Philips and Lee, at Mancheſter, where the light obtained by the combuſtion of the gas from coal is uſed upon a very large ſcale; the apparatus for its production and application having been prepared by me at the works of Meſſrs. Boulton, Watt, and Co. at Soho.

"The whole of the rooms of this cotton mill, which is, I believe, the moſt extenſive in the united kingdom, as well as its counting-houſes and ſtore-rooms, and the adjacent dwelling houſe of Mr. Lee, are lighted with the gas from coal. The total quantity of light uſed during the hours of burning has been aſcertained, by a compariſon of ſhadows, to be about equal to the light which 2500 mould candles, of ſix in the pound, would give; each of the candles with which the compariſon was made conſuming at the rate of 4-10ths of an ounce (175 grains) of tallow per hour.

"The burners are of two kinds: the one is upon the principle of the Argand lamp, and reſembles it in appearance; the other is a ſmall curved tube with a conical end, having three circular apertures or perforations, of about a thirtieth of an inch in diameter, one at the point of the cone, and two lateral ones, through which the gas iſſues, forming three divergent jets of flame, ſomewhat like a fleur-de-lis. The ſhape and general appearance of this tube has procured it, among the workmen, the name of the cockſpur burner.

"The number of burners employed in all the buildings amounts to 271 Argands, and 633 cockſpurs; each of the former giving a light equal to that of four candles of the deſcription above-mentioned; and each of the latter a light equal to two and a quarter of the ſame candles; making therefore the total of the gas light a little more than equal to that of 2500 candles. When thus regulated, the whole of the above burners require an hourly ſupply of 1250 cubic feet of the gas produced from cannel coal; the ſuperior quality and quantity of the gas produced from that material having given it a decided preference in this ſituation over every other coal, notwithſtanding its higher price.

"The time during which the gas light is uſed may, upon an average of the whole year, be ſtated at leaſt at two hours per day of 24 hours. In ſome mills, where there is over work, it will be three hours; and in the few where night work is ſtill continued nearly twelve hours. But taking two hours per day as the common average throughout the year, the conſumption in Meſſrs. Philips' and Lee's mill will be 1250 × 2 = 2500 cubic feet of gas per day; to produce which 700 weight of cannel coal is required in the retort. The price of the beſt Wigan cannel (the ſort uſed) is 13½*d.* per cwt. (22*s.* 6*d.* per ton) delivered at the mill, or ſay about eight ſhillings for the ſeven hundred weight. Multiplying by the number of working days in the year (313), the annual conſumption of cannel will be 110 tons, and its coſt 125*l.*

"About one-third of the above quantity, or ſay forty tons of good common coal, value ten ſhillinge per ton, is required for fuel to heat the retorts, the annual amount of which is 20*l.*

"The 110 tons of cannel coal, when diſtilled, produce about 70 tons of good coak, which is ſold upon the ſpot at 1*s.* 4*d.* per cwt. and will therefore amount annually to the ſum of 93*l.*

"The quantity of tar produced from each ton of cannel coal is from 11 to 12 ale gallons, making a total annual produce of about 1250 ale gallons, which not having been yet ſold, I cannot determine its value.

"The intereſt of the capital expended in the neceſſary apparatus and buildings, together with what is conſidered as an ample allowance for wear and tear, is ſtated by Mr. Lee at about 550*l.* per annum, in which ſome allowance is made for this apparatus being made upon a ſcale adequate to the ſupply of a ſtill greater quantity of light, than he has occaſion to make uſe of.

"He is of opinion that the coſt of attendance upon candles would be as much, if not more, than upon the gas apparatus; ſo that, in forming the compariſon, nothing need be ſtated upon that ſcore, on either ſide.

"The economical ſtatement for one year, then, ſtands thus:

Coſt of 110 tons of cannel coal - -	£ 125
Ditto of 40 tons of common ditto - -	20
	145
Deduct the value of 70 tons of coak -	93
The annual expenditure in coal, after deducting the value of the coak, and without allowing any thing for the tar, is therefore - -	52
And the intereſt of capital, and wear and tear of apparatus - - -	550
Making the total expence of the gas apparatus per annum, about - - -	600

"That of candles, to give the ſame light, would be about 2000*l.* For each candle, conſuming at the rate of 4-10ths of an ounce of tallow per hour, the 2500 candles burning, upon an average of the year, two hours per day, would, at one ſhilling per pound, the preſent price, amount to nearly the ſum of money above-mentioned.

"If the compariſon were made upon an average of three hours per day, the advantage would be ſtill more in favour of the gas light.

"At firſt, ſome inconvenience was experienced from the ſmell of the unconſumed, or imperfectly purified gas, which may in a great meaſure be attributed to the introduction of ſucceſſive improvements in the conſtruction of the apparatus, as the work proceeded. But ſince its completion, and ſince the perſons to whoſe care it is confided have become familiar with its management, this inconvenience has been obviated, not only in the mill, but alſo in Mr. Lee's houſe, which is moſt brilliantly illuminated with it, to the excluſion of every other ſpecies of artificial light.

"The peculiar ſoftneſs and clearneſs of this light, with its almoſt unvarying intenſity, have brought it into great favour with the work-people. And its being free from the inconvenience and danger reſulting from the ſparks and frequent ſnuffing of candles, is a circumſtance of material importance, as tending to diminiſh the hazard of fire, to which cotton mills are known to be much expoſed."

In the burning of candles or oil lamps, the heat of the flame ſoftens and attenuates the materials, and converts them partly into an elaſtic fluid which takes fire ſucceſſively and maintains the flame. In the burning of coals, wood, turf, &c. various gaſes, as well as vapours, are extricated from them, but theſe products are not all combuſtible; therefore thoſe which are not combuſtible tend to check the activity of the flame which ariſes from the combuſtion of the others. The gaſes which are principally extricated from the above-mentioned materials are hydrogen gas, azotic gas, and carbonic acid gas; the firſt of which only is highly inflammable in all its combinations; and it is hardly ever yielded pure by any of the above-mentioned materials. Its uſual combinations are either with ſulphur, or with carbon, or with phoſphorus; hence it derives the denominations of ſulphurated, carburated, or phoſphorated, hydrogen gas.

The flames of different combuſtibles are not all attended with an equal production of heat and light. Sulphur burns with a weak flame; phoſphorus with a very denſe one. Spirit of wine burns with a very ſlight flame in point of light, but a very powerful one with reſpect to heat; ſo that if an Argand lamp be charged with oil, and another ſimilar lamp be charged with ſpirit of wine, the flame of the latter will not have a quarter of the light of the other, but it gives more than twice as much heat as the other. The flame of ſpirit of wine is not accompanied with any ſmoke. The flame of ether is denſer, but produces ſmoke. The flame of ſpirit of turpentine is attended with a very denſe ſmoke. The flame of pure hydrogen is very faint. This flame of hydrogen produces a remarkable phenomenon, which deſerves to be mentioned in this place.

If a phial, containing the materials proper for the production of hydrogen gas, (*viz.* iron filings and diluted ſulphuric acid,) be furniſhed with a tube having a ſmall aperture for the exit of a ſtream of the gas, and if this ſtream be lighted, a flame will continue to burn at that aperture as long as the materials continue to give out the gas. Now, if a glaſs tube of about an inch in diameter, and about a foot long, be held ſtraight up, with its aperture juſt over the above-mentioned flame, a ſound will be heard, ſomewhat like a delicate ſound of an organ pipe. This ſound varies according to the ſize of the tube. No very ſatisfactory explanation has, as yet, been given of this ſingular phenomenon.

The flames of volatile combuſtibles that are more compound in their nature, vary conſiderably with reſpect to the intenſities of their heat and light. A curious phenomenon takes place in uniting the flames of two candles, *viz.* the light is conſiderably increaſed. Let a perſon hold two candles before his face, at firſt ſeparate, and then with their flames joined. Upon the junction of the two flames, his face will appear much more illuminated than it was before. "It is conjectured," Dr. Prieſtley ſays, "that the union of the two flames produces a greater degree of heat, and that this cauſes a farther attenuation of the vapour, and a more copious emiſſion of the particles of which light conſiſts."

The effects which we have juſt been enumerating are ſuch as take place in common atmoſpheric air.

The various colours of the flames of ſimple and compound bodies are likewiſe highly deſerving the attention of philoſophers. Certain combuſtibles, even of the pureſt kind, burn with flames having peculiar tints; but much ſtronger colours may be communicated to their flames by the admixture of various ſubſtances, eſpecially of ſalts that are of an earthy or metallic nature.

The flame of a common candle is far from being of an uniform colour. The loweſt part of the flame is always blue; and when the flame is ſufficiently elongated, ſo as to be juſt ready to ſmoke, the tip is always red.

As for the colours of flames that ariſe from coals, wood, and other uſual combuſtibles, their variety, which hardly amounts to a few ſhades of red, or purple, intermixed with the bright white light, ſeems principally to ariſe from the greater or leſs admixture of aqueous vapour, denſe ſmoke, or, in ſhort, of other incombuſtible products.

Spirit of wine burns with a blueiſh flame. The flame of ſulphur has nearly the ſame tinge. The flame of zinc is of a bright white. The flame of moſt of the preparations of copper, or of the ſubſtances with which they are mixed, is greeniſh-blue. Spirit of wine, mixed with common ſalt, burns with a very unpleaſant effect, as may be experienced by looking at the ſpectators who are illuminated by ſuch light. If a ſpoonful of ſpirit of wine and a little boracic acid be ſtirred together in a cup, and then be inflamed, the flame will be beautifully green. If the ſpirit of wine be mixed with a little ſtrontian earth in powder, or with any of its ſaline preparations, it will afterwards, on being inflamed, burn with a red, or rather purple flame. If the ſpirit of wine be mixed with barytes, its flame will have a beautiful yellow appearance. Such are the principal means of colouring flames, the admixture of various other ſubſtances will alſo impart ſome ſhades of colour to flaming bodies, but not nearly ſo ſtrong as the above.

Some years ago an elegant and curious exhibition, under the title of "Philoſophical Fire-works," was ſhewn in London by an induſtrious foreigner, named Diller. The exhibition conſiſted of the flames of certain gaſes or vapours which iſſued out of a variety of ſmall apertures at the ends of ſhort tubes, which were diſpoſed in the forms of wheels, pyramids, ſpirals, tridents, &c. Out of theſe apertures the flames were gradually made to increaſe and decreaſe alternately; ſo that ſometimes the room looked as bright as if it were illuminated by the ſun, and at other times the flames would be barely diſcerned. But the moſt pleaſing effect aroſe from the colours of theſe flames, as there were beautiful greens, yellows, reds, purples, &c. Mr. Diller died, and it ſeems that he did not leave the ſecret of the preparations behind him; for no one has ſince been able to exhibit any thing equal to thoſe philoſophical fire-works. The ſmell of ether, which predominated in the exhibition room, ſeemed to ſhew that Mr. Diller made great uſe of that liquid.

The combuſtible vapours and gaſes are not all inflamed with equal readineſs. Hydrogen gas may be inflamed not only by the contact of another flaming body, but even by a very ſmall electric ſpark. An electric ſpark a little more powerful will fire ſpirit of wine and ether, eſpecially when thoſe fluids are a little warm. Spirit of turpentine, and ſome eſſential oils may be inflamed, not only by the above-mentioned means, but even by the action of cold acids. Put about a ſpoonful of oil of turpentine in a cup, and pour over it about half that quantity of ſtrong nitrous acid previouſly mixed with a few drops of ſulphuric acid. The oil of turpentine will immediately burſt out into a flame merely in conſequence of the action of the acid.

The thick fat oils muſt be heated to a conſiderable degree, and in that ſtate a flaming body muſt be brought in contact with their vapour, before they will be inflamed. Even when raiſed to a very high temperature, they ſeldom will of themſelves burſt out in a flame. If a veſſel containing oil be ſet upon a fire, a ſmoke or vapour begins to riſe from it, which grows by degrees denſer and denſer; and at laſt it begins to ſhine in ſome places near the ſurface of the oil, ſomewhat like an electric light; yet it does not flame; but if in this ſtate a flaming body, like a candle, a match, &c. be brought within the vapour, the latter will be inſtantly inflamed, breaking out with a ſort of exploſion, and will continue to burn until the oil is in great meaſure conſumed.

Beſides the uſe of their light, the flames of candles, and eſpecially of lamps, are often uſed for the ſake of the uniform heat which they give; and when no very great degree of heat is wanted, the uſe of ſuch flames muſt be allowed to be incomparably more commodious, and more economical than a common fire. The enameller, the mineralogiſt, and the philoſophical inſtrument makers, make great uſe of the heat of candles and lamps, the flames of which they frequently urge by means of the blow-pipe. An Argand lamp, eſpecially when charged with ſpirit of wine, (for which purpoſe, however, the lamp muſt be made in a particular manner,) inſtead of oil, forms a pretty powerful furnace for ſmall diſtillations, decoctions, &c. but even the flame of a ſingle common lamp is ſufficient for a great variety of delicate purpoſes.

The word flame, beſides its true meaning, which we have already explained, and which denotes the combuſtion of a volatile combuſtible body attended with the emiſſion of heat and light, has often been indiſcriminately applied to every kind of luminous appearance, provided its light had a pretty evident degree of intenſity. Thus all phoſphoreſcent bodies, electrical light, northern lights, &c. have been called flames by a variety of writers. Certain phenomena really have much the appearance of true flames; yet their real nature has not been ſufficiently inveſtigated. Thus the *ignis fatuus*, or *Jack-a-lanthorn*, is ſuppoſed to be nothing more than phoſphorated hydrogen, which being extricated from certain materials in particular places, comes out of the ground, and burns on the ſurface of it; for it is a property of that gas to take fire of itſelf the moment it comes in contact with reſpirable air. The nature of thoſe appearances in the ſky, which have been called flames, is moſtly unknown to us. See METEORS, and IGNIS *fatuus*.

By ſome authors, flame is defined to be *light emitted from fire*; by others, who have followed Newton, flame is ſaid to be a vapour heated red-hot; for Newton in his Optics ſays, "Is not flame a vapour, fume, or exhalation heated red-hot, that is, ſo hot as to ſhine? For bodies do not flame without emitting a copious fume, and this fume burns in the flame."

With reſpect to the firſt definition, we imagine that the preceding part of the preſent article has clearly ſhewn that not all the light which is emitted from a fire is flame; and ſuch for inſtance is the light emitted from a red-hot cinder, or of a coal nearly exhauſted of its gas. As for ſir I. Newton's query, it may be juſtly ſaid, that the ſtate of chemical knowledge at his time could not furniſh him with better ideas reſpecting the nature of flame.

FLAME, *Vital*, *Flamma*, or *Flammula vitalis*, a fine, warm, igneous ſubſtance, ſuppoſed by many, both of the ancients and moderns, to reſide in the hearts of animals, as neceſſary to life, or rather as that which conſtitutes life itſelf.

To the preſervation of this flame they ſuppoſe air as neceſſary as it is to the preſervation of common flame; and hence they aſcribe the neceſſity of reſpiration to animal life.

Mr. Boyle, by experiments in an exhauſted receiver, found that the vital flame of animals, if life may be ſo called, ſurvives or outlaſts the flame of ſpirit of wine, or of a wax or tallow candle, &c. Some animals would remain alive and well *in vacuo* for three or four minutes, whereas no common flame would laſt there one minute. The light of the glow-worms, he found, would preſently be deſtroyed by exhauſting the air, and retrieved again upon its re-admiſſion. Dr. Quincy could find nothing more in the notion of vital flame than the natural warmth, which is the effect of a circulating blood, and which is always as its velocity. See *Animal* HEAT.

FLAMEEL, or FLAMAEL, BERTHOLET, in *Biography*, a painter of hiſtorical ſubjects, born at Liege in 1614. He began his ſtudies in Flanders, but at the age of 24 he went into Italy to cultivate his talents by a view of the works of the renowned painters of that country. He took up his reſidence in Rome, there copying the beſt works of the great maſters. He ſoon acquired a reputation which recommended him to the court of Florence, to which the grand duke invited him, and there employed him in ſeveral works, the execution of which acquired for him the eſteem of that prince, and the applauſe of the public.

In returning from hence homewards, after an abſence of nine years, he went to Paris, and there painted, in the cupola of the church of the bare-footed Carmelites, Elijah aſcending to heaven, and Eliſha below endeavouring to catch the falling mantle of the prophet, thus miraculouſly borne from the earth.

At Liege he was received with great warmth, and to confirm the high opinion which his countrymen had conceived of his merit, he painted a crucifixion for the collegiate church of St. John, in which he introduced a great number of figures with great propriety and perſpicuity. He alſo painted, in St. Paul's church, the converſion of that ſaint. And in the cathedral of the city another picture, repreſenting the reſurrection of Lazarus.

The cloſe of his life is a melancholy inſtance of the frail tenure on which man holds either his mental or bodily capacities. Notwithſtanding that wealth, reputation, and eſteem attended him, he fell, unaccountably, into melancholy, and dejection of ſpirits, which inceſſantly oppreſſed him, till ultimately he ſunk under it. It was by many ſuppoſed to be owing to poiſon given him by an intimate friend named Brinvilliers, but there is no proof of that ſuppoſition being true. He died in 1675, aged 61.

By his reſidence in Rome, he adopted the taſte of deſign of that ſchool, being careful in his ſelection of objects, and correct in the repreſentation of them. He introduced into his pictures a great deal of architecture, in which he was a proficient; he had great knowledge alſo of antiquities, and was careful in obſerving the coſtume; theſe, united with a lively imagination, render his works very intereſting.

FLAMEN, among the ancient Romans, was a prieſt or miniſter of ſacrifice.

There were as many kinds of flamens at Rome as there were gods who had prieſts and ſacrifices offered them.

Romulus and Numa, at firſt, only inſtituted three; one for Jupiter, called *flamen Dialis*; another for Mars, called *flamen Martialis*; and a third for Romulus or Quirinus, called *flamen Quirinalis*. Plutarch and Dionyſius Halicarnaſſeus maintain, that Numa created only the laſt in honour of Romulus; but Livy aſſures us, that Romulus had inſtituted only the firſt, and that the two others were added by Numa; and Varro ſpeaks in the plural number of the flamines inſtituted by Numa. In after-times twelve more were added, which made the number of flamens fifteen.

The three firſt were taken from among the patricians, and were held of a rank and diſtinction ſuperior to the reſt. They were called greater flamens, *flamines majores*, in contradiſtinction to the other twelve, who were choſen from among the plebeians, and were therefore called leſſer flamens, *flamines minores*. The *flamen Dialis*, or of Jupiter, was the firſt inſtituted, and held in the greateſt repute. He bore a peculiar ornament on his head, called *albugalerus*, which was made of the ſkin of a white victim ſacrificed to Jupiter.

One of theſe prieſts revived an ancient pretenſion to a ſeat in the ſenate in right of his office, which, by the indolence of his predeceſſors, had not been claimed or enjoyed for many generations. The prætor rejected his claim, nor would ſuffer him to ſit in that aſſembly; but upon his appeal to the tribunes of the people, that is, to the people, his right was confirmed, and he was allowed to take his place as a ſenator. Liv. xxvii. 8. Middlet. of Rom. Sen. p. 49.

The cap worn by the reſt was called *flamma* or *apex*. It was made of a ſheep-ſkin, with the wool on; to which was faſtened a little branch of an olive-tree. That of the flamen of Jupiter ended in a point called *tutulus*. It was tied under the chin with ſtrings; but in the ſummer-time it was only a woollen thread tied round the head, it being prohibited them ever to appear quite bare-headed. And hence, according to Feſtus, came their denomination of flamen, *viz.* from *filamen* or *filum*, *thread*.

Though the flamens bore one common appellation, yet did not they conſtitute any company or college. Each god had his ſeveral ſacrifices, feaſts, and ceremonies a-part; nor had one flamen any relation to another, only they were all ſubordinate to the pontifex maximus. Aulus Gellius aſſures us, that they were created by the people in the comitia curiata; but the pontifex maximus afterwards conſecrated them. Their prieſthood, called *flaminatus*, was perpetual, though on ſome occaſions they might be depoſed.

The names of the ſeveral flamens are as follow: the three great flamens, as already obſerved, were the *flamen Dialis*, *flamen Martialis*, and *flamen Quirinalis*: the twelve leſſer were the *flamen Carmentalis*, or prieſt of the goddeſs Carmenta, mentioned by Cicero in his Brutus; *flamen Falacer*, or prieſt of the god Falacer, a name whoſe origin, Varro obſerves, is not known; *flamen Floralis*, or of the goddeſs Flora; *flamen Furinalis*, whoſe etymology is not known; *flamen Levinalis*; *flamen Lucinaris*; *flamen Palatualis*, whom ſome moderns will have to be the prieſt of the goddeſs that preſided over the palatium, though Varro owns himſelf at a loſs for its original; *flamen Pomonalis*, or of Pomona, goddeſs of fruits; *flamen Virbialis*, or of the god Virbius, whom ſome take for the ſame with Hippolytus; *flamen Vulcanalis*, or of Vulcan; and *flamen Volturnalis*, or of the god Volturnus. Some authors alſo ſpeak of the *flamen Hadrianalis*, prieſt of Hadrian: *flamen Julii Cæſaris*, of Julius Cæſar; and *flamen Auguſtalis*; and Commodus likewiſe had a flamen created under the title of *flamen Herculaneus Commodianus*.

They had alſo their *flaminæ* or *flaminicæ*, who were wives of the flamens, or the prieſteſſes of the deities. In an ancient marble, quoted by Gruter, p. cccclix. n. 9. the word *flamina* is uſed for prieſteſs; and in the ſame author, p. cccviii. n. 3, the prieſteſs of the goddeſs Feronia is called FLAM. FERON. that is, *flamina*, or *flaminica Feroniæ*. The *flamina* bore the ſame ornament on her head with the flamen. She had alſo the ſame ſurname of office with her huſband, as *flamina Dialis*, *Martialis*, &c.

FLAMETTE, in *Conchology*, a name given by the French writers to a ſpecies of chama or ſhell-fiſh of the bivalve kind, with its ſhells always more or leſs open; this ſpecies is as hot as pepper to the taſte.

FLAMINGO, in *Ornithology*. See PHOENICOPTERUS *ruber*.

FLAMINIAN WAY, one of the Roman ways, which, as it is corrected from the Itineraries and beſt modern maps by d'Anville, may be thus ſtated: Rome to Narni, 51 Roman miles; Terni, 57; Spoleto, 75; Foligno, 88; Nocera, 103; Cagli, 142; Interciſa, 157; Foſſombrone, 160; Fano, 176; Peſaro, 184; Rimini, 208; about 189 Engliſh miles.

FLAMINIO, MARCANTONIO, in *Biography*, was the ſon of a man of letters, and born at Serravalle in 1498. He was educated with great care by his father, and when he was about ſixteen years of age he was introduced to pope Leo X. who received him very graciouſly, and in order to put his talents to the trial, cauſed the youth to diſpute on certain queſtions in the preſence of many cardinals, when he acquitted himſelf ſo well as to excite the ſurprize and admiration of all who heard him. His ſucceſs induced his father to leave him to puſh his own fortune. The young man went to Naples, and from thence to Urbino, and in both places he had favourable opportunities of exhibiting the great power with which he was gifted. His father, dreading the influence of flattery, removed him to Bologna, to the purſuit of ſeverer ſtudies. In 1523, he re-viſited Rome, and from thence he went to Genoa, and was elected one of the academy. After this he paſſed into the ſervice of Giberti, with whom he reſided at Padua, and then, for ſome years, at Verona. His patron preſented him with a farm ſituated on the bank of Lago di Garda, where he ſpent much of his leiſure time, and wrote a Latin paraphraſe of Ariſtotle's Metaphyſics, which was printed at Baſil in the year 1537. In the following year, being in an ill ſtate of health, he went to Naples, in which city he remained till 1541. Here his health was perfectly reſtored, and here, by the converſation which he had with ſome favourers of the Reformation, he was himſelf almoſt a convert. On his return from Naples he ſpent ſome time at Viterbo with cardinal Pole, who took great pains to reſtore him to the orthodox faith. In 1543, he was at Trent with the cardinal, and was after this offered the high poſt of ſecretary to the council of legates, which he declined. He was, however, the conſtant attendant and friend of cardinal Pole, and greatly beloved by many other cardinals and great men of his time. After a tedious illneſs he died at the houſe of his patron in 1550. His death was univerſally lamented, and his contemporaries are laviſh in his praiſes, as well for the goodneſs of his diſpoſition and his Chriſtian virtues, as the depth of his erudition and the elegance of his genius. "His works," ſays his biographer, "appear to be dictated not by the underſtanding but by the heart." His poems rank him with the beſt poets of the Latin ſchool. Of theſe, ſome in his early youth partake of the licence of the times, but the admonitions of his father and the ſobriety of his own diſpoſition called him to more ſerious ſtrains. The greater part of the "Carmina quinque illuſtrium poetarum" conſiſts of the works of Flaminio. His elegant poetical paraphraſes of thirty pſalms, publiſhed a few years before his death, and his Italian letters, are very highly eſteemed. Some years after his deceaſe his orthodoxy was ſuſpected, his works prohibited, and it was intended to dig up his body for the purpoſe of committing it to the flames; but wiſer and more deliberate councils determined otherwiſe. Moreri.

FLAMINIUS, or FLAMININUS, TITUS QUINCTIUS, an eminent Roman, was born about the year 228 before Chriſt. He was brought up to the practice of arms, and acquitted himſelf ſo well in ſeveral things which he undertook, that he was in early life appointed to the conduct of important expeditions. At the age of 30 he was candidate for the conſulſhip, and was choſen though he had not ſerved any of the inferior and preparatory offices in the ſtate. He obtained, by lot, the conduct of the war in Macedon; and performed, in various parts of Greece, many exploits recorded in hiſtory, till at length he treated with Philip, and made a peace on condition that the king ſhould withdraw all his troops from the Grecian towns. Commiſſioners were ſent from Rome to aſſiſt Flaminius in diſpoſing of his conqueſts: theſe wiſhed Roman garriſons to be kept at Corinth and other places, regarded then as the keys of the country, but the conqueror perſuaded them to conſent to the full and complete liberation of Greece from foreign dominion. The decree was proclaimed during the Iſthmian games. A vaſt multitude aſſembled from all parts, uncertain of their future fate, and filled with the utmoſt anxiety for themſelves and their country. Silence was proclaimed by the ſound of a trumpet, and a herald advanced into the middle of the arena, where, in the name of the Roman people and of the proconſul Flaminius, he declared by name all thoſe cities and ſtates of Greece free which had been poſſeſſed by Philip. The proclamation was repeated, and the people, as with one voice, rent the ſkies with their ſhouts: ſo tremendous was the noiſe, that the birds were ſaid to have been ſtruck to the ground by the concuſſion of the air, and Flaminius himſelf was in danger of ſuffocation from the people who ruſhed upon him to kiſs his hand in gratitude for his kindneſs. To him it was a glorious day; but the Romans refuſed to ratify the decree, and in a ſhort time they dictated what terms they choſe to the Grecian republics, which now were declared free by Flaminius. The conſul left Greece with many tokens of gratitude of the people, but with none which he ſo highly prized as a preſent of 1200 Romans made captive in the war with Hannibal, who had been ſold for ſlaves in the Grecian ſtates, and whom the Acheans had carefully collected and redeemed, in order to ſend back with him. In the habits of manumitted ſlaves thoſe men followed the chariot of their benefactor at the ſplendid triumph granted him on his return. Flaminius was afterwards long kept as a reſident in Greece; the attachment of the nation to him, and his accurate knowledge of the views and intereſts of the ſeveral ſtates, rendering him very uſeful as a negociator. About the year 190 B. C. he was created cenſor at Rome, after which he was employed as an ambaſſador to Pruſias, king of Bithynia, whom he perſuaded to violate the laws of hoſpitality in delivering up Hannibal, who had taken refuge in his court, but the veteran ſoldier prevented the treachery by taking poiſon. This is the laſt recorded tranſaction in which Flaminius engaged. Univerſal Hiſtory. Plutarch.

FLAMMA JOVIS, a name given by many writers to a plant of the *clematis* or *virgin's bower* kind, called by the Greek writers *phlogus*.

FLAMMULA, or FLAMULA, under the *Eaſtern Empire*, was a kind of flag terminating in a point ſomewhat like a flame, ſerving as a mark or badge to diſtinguiſh the ſoldiers of the ſeveral companies, battalions, regiments, &c. In Greek it was called φλαμελον: it was ſometimes placed on the caſque, ſometimes on the cuiraſs, and ſometimes at the end or tip of the pike, &c.

The emperor Maurice ordered that the flammulæ of each diviſion ſhould be of a particular colour, to diſtinguiſh them from the other battalions or brigades.

They uſed to lay aſide the flammula before an engagement, leſt it ſhould prove an incumbrance. The cavalry had alſo flammulæ on their horſes, to diſtinguiſh the troops they belonged to.

FLAMMULA, in *Botany*, a name given by ſome authors to a particular ſpecies of the crow-foot, commonly called the ranunculus flammeus.

FLAMMULÆ *Auri*, in *Natural Hiſtory*, a name given by Dr. Woodward, and others, to thoſe ſmall pieces of gold found among the ſands of rivers in ſome places. They are ſometimes found in roundiſh pieces, but more uſually in their ſhining flakes, whence the name flammula ſeems to have been given them, as being very bright and gloſſy. This ſort of gold is pure and malleable, and loſes ſcarcely any part of its weight in fuſion.

The gold duſt, as it is called, which is brought from Guinea, is much of this kind; its particles are uſually very ſmall, though ſometimes lumps of the ſize of a pea or horſe-bean are found, and ſometimes maſſes of an irregular figure of three or four ounces weight: but theſe loſe the name of flammulæ when they become ſo thick and ſolid, and ſo large, and are called by the merchants rock-gold. Woodw. Cat. Foſſ. vol. ii. p. 30. See GOLD.

FLAMSTEED, JOHN, in *Biography*, an eminent Engliſh aſtronomer, was born at Denby, in Derbyſhire, in the year 1646. He received his claſſical education at the free ſchool at Derby, and it was intended that he ſhould purſue his ſtudies at the univerſity, but a very ſevere illneſs at the age of 14, when he had attained the higheſt place in the ſchool, rendered it neceſſary for his friends to change their original plan with regard to his future purſuits. Soon after he had quitted the grammar ſchool he met with Sacroboſco's work, intitled "De Sphæra," which he read with delight, and ſome parts of which he immediately tranſlated. He now ſought for other treatiſes connected with the ſame ſubject, among which was Street's "Aſtronomia Carolina;" from this he learned the method of calculating eclipſe and the places of the planets. In 1669, having calculate an eclipſe of the ſun, that was omitted in the ephemeris for the following year, he ſent this, with other aſtronomical ſpeculations, to lord Brouncker, preſident of the Royal Society, who laid them before that learned body, by whom they were greatly approved. From this period he kept up a correſpondenc on literary and ſcientific ſubjects with many of the moſt learned men of his time. In 1670, his father made him an offer of taking a journey to London, that he might become perſonally known to his ingenious and learned correſpondents, which he gladly accepted. He was now introduced to Mr. Collins, Mr. Oldenburg, and ſir Jonas Moore, the latter of whom became a moſt valuable friend and patron to Mr. Flamſteed. On his return he paſſed through Cambridge, viſited Dr. Barrow, Mr. Iſaac Newton, and other learned men; and entered himſelf a ſtudent of Jeſus college. Mr. Flamſteed, applying himſelf moſt vigorouſly to the ſtudy of aſtronomy, wrote in the year 1673 a treatiſe on the true and apparent diameters of all the planets, which ſir Iſaac Newton made uſe of in the 4th book of his Principia. He wrote alſo on other ſubjects, as the tides, which were more popular and adapted to practical uſes, and of which one was preſented to the king. To whom, likewiſe, by means of his friend ſir Jonas Moore, he preſented a pair of barometers, with directions for their uſe. Theſe were new inſtruments at that period, and excited the attention of the monarch and of the nobility, to whoſe patronage he had been earneſtly recommended. Mr. Flamſteed now determined to take orders, and was ordained in 1675 by biſhop Gunning; but he did not obtain any preferment in the church for ſeveral years. Sir Jonas, however, prevailed on the king to erect a new office for him, *viz.* that of aſtronomer-royal, and the foundation of the Royal Obſervatory at Greenwich was built and named after him, Flamſteed Houſe. In 1681, his work intitled "The Doctrine of the Sphere," was publiſhed by ſir Jonas Moore in his "Syſtem of Mathematics;" and, in 1684, he was preſented with the living of Durſtow in Surrey, the only inſtance of preferment to which he attained, notwithſtanding the high eſtimation in which he was held by perſons of the firſt rank among his contemporaries. He now maintained a cloſe and conſtant correſpondence with the immortal Newton, with Halley, and all the great men of that illuſtrious age, and among his foreign correſpondents was the celebrated Caſſini, who was held in the higheſt reſpect by him. To any and all his friends he was ever ready to give aſſiſtance in facilitating their ſtudies, and he took pleaſure in contributing, by his ſuggeſtions and hints, to the extenſion of their reputation. He ſpent the remainder of his life in proſecuting his labours in the improvement of aſtronomy with unwearied exertion and activity, and died at the end of the year 1719, at the age of 73. He publiſhed many ſmall tracts, a vaſt number of papers in the Philoſophical Tranſactions, in almoſt every volume from the fourth to the twenty-ninth. But his great work, and that on which his celebrity depends, is intitled "Hiſtoria Cœleſtis Britannica," in three volumes folio. The firſt of which contains the obſervations of Mr. Gaſcoigne, taken at Middleton in Yorkſhire; and likewiſe thoſe made by Mr. Flamſteed at Derby, between the years 1638 and 1643, with tables, &c. made at the Royal Obſervatory between the years 1675 and 1689.

The ſecond volume contains his obſervations, made with a capital teleſcope, on the zenith diſtances of the fixed ſtars, ſun, moon, and planets, with their tranſits over the meridian; alſo notes and obſervations on the diameters of the ſun and moon, with their eclipſes, and thoſe of Jupiter's ſatellites, between the years 1689 and 1719. The third volume compriſes a catalogue of the right aſcenſions, polar diſtances, longitudes, and magnitudes of nearly 3000 fixed ſtars. The preface to this volume contains an account of all the aſtronomical obſervations made before his time, with a deſcription of the inſtruments employed, and much other curious and highly important matter. The printing of this noble work was not finiſhed at the time of our author's death, and the care neceſſary to its completion devolved on Mr. James Hodgſon, by whom it was publiſhed in the year 1725. Few men poſſeſſed more zeal and application in the purſuit of ſcientific knowledge than the firſt aſtronomer-royal; and ſcarcely any man ever attained to higher reſpect among his contemporaries. In common life he was free, eaſy of acceſs, and pleaſed with the company of thoſe who with ſcientific reſearch could unite their ſhare in the convivial intercourſe of life. Biog. Brit.

FLANCH, Flanque, or *Flaſque*, in *Heraldry*, an ordinary formed by an arched line, which begins at the corners of the chief, and ends in the baſe of the eſcutcheon.

He beareth ermin two flanches vert. Flanches are always borne by pairs.

Leigh makes *flanque* and *flaſk* two diſtinct bearings, whereof the former is more bent than the latter; but Gibbon judiciouſly makes them but one, which he calls *flanque*.

FLANCONNADE, in *Fencing*, is the action of dropping the point of your ſword under your adverſary's hilt, in ſeizing with force the feeble or foible of his blade; which, binding without quitting it, form the parade in octave, and then throw in your thruſt. This thruſt is ſeldom practiſed, except on favourable occaſions, when the adverſary holds his wriſt low on guard.

FLANDERS, in *Geography*, a maritime province of the Netherlands, was formerly very conſiderable, and bounded on the north by the mouth of the Scheldt and the German ocean, on the eaſt by Brabant and Hainaut, on the ſouth by Hainaut and a part of France, formerly called Artois and Picardy, and on the weſt by the Engliſh channel and Artois. Its greateſt length is eſtimated at about 60 miles, and its breadth about 50. It contained 30 cities or walled towns, a great number of market towns, 1154 villages, and ſeveral religious houſes. Flanders was generally divided into Auſtrian, French, and Dutch Flanders. The firſt extended from the ſea to the Dender, being bounded on the north by Dutch Flanders, on the eaſt by Brabant, on the ſouth by French Flanders, and on the weſt by the channel, and contained ſeveral conſiderable cities, as Ghent, Bruges, Oſtend, Oudenard, Dendermond, Nieuport, Furnes, Dixmude, Courtray, Ypres, Tournay, &c. &c. French Flanders contained Liſle, Dunkirk, Gravelines, Caſſel, &c. &c. The third, or Dutch Flanders, bordering on the Scheldt, towards its mouth, contains the towns of Hulſt, Axel, Bouchoult, Aſſenede, Ardenburg, &c.; and this ſeems to be the only part which retains the name of Flanders. By the treaty of Formio, A.D. 1797, the whole of Auſtrian Flanders was annexed to the dominions of France, and converted into the deparments of the Lys and the Scheldt. The climate of this country is temperate and ſalubrious; the ſoil in general is fertile and fit for tillage; and in ſome places it is uncommonly fertile. The land produces all kinds of grain and vegetables. Flax is a very conſiderable commodity, and has greatly contributed to the wealth of the country. The paſture grounds are excellent, and nouriſh a valuable breed of cattle, which yield rich cheeſe and butter. The breed of horſes and ſheep is alſo conſiderable. The Flemings were at one time the principal manufacturers of Europe; and by them the Engliſh were taught the art of weaving, and probably that of agriculture. Their trade was alſo very extenſive. The moſt beautiful table linen is ſtill the manufacture of this country, and its lace is ſuperior to every other. The principal river are the Scheldt and the Lys.

Flanders, a town of New Jerſey; 23 miles N.N.W. of New Brunſwick.

FLANEL, or Flannel, a kind of ſlight, looſe, woollen ſtuff, not quilted, but very warm, compoſed of a woof and warp, and wove on a loom with two treddles, after the manner of bays. As flannel is a bad conductor of heat, it muſt evidently form an uſeful garment in cold weather; its unfitneſs for conducting heat is obvious from its lax ſtructure;

for the fibres of wool touch each other ſlightly, and therefore the heat moves ſlowly through the interſtices, which, being filled with air, afford little aſſiſtance in carrying it off. Count Rumford made many experiments on this ſubject; whence it ſhould ſeem, that though linen, which readily receives humidity from the atmoſphere, appears to poſſeſs a greater degree of attraction with reſpect to water than other ſubſtances; yet thoſe ſubſtances which receive water in its unelaſtic form with the greateſt eaſe, or are moſt eaſily moiſtened, do not, in all caſes, attract the moiſture of the atmoſphere with the greateſt avidity. "Perhaps," ſays he, "the apparent dampneſs of linen to the touch ariſes more from the eaſe with which that ſubſtance parts with the water it contains, than from the quantity of water it actually holds; in the ſame manner as a body appears hot to the touch in conſequence of its parting freely with its heat, while another body, which is really at the ſame temperature, but which withholds its heat with great obſtinacy, affects the ſenſe of feeling much leſs violently. It is well known that woollen clothes, ſuch as flannels, &c. worn next the ſkin, greatly promote inſenſible perſpiration. May not this ariſe principally from the ſtrong attraction which ſubſiſts between wool and the watery vapour which is continually iſſuing from the human body? That it does not depend entirely on the warmth of that covering is clear; for the ſame degree of warmth produced by wearing more clothing of a different kind does not produce the ſame effect. The perſpiration of the human body being abſorbed by a covering of flannel, it is immediately diſtributed through the whole thickneſs of that ſubſtance, and by that means expoſed by a very large ſurface to be carried off by the atmoſphere; and the loſs of this watery vapour which the flannel ſuſtains on the one ſide, by evaporation, being immediately reſtored from the other, in conſequence of the ſtrong attraction between the flannel and this vapour, the pores of the ſkin are diſencumbered, and they are continually ſurrounded by a dry and ſalubrious atmoſphere." He expreſſes his ſurpriſe that the cuſtom of wearing flannel next the ſkin ſhould not have prevailed more univerſally. He is confident it would prevent a number of diſeaſes; and he thinks there is no greater luxury than the comfortable ſenſation which ariſes from wearing it, eſpecially after one is a little accuſtomed to it. "It is a miſtaken notion," ſays he, "that it is too warm a clothing for ſummer. I have worn it in the hotteſt climates, and at all ſeaſons of the year; and never found the leaſt inconvenience from it. It is the warm bath of perſpiration confined by a linen ſhirt, wet with ſweat, which renders the ſummer heats of ſouthern climates ſo inſupportable; but flannel promotes perſpiration, and favours its evaporation; and evaporation, as is well known, produces poſitive cold."

It has been obſerved that new flannel, after ſome time wearing, acquires the property of ſhining in the dark, but loſes it on being waſhed. Phil. Tranſ. N° 483. § 7. See ELECTRICITY.

FLANK, or FLANC, in the *Manege*, is applied to the ſides of a horſe's buttocks, &c.

In a ſtrict ſenſe, the flanks of a horſe are the extremes of the belly, where the ribs are wanting, and are below the loins.

The flanks of a horſe ſhould be full, and at the top of each a feather. The diſtance between the laſt rib and haunch bone, which is properly the flank, ſhould be ſhort, which they term *well coupled*, ſuch horſes being moſt hardy, and fit to endure labour.

A horſe is ſaid to have no flank if the laſt of the ſhort ribs be at a conſiderable diſtance from the haunch bone; as alſo when his ribs are too much ſtraightened in their compaſs.

FLANK *of an Army*, in *Military Language*, is the exterior point, or part, towards either end of every line, the ſame as the terminations of the files of a battalion or company are their flanks reſpectively. It has ever been held among military men of the firſt importance to preſerve the integrity of the flanks, by ſupporting them in the moſt effectual manner againſt every aſſault. This, however, is not always practicable when oppoſed to a ſuperior force, unleſs by the aid of ſuch a formation of the line as may render any ſuch ſuperiority, not extending to more than a fifth or ſixth, of leſs avail than it would obviouſly be, were the two armies to be drawn up parallel to each other: in ſuch caſe the greater force muſt cover a greater extent of ground, and thus be enabled to "out-flank" its opponent. When ſuch an opportunity may offer, it will generally be ſeen, that while the reſidue are left upon equal terms, man to man, and gun to gun, the exceſs of numbers is devoted to ſuch a powerful charge on one flank as ſhould ſeem to be irreſiſtible. Thus, the attack is either made in column, uſually concealed by a body of cavalry until the moment of aſſault, or an angle is formed in advance, which is called "offering a flank," for the purpoſe of beating in the flank by an oblique or a circuitous approach to, not only its extremity, but even towards its rear. In ſuch caſe the leſſer body neceſſarily avails itſelf of that ſimple evolution termed "refuſing a flank," by throwing back a portion of its extremity in an angular direction, ſo as to become parallel with the flank "offered" by the ſtronger party. The firſt figure, *Tactics*, *Plate* II. ſhews the attack made in column C, by an army A, ſuperior on one flank, together with the deploy of the cavalry B, that covered or maſked the manœuvre towards the flank of the line D, with the view to "turn" it; that is, to beat it in towards the centre, and thereby to throw the whole into confuſion. The dotted lines at E ſhew the change made from D, for the purpoſe of "refuſing a flank," and of thus bringing a column to oppoſe the charge intended to be made. The village G ſerves to "cover the flank" from the cavalry that deployed for its attack.

In *fig.* 2. the line H I K is ſuperior to the line L M N: the former "offers the flank" I O, which the latter renders unavailing (at leaſt ſo far as leſſer can reſiſt greater forces,) by "refuſing a flank" in the direction M P, parallel to I O. This, conſidered mathematically, will be found ſufficient; becauſe, under the ſuppoſition that the lines L M and M P are chords of arcs having their common centre ſomewhere in their rear, it is evident that the parallels H I and I O, being, of courſe, concentric therewith, but exteriorly ſituated, muſt occupy a greater extent, and yet, in effect, not outflank their inner parallels. We do not mean to inculcate that the ſuperior force is not ſtill the ſuperior force, but only to ſhew how the leſſer body can, by a judicious arrangement, either render that ſuperiority leſs availing, or, perhaps, induce to a break near the centre, whereby an opening may offer for the cavalry of the weaker army to daſh in ſo as to divide the enemy's line, and to facilitate the defeat of at leaſt one wing.

FLANK *of a Baſtion*, in *Fortification*, is that part which forms an angle, generally of about 110°, or in flat baſtions of 130°, with the contiguous face. The flank of a baſtion is generally intended to defend the face of the other baſtion ſtanding at the further extremity of the ſame curtain; therefore uſually ſtands at right angles, or nearly ſo, therewith: hence it is neceſſary to ſilence the flanks of the contiguous baſtions, both right and left, before the flanked angle of that baſtion ſtanding between them, though perfectly breached, can with propriety be ſtormed.

Flank, *Low*, *covered*, or *retired*, is the platform of the caſement which lies hid in the baſtion; otherwiſe called the orillon.

Flank *Fitchant*, is that from whence a cannon playing, fireth bullets directly in the face of the oppoſite baſtion.

Flank *Razant*, or *raſant*, is the point from whence the line of defence begins, from the conjunction of which with the curtain, the ſhot only raſeth the face of the next baſtion, which happens when the face cannot be diſcovered but from the flank alone.

Flanks, *Simple*, are lines going from the angle of the ſhoulder to the curtain; whoſe chief office is for the defence of the moat and place.

Flank-*walls*, in *Engineery*, are the ſame with wing or return-walls of a lock or bridge. See Canal.

FLANKED, Flanqué, is uſed by the French heralds to expreſs our party per ſaltier; that is, when the field is divided into four parts, after the manner of an X.

Though Colombiere uſes the term in another ſenſe, which appears more natural, *viz.* for the taking of flanches or rounding ſections out of the ſides of the eſcutcheons; the firſt from the angles of it, the latter in ſtraight lines, forming an angle at the feſs, without making any ſaltier.

Flanked *Angle*, in *Fortification*, is the angle formed by the two faces of the baſtion, and which of courſe forms the point of the baſtion.

Flanked *Line of Defence.* See Angle and *Line of* Defence.

Flanked *Tenaille*, is called alſo tenaille.

FLANKING, in the general, is the act of diſcovering and firing upon the ſide of a place, body, battalion, &c.

To flank a place, is to diſpoſe a place or other work in ſuch a manner as that there ſhall be no part of the place but what may be played on, both in front and rear.

Any fortification that has no defence but juſt right forwards is faulty; and to render it complete, one part ought to be made to flank the other. Hence the curtain is always the ſtrongeſt part of any place, becauſe it is flanked at each end.

Battalions alſo are ſaid to be flanked by the wings of the cavalry. A houſe is ſometimes ſaid to be flanked with two pavilions, or two galleries, meaning it has a gallery, &c. on each ſide.

Flanking *Angle.* See Angle.

Flanking *Batteries*, are ſuch as defend each other mutually, ſuch as the face of a raveline, and the contiguous face of its lunette; which ſtand nearly at right angles, and form a re-entering angle. In general, the term is applied only to that battery whoſe fire, when direct, grazes the front of the work it is to defend, as ſhewn above in deſcribing the flank of a baſtion; but in that inſtance the defences do not afford reciprocal ſupport. Works that are not flanked by others can be ſtrong only in conſequence of natural advantages. See Field *Fortification*, and Construction, *Military*.

Flanking *Line of Defence.* See *Line of* Defence.

FLANNAN Islands, in *Geography*, or *Seven Hunters*, a group of ſmall uninhabited iſlands in the North ſea, about 17 miles N.W. from the iſland of Lewis. They yield good paſture for ſheep. On the largeſt are the ruins of a chapel dedicated to St. Flannan. N. lat. 58° 26′. W. long. 7° 25′.

FLANSKER, a ſmall iſland on the E. ſide of the gulf of Bothnia. N. lat. 63° 24′. E. long. 21° 26′.

FLASHES, in *Engineery*, are a kind of ſluices erected upon navigable rivers to raiſe the water upon any ſhoals therein, while the veſſels or craft are paſſing. See Canal.

FLASK, in the *Artillery*. See Powder-*flaſk*.

Flask, *Flaſque*, a bearing more properly called *flanque* or *flanch*.

FLASKET, in *Geography*, an iſland near the coaſt of Norway; 88 miles S.W. of Drontheim.

FLAT, is a character in *Muſic*, expreſſed by a ſmall b, of which the effect is lowering the note to which it is affixed a ſemitone minor. Guido d'Arezzo having given names to ſix ſounds of the octave of which he conſtituted his celebrated hexachord, left the ſeventh of the natural ſcale unprovided with any other appellation than the letter b, which is wanted in the molle hexachord, when the ſame ſound becomes the fourth of the key of F. (See Hexachords and *Muſical* Characters.) Flats on keyed inſtruments are the nominal half notes below, that is, on the left hand of the natural notes, as ſharps are on the right hand. There are two ways of uſing flats, the one *accidental*, which has no effect beyond the ſingle bar in which it occurs; the other is the flat or flats placed at the clef, in the beginning of a movement which affect all the notes on the ſame line or ſpace throughout a movement, unleſs accidentally diſcharged by a natural, ♮. The placing the flats at the clef is not arbitrary, as the firſt neceſſarily is on B, the ſecond on E, the fourth above or 5th below, &c. in the following order:

$\overset{1}{\mathrm{B}}\flat$ $\overset{2}{\mathrm{E}}\flat$ $\overset{3}{\mathrm{A}}\flat$ $\overset{4}{\mathrm{D}}\flat$ $\overset{5}{\mathrm{G}}\flat$

For theſe five flats upon keyed inſtruments, there are five ſhort keys; flats, however, ſometimes occur in C and F, but for theſe the two long keys are obliged to be uſed of B and E natural, the two half notes below C and F natural. If it is neceſſary in practice to lower any ſound already flat at the clef a ſemitone, it is done by double flats: as B ♭♭ is A ♮, E double flat D natural, &c. See Scales, Characters, and Transpositions.

Flat *Third.* See Minor *Third.*

Flat *Key.* See Minor *Third.*

Flat, *Double*, is a term uſed where a note already flat is required to be again depreſſed by a half-note, and is marked thus ♭♭ or $\overset{\flat}{\flat}$; the quantity or exact depreſſing effect of which will only be conſtant in the equal temperament, and in all other ſyſtems of temperament will partake of all the uncertainty which we have ſhewn to prevail with regard to ♭. See Flat.

Flats are a kind of additional or half-notes contrived, &c. together with ſharps, to remedy the defects of muſical inſtruments.

The natural ſcale of muſic being limited to fixed ſounds, and adjuſted to an inſtrument, the inſtrument will be found defective in ſeveral points; as particularly, in that we can only proceed from any note by one particular order of degrees; that for this reaſon we cannot find any interval required from any note or letter upwards or downwards; and that a ſong may be ſo contrived, as that if it be begun by any particular note or letter, all the intervals or other notes ſhall be juſtly found on the inſtrument, or in the fixed ſeries; yet where the ſong begun with any other note, we could not proceed.

To remove or ſupply this defect, muſicians have recourſe to a ſcale proceeding by twelve degrees; that is, thirteen notes, including the extremes, to an octave, which makes the inſtrument ſo perfect that there is but little to complain of. This, therefore, is the preſent ſyſtem of the ſcale for inſtruments, *viz.* between the extremes of every tone of the natural ſcale is put a note, which divides it into two unequal parts, called *ſemitones;* and the whole may be called the *ſemitonic ſcale*, containing twelve ſemitones betwixt thirteen notes in the compaſs of the octave.

Now, to preſerve the diatonic ſeries diſtinct, theſe inſerted notes either take the name of the natural note next below with a character called a *ſharp;* or they take the name of the natural note next above with a mark called *flat*. Thus D flat ſignifies a ſemitone below the D natural: and it is indifferent, in the main, whether the inſerted note be accounted as a flat or a ſharp.

The ſemitonic ſeries or ſcale is very exactly repreſented by the keys of a ſpinnet; the foremoſt range of keys being the natural notes, and keys behind, the artificial notes, or the flats and ſharps. The flat is denoted by the letter b in the writing and printing of muſic, and denotes that the note to which it is prefixed is to be lowered a half-note or ſemitone, and of courſe made to coincide with the note immediately below, in all ſuch nſtruments as have but 12 intervals in the octave; it muſt however be obſerved, that except in the *Equal* TEMPERAMENT of the ſcale (which ſee), the flattening effect of a ♭ is not always the ſame, but varies according to the magnitude of the half-notes in each different ſyſtem of temperament or part of the ſame ſyſtem, as obſerved under FINGER-*key intervals*.

Writers on the theory of muſic are by no means agreed on the magnitude of the interval which they aſſign to a flat. Dr. Robert Smith (Harmonics, p. 160.) defines it to mean the *minor* LIMMA of his different tempered ſyſtems (which ſee). Mr. Maxwell, (Eſſay on Tune, p. 51.) fixes it to his major limma, which has a ratio of $\frac{128}{135} = 47\Sigma + f + 4m$, and is the *medius* SEMITONE (which ſee). Dr. Calcott (Muſical Grammar, p. 112.) defines it to mean his chromatic ſemitone, or the apotome which has a ratio of $\frac{2{,}048}{2{,}187} = 58\Sigma + f + 5m$; in numerous other inſtances, we find the flat defined to mean the limma whoſe ratio is $\frac{243}{256} = 46\Sigma + f + 4m$. If we examine the MSS. of Mr. Overend, we find the flat fourth of Tartini and himſelf, and alſo what he calls the greater of the flat ſevenths and flat eighths, are each of them depreſſed below their natural intervals by the minor ſemitone, whoſe ratio is $\frac{24}{25} = 36\Sigma + f + 3m$. See SHARP.

FLAT, in *Sea Language*, denotes a level ground lying at a ſmall depth under the ſurface of the ſea, and is alſo called a ſhoal or ſhallow.

FLAT *Baſtion*, in *Fortification*. See BASTION.

FLAT-*bottomed Boats* are ſuch as are made to ſwim in ſhallow water, and to carry a great number of troops, artillery, ammunition, &c. They are conſtructed with a twelve-pounder, bow-chaſe, and an eighteen-pounder, ſtern-chaſe; their keel is from ninety to one hundred feet, and from twelve to twenty-four feet beam: they have one maſt, a large ſquare main-ſail, and a jib-ſail, are rowed by eighteen or twenty oars, and can carry four hundred men each. The gun takes up one bow, and a bridge the other, over which the troops are to march. Thoſe that carry horſes have the fore-part of the boat made to open when the men are to mount and ride over a bridge. See BOAT.

FLAT-*bottomed Moat*. See MOAT.

FLAT *Crown*, in *Architecture*. See CORONA.

FLAT-*aſt*, in *Sea Language*, denotes the ſituation of the ſails, when their ſurfaces are preſſed aft againſt the maſt by the force of the wind.

To FLAT-*in*, is to draw in the aftmoſt lower corner or clue of a ſail towards the middle of the ſhip, to give the ſail a greater power of turning the veſſel. Thus, if the mizen or after-ſails are flatted-in, this action is intended to carry the ſtern to leeward, and turn the head nearer to the direction of the wind; and if the head-ſails are flatted-in, the intention is to make the ſhip fall off, when by accident or deſign ſhe has come ſo near the wind as to make the ſails ſhiver.

To FLAT-*in forward*, is to draw in the fore-ſheet, jib-ſheet, and fore-ſtay-ſail ſheet towards the middle of the ſhip. This operation is ſeldom performed, except in light breezes of wind, when the helm has not ſufficient government of the ſhip.

FLAT-*buſh*, in *Geography*, the chief town of King's county, in Long iſland, New York. This town is healthy and pleaſant, and diſtant five miles S. by E. from New York. The inhabitants are chiefly of Dutch extraction; their number is 956, of whom 341 are ſlaves. The whole townſhip in ſummer appears like a garden; and its productions, which are various kinds of fruit, vegetables, grain, &c. find a ready market in the capital. The public buildings are a Dutch church, and a flouriſhing academy, called Eraſmus Hall. The Americans were defeated in this place, after a ſanguinary conteſt with the Britiſh, and ſuffered a great loſs, Auguſt 27, 1776.

FLAT *Head*, a cape on the S. coaſt of Ireland, in the county of Cork, ſeven miles E. of Kinſale.

FLAT *Holm*, a ſmall iſland in the Briſtol channel, about 1½ mile in circumference. On the higheſt point of land is a light-houſe to guide veſſels up the channel. N. lat. 51° 30′. W. long. 3° 5′.

FLAT *Iſland*, a ſmall iſland in the Eaſt Indian ſea, near the N. coaſt of the iſland of Flores. S. lat. 7° 59′. E. long. 120° 59′.—Alſo, a ſmall iſland in the S. Pacific ocean, near the E. coaſt of New Zealand. S. lat. 37° 40′. W. long. 183° 15′.

FLAT *Iſlands*, iſlands of Upper Canada, lying to the weſt of the Manitou iſlands, and open to the ſtraits of Michilimackinac, upon lake Huron.

FLAT *Kill*, a river of New Jerſey, which runs into the Delaware. N. lat. 41° 4′. W. long. 75° 4′.

FLAT *Lands*, a ſmall townſhip in King's county, Long iſland, diſtant from New York ſix or ſeven miles; containing 493 inhabitants, of whom 128 are ſlaves.

FLAT *Point*, a cape on the N. coaſt of the iſland of Jamaica. N. lat. 18 30′. W. long. 77° 8′.—Alſo, a cape at the ſouthern extremity of the iſland of Sumatra. S. lat. 0° 50′. E. long. 102° 38′.—Alſo, a cape on the S. coaſt of the iſland of Borneo. S. lat. 2° 45′. E. long. 112°.

FLATA ISLANDS, a cluſter of ſmall iſlands near the S.E. coaſt of North Uiſt, and about one mile N.E. of Rona iſland.

FLATOR TIBIARUM, in *Ancient Muſic*, a flute player, a Tibicen.

FLATTA, in *Geography*, one of the ſmaller weſtern iſlands of Scotland, two miles E. from the iſland of Barra. N. lat. 56 58′. W. long. 7° 20′.

FLATTE′, *Fr.* a grace equal to a beat in Engliſh muſic.

FLATTENED, in *Muſic*, is applied to ſuch intervals as are leſſened, or notes which are depreſſed in their tone, by the intervals which anſwer to a flat (marked ♭), which (except in the equal temperament) are very numerous. See Flat.

Flattened *Foſſils*, in *Natural Hiſtory*, are ſuch mineral ſubſtances, organic remains in particular, as ſeem to have ſuffered a compreſſion or flattening, ſince their firſt depoſit in the ſtrata; Mr. W. Martin obſerves (Outlines, p. 72.) that ſuch compreſſed, or flattened form of reliquia, "is often the conſequence of the *mode* in which the mineral change has been brought about, and not the effect of a ſimilar ſtructure in the original. Some reliquia retain the form only of one ſide, or of one half, of the organized body repreſented; while others preſent the whole of the external or internal organic fabric, according to the manner in which the mineral matter has been united to the animal or vegetable figure." See Compressed *Foſſils*.

FLATTER, or Flattener. See Coining.

FLATTERY, Cape, in *Geography*, a cape on the N.W. coaſt of North America, ſo called by captain Cook in his Third Voyage (March 1778), becauſe it preſented an opening, which flattered the navigators with the hopes of a harbour, but diſappointed them; the opening being cloſed by low land. It lies in N. lat. 48° 15′. E. long. 235° 3′. Over it is a round hill of moderate height; and the adjacent land is well covered with wood, and exhibited a very pleaſant and fertile appearance. In this latitude geographers have placed the pretended ſtrait of Juan de Fuca. But our navigators ſaw nothing like it; nor, ſay they, is there the leaſt probability that ever any ſuch thing exiſted.—Alſo, a cape on the N.E. coaſt of New Holland. It lies in S. lat. 14° 56′. W. long. 214° 43′, and is a lofty promontory, making next the ſea two hills, which have a third behind them, with low ſandy ground on each ſide; but it may be better known by three iſlands out at ſea; the largeſt, and northernmoſt, lying about five leagues from the cape, in the direction of N.N.E. This is ſuppoſed to be the ſame with that which capt. Dixon called Cape Cox.

FLATTING, or Flattening. See Coining.

Flatting-*courſe*, among *Brick-makers*. See Brick.

Flatting-*mill*. See Mill and Gold-*wire*.

FLATTS, ſignify the ſame with dirt-boats or floats, which are rectangular flat-bottomed and very ſhallow veſſels, uſed on the Merſey and other navigable rivers, for moving ſtuff to repair the banks of a canal, and other purpoſes; in ſome places the ordinary trading boats are ſo called.

FLATULENCE, in *Medicine*, from the Latin, *flatus*, a puff, or *blaſt of wind*, ſignifies the generation and diſcharge of air, or gas, in and from the human body, eſpecially in the ſtomach and inteſtines.

There are only two ſources from which air can be generated in the paſſages juſt mentioned; namely, their contents, and the blood-veſſels which ſecrete other fluids into them. The firſt of theſe, the ſubſtances contained in and paſſing through the alimentary canal, are the ordinary ſources of flatus: for although we know that in ſome animal ſtructures, as in the air-bladder of fiſhes, the veſſels appear to be adapted for the ſecretion of air; and although it is not improbable that, in ſome morbid conditions of the organs of the human body, the blood-veſſels occaſionally ſecrete air, as was ſuggeſted by Mr. John Hunter; yet, in general, we have a much more natural ſolution of the problem, in the diſengagement of air from the ſubſtances taken for the purpoſe of nutriment. All animal and vegetable ſubſtances diſengage a conſiderable quantity of air in the courſe of their decompoſition, whether by fermentation or putrefaction. It appears from the experiments of Dr. Hales, that an apple, and many other kinds of aliment, give out ſix hundred times their own bulk of an elaſtic gas during fermentation. But the proceſs of digeſtion, when well performed, prevents this fermentation from taking place; and the ſolvent power of the gaſtric juice converts the food into chyle without any diſengagement of air. When, however, the digeſtive proceſs is imperfectly carried on, the aliment, and eſpecially the vegetable part of it, is ſuffered to go into a partial fermentation, of which the diſengagement of air is a neceſſary conſequence. Flatulence, therefore, is not ſo much a diſeaſe in itſelf, although generally conſidered ſo by thoſe who are troubled with it, as *a ſymptom* of indigeſtion, or of a weakened condition of ſtomach; and hence, although a flatulent diſtenſion of this organ may be relieved by the means which we ſhall enumerate, it can only be entirely cured by reſtoring the ſtrength of the ſtomach. See Dyspepsia, and Indigestion.

Flatulence occaſions various feelings of diſtreſs, according to the part of the alimentary canal in which the wind is generated or pent up. When it is copiouſly generated in the ſtomach, and does not paſs readily through the upper orifice, to be diſpelled by *eructation*, it produces all the diſtreſſing conſequences which are attendant on great diſtenſion of that organ: in ſome inſtances great pain of the ſtomach is excited, either by the ſimple extenſion of the fibres, or by partial ſpaſmodic contractions; in others, eſpecially in hyſterical habits, the adjoining organs are conſiderably affected by the preſſure of the diſtended ſtomach; whence great anxiety and oppreſſion are felt in the cheſt, from the impediment to the free motion of the lungs and of the heart; the reſpiration becomes laborious and difficult, with a ſenſe of ſuffocation, and the heart intermits in its action, giving riſe to intermiſſion of the pulſe, or is excited to violent palpitations. Theſe ſymptoms are generally alleviated by the diſcharge of wind by eructation: this alleviation however, is only temporary; for the flatus again accumulates and re-produces the ſame effects. The generation of air in the ſtomach, in leſs degrees, is an ordinary concomitant of indigeſtion; but it generally paſſes off readily. Some people, indeed, acquire a habit of voluntary eructation, which, however, augments the malady. For, as Dr. Darwin juſtly obſerves, "when people voluntarily eject the fixed air from their ſtomachs, the fermentation of the aliment goes on the faſter; for ſtopping the veſſels which contain new wines, retards their fermentation, and opening them again accelerates it; hence where the digeſtion is impaired, and the ſtomach ſomewhat diſtended with air, it is better to reſtrain than to encourage eructations, except the quantity makes it neceſſary." (Zoonomia, Claſs i. 3. 1.) It has been ſuggeſted, and we think not incorrectly, that in the repeated voluntary attempts to diſpel wind from the ſtomach, which are often continued for ſome length of time, the atmoſpheric air is often actually *ſwallowed*, and the diſagreeable ſenſation of diſtenſion thus augmented.

When air paſſes from the lower orifice of the ſtomach into the inteſtines, or when, as is perhaps more common, it is generated from the fermentation or putrefactive changes of the alimentary matters in their courſe through the canal, other diſtreſſing ſymptoms are produced. The ſlighteſt affection of the bowels from flatulence is a ſenſe of uneaſineſs, with a rumbling or gurgling noiſe in the belly, termed *borborigmus*. This, however, is ſometimes ſufficiently diſtreſſing, eſpecially from drawing the attention of by-ſtanders, and is not very uncommon in young women, about the age of puberty. "I attended a young lady about ſixteen," ſays Dr. Darwin, "who was in other reſpects feeble, whoſe bowels almoſt inceſſantly made a gurgling noiſe, ſo loud as to be heard at a conſiderable diſtance, and to attract the notice of all who were near her. As this noiſe never ceaſed a minute together for many hours in a day, it could not be produced by the uniform deſcent of water, and aſcent of air through it, but there muſt have been alternately a retrograde movement of a part of the bowel, which muſt again have puſhed up the water above the air; or which might raiſe a part of the bowel, in which the fluid was lodged, alternately above and below another portion of it, as might happen in ſome of the curvatures of the ſmaller inteſtines, the air in which might be moved backward and forward like the air-bubble in a glaſs level." (Loc. cit.)

The colic, which is occaſioned by flatulence, (the *windy colic*, or *colica flatulenta*,) ariſes from partial collections of air, probably pent up by partial ſpaſmodic ſtrictures, eſpecially in the *colon*, or great gut. The diſtenſions, in ſuch caſes as Hoffmann has remarked, are moſt frequently obvious in the right or left hypochondrium (under the ſhort ribs), on account of the curvature of the bowel in thoſe parts, by which the more ready paſſage of its contents is impeded: and ſuch diſtenſions, he adds, have been miſtaken by perſons ignorant of anatomy, for tumours of the ſpleen. Large and painful tumours are alſo ſometimes obſerved, above the ſpine of the right ilium, which are augmented by flatulent food. Hoffmann aſſigns their ſeat to the head of the colon, which is capacious and muſcular for the purpoſe of propelling the fæces upwards, and which has been occaſionally ſeen ſo much diſtended, as to puſh forward the integuments, with conſiderable pain, and to be in danger of being ruptured. The nature of ſuch tumours may be learnt from the relief to the pain and diminution of the ſwelling, which follow the emiſſion of flatus, or the copious diſcharge of a tenacious matter, by vomiting or by ſtool. A great diſtenſion of the colon occaſions very ſimilar diſtreſſing ſymptoms, to thoſe which ariſe from diſtenſion of the ſtomach, from the preſſure produced on the ſurrounding organs. Hoffmann obſerves, that pains in the loins, intermiſſion of the pulſe, œdematous ſwellings of the feet, &c. originate often in flatulent diſtenſions of the bowels, compreſſing the great veſſels and nerves. (Hoffmann, Med. Rational. ſect. i. cap. v. § 57.) See Colica.

Sometimes the whole abdomen is enlarged by the general diſtenſion of the bowels with air, accompanied by conſtipation. When this diſtenſion has been of ſome duration, a degree of paralyſis of the muſcular fibres of the inteſtines is produced, their power in expelling the wind is loſt, and the integuments of the abdomen become tenſe, like a drum; the patient becomes emaciated and tabid. This diſeaſe is called *Tympanites;* which ſee.

For the *relief* of flatulence, (the radical cure, as we have already obſerved, can only be effected by curing the debility of the ſtomach and bowels,) a number of medicines have been deviſed, from a very early period of time, eſpecially ſuch as are comprehended under the appellation of *Carminatives*, (which ſee). Theſe are generally ſubſtances poſſeſſing ſtrong ſenſible qualities, which render them inſtantaneouſly ſtimulant to the nervous ſyſtem; and by ſuddenly exciting the muſcular coat of the ſtomach to action, enable it to overcome the diſtenſion, and diſpel the diſtending gas. The aromatic vegetables, containing much eſſential oil, ſuch as juniper berries, the ſeeds of aniſe, carraway, and coriander, the roots of ginger and zedoary, and the waters diſtilled from theſe, are among the moſt eſteemed carminatives. To theſe may be added other ſtimulant and antiſpaſmodic medicines; ſuch as aſſafœtida, and other ſtrong ſmelling gums; volatile alkali; opium, æther, &c. Warm fomentation externally to the region of the ſtomach has been recommended by Dr. Darwin, and other external remedies were employed by Dr. Whytt; eſpecially frictions on the region of the ſtomach, with liniments compoſed of the warm oils; ſuch as the expreſſed oil of mace, oil of mint, &c.; and alſo the application of large plaſters to the belly, made with the ſtimulating gums and gum-reſins. He conſidered æther and opium, however, as the moſt effectual remedies for flatulence. Dr. Darwin recommends "ten corns of black pepper ſwallowed whole after dinner, that its effects may be ſlower and more permanent," in the borborygmi of young women. We have ſeen them ſuſpended by any ſubſtance, taken into the ſtomach, as a piece of dry biſcuit, which, by the way, the late Dr. Buchan conſidered "as one of the beſt carminative medicines," and recommends it in all complaints of the ſtomach, ariſing from flatulence and indigeſtion. Theſe diſorders are often particularly troubleſome when the ſtomach is nearly empty, and perhaps the operation of a biſcuit taken at ſuch times is merely that of relieving this temporary vacuity, which any other light aliment would effect.

As the proper digeſtion of the food is much aided by a regular motion and diſcharge of the excrementitious portion of it downwards, wherever the bowels are conſtipated, particular care ſhould be taken to obviate this tardineſs of their action, by conjoining ſtimulant laxatives with the diſpellers of wind. Hence pills, conſiſting of aloes, calomel, or rhubarb, combined with aſſafœtida, ginger, &c. may be advantageouſly adminiſtered. To theſe means the general remedies for indigeſtion ſhould be added, as well thoſe which ſtrengthen the conſtitution at large, as thoſe which give vigour to the ſtomach in particular; ſuch are eſpecially the aromatic bitters, preparations of ſteel, and exerciſe. And the diet ſhould be ſelected from thoſe materials which do not readily paſs into the vinous or acetous fermentation, and which are eaſy of digeſtion: hence greens, peas, beans, and other ſimilar vegetable matters ſhould be avoided, as well as liquors which are in a ſtate of active fermentation, and conſequently diſengaging elaſtic air; and particular attention ſhould be paid to moderation in eating and drinking, ſo that the digeſtive powers may not be oppreſſed and overcome. For, as we have already obſerved, when ſpeaking of Diet, exceſs in quantity is, in general, much more productive of injury, than any unwholeſome quality in the articles of food which we uſe.

FLATULENT, ſomething that has a relation to flatuſes, or blaſts of wind.

Peas, and moſt kinds of pulſe, onions, &c. are flatulent foods.

FLAT-Works, in *Mining*, ſignify ſmall pipe-works or bodies of ore, which, inſtead of being depoſited in a rake or ſtraight vertical fiſſure of the rock, is found in an horizontal poſition, or nearly ſo, between the beds of ſtone, or ſometimes in the ſubſtance of the ſtone itſelf, according to Mr. W. Martin; this kind of mine is very rare in Derbyſhire.

FLAVEL, John, in *Biography*, a celebrated Engliſh divine, was born in Worceſterſhire about the year 1627. He was educated at the Univerſity-college, Oxford, where he took his degree of B. A. In 1650, he ſettled as aſſiſtant miniſter to Mr. Walplate, rector of Diptford in Devonſhire, and ſhortly after ſucceeded to the rectory, which, however, in 1656, he reſigned in order that he might enlarge the ſphere of his uſefulneſs, by becoming miniſter of a very populous pariſh at Dartmouth; though the ſtipend in this ſituation was much leſs advantageous than that which he had ſeſt. In 1662, he was among the number of ejected miniſters, for refuſing the terms propoſed by the act of uniformity. He did not, however, entirely ſeparate himſelf from his people, but preached and adminiſtered the ſacrament privately, till the paſſing of the Oxford act in 1665, which prohibited non-conforming miniſters from reſiding within five miles of any city, corporate town, &c. or any place where they had preached. Mr. Flavel was now obliged to retire to Slapton, a village five miles from Dartmouth, where he preached to thoſe who durſt venture to become his auditors, and ſometimes he viſited his former people, but this required the greateſt care on his part to avoid that perſecution which would unqueſtionably follow the violation of the law. His zeal in ſome inſtances led him to the exerciſe of his talents at a hazard of his ſafety; once in a wood about three miles from Exeter, a congregation aſſembled to hear him, but he had ſcarcely begun when a party, ſent for the purpoſe, ſurrounded the place of meeting, and it was with the utmoſt difficulty he eſcaped; others who were ſuppoſed the leaders were apprehended and heavily fined. Thoſe who were more fortunately circumſtanced, remembering the admonition, "that if perſecuted in one place they ſhould flee to another," accompanied their preacher to an adjoining wood, where he preached without moleſtation. In 1685, the mob was excited againſt him, and would probably have deſtroyed him, had he fallen into their hands; to avoid therefore the threatened evil he came to London. Here, however, he was not long ſafe; in one inſtance while a number of perſons were aſſembled, a party of ſoldiers broke in upon them, and though Mr. Flavel again eſcaped, yet an aged miniſter, Mr. Jenkins, fell into their hands, and was thrown into Newgate, where he ſuffered ſo much hardſhip, as ſpeedily to terminate his life. After ſome ſtay in the metropolis, he returned to Dartmouth, where, a priſoner in his own houſe, he was uſeful in affording private inſtructions to thoſe who reſorted to him for the purpoſe. In 1687, when king James aſſumed the right of diſpenſing with the laws, and granting more liberty to non-conformiſts, Mr. Flavel's congregation immediately obtained for him a large place, in which he was enabled to exerciſe his miniſterial functions; and by the revolution in 1688, he was permitted to do that by law which he had performed before by connivance. He died at Exeter in 1691, in his 64th year, having long poſſeſſed, in an eminent degree, the reſpect and eſteem of all good men. He was a man of exemplary piety, and his various works were once much read, and are ſtill regarded by thoſe who hold calviniſtic ſentiments. They were collected after his death in two volumes folio. Calamy's Ejected Miniſters.

FLAVERIA, in *Botany*, from *flavus*, yellow, becauſe it is uſed in dying that colour by the inhabitants of Chili. Juſſ. 186. (Eupatorio-phalacron, n. 5; Vaill. Act. Ed. Germ. 598.)—Claſs and order, *Syngeneſia Polygamia-æqualis*. Nat. Ord. *Compoſitæ diſcoideæ*, Linn. *Corymbiferæ*, Juſſ.

Gen. Ch. *Common calyx* oblong, of three or four equal, cohering, obtuſe, ribbed, unarmed ſcales. *Cor.* compound, uniform, diſcoid; florets few, all uniform, perfect, fertile, monopetalous, funnel-ſhaped, with a regular, five-cleft, ſpreading border. *Stam.* Filaments five, capillary, ſhort; anthers united into a cylindrical tube, prominent. *Piſt.* Germen ſlender; ſtyle thread-ſhaped; ſtigmas ſlender, bluntiſh, ſpreading, projecting beyond the anthers. *Peric.* none, except the folded leaves of the permanent calyx. *Seeds* ſolitary, oblong, ſtriated, naked. *Recept.* very ſmall, naked.

Eſſ. Ch. Receptacle minute, naked. Down none. Calyx of five equal, ribbed, pointleſs, at length folded, leaves. Florets few, tubular. Seeds ſtriated, enfolded in the calyx.

1. F. *capitata*. Juſſ. MSS. Flowers in aggregate corymboſe heads.—(Ethulia bidentis; Linn. Mant. 110. Willd. Sp. Pl. v. 3. 1741. See Ethulia.—Eupatorioides ſalicis folio trinervi, flore luteo, vulgo Contrahierba; Feuill. Pl. de Perou & Chili, 18. t. 14.)—Native of Chili, where it was gathered by Feuillée, who mentions its affording a fine yellow dye, if boiled in common water; and ſubſequently by Mr. Menzies, to whom we are obliged for a ſpecimen in ripe fruit. It has been cultivated in the royal garden at Paris, whence we received a ſpecimen in flower by favour of M. de Juſſieu, marked with his own ſpecific name as above. This is preciſely the ſame as the *Ethulia bidentis* of the Linnæan herbarium, whoſe native country was never before aſcertained.—The *root* is fibrous, and appears to be annual. *Stem* from one to two feet high, erect, ſtraight, angular, ſtriated, ſmooth, often purpliſh, ſolid, leafy, with ſeveral oppoſite, ſtraight, ſpreading, forked branches. *Leaves* oppoſite, ſtalked, ſpreading, lanceolate, acute, three-ribbed, ſmooth, with numerous incurved ſerratures. *Footſtalks* dilated at the baſe, and claſping the ſtem. *Flowers* terminal, yellow, numerous, in a ſort of compound corymbus, very ill-drawn by Feuillée. The ultimate ſtalks are each a ſort of compreſſed *rachis*, on which the flowers are ranged alternately, in a ſpiked manner, with a bractea under each, and ſeveral ſuch ſtalks combine to form a denſe level-topped head. All the parts of the infloreſcence and flower are ſmooth, except a few hairs now and then at the edges of the principal ſtalks. When in fruit, the whole aſſumes a pale hue, the calyx becomes gibbous, containing rarely more than one grey, ſlender, obovate, neatly ribbed *ſeed*. The infloreſcence of this plant greatly reſembles that of *Valeriana Cornucopiæ*, and ſome others of the ſame genus.

2. F. *ſpicata*. Juſſ. MSS. Flowers in compound ſpikes. Gathered by the unfortunate Dombey in Peru; ſee Dombey. One of his ſpecimens was given us by M. de Juſſieu, with the name we have adopted, and a very fine one was found, without any mark, in the herbarium of the younger Linnæus. This ſpecies has altogether the aſpect of a *Solidago*; but the *ſtem* is ſhrubby, with many round, or ſlightly angular, roughiſh, leafy and flowery branches. *Leaves* oppoſite, ſtalked, lanceolate, narrow, ſmooth above; with three ribs, which are rough beneath; and a few ſhallow diſtant ſerratures. *Spikes* very numerous, oppoſite, lateral and terminal, with innumerable little, yellow, crowded, ſeſſile, bracteated *flowers*, whoſe calyx-leaves are fringed, roughiſh and very obtuſe. *Florets* about three. *Seed* ſhaped like the laſt, but ſmaller, blackiſh, and with ſcarcely more than four angles or ribs. The flavour of the plant is ſlightly bitter and aromatic. S.

FLAVIA Cæsariensis, in *Ancient Geography*, a province of Britain, which extended over the whole breadth of the iſland where it is broadeſt, from the Land's End in Cornwall, to the South Foreland in Kent; and was bounded on the S. by the Engliſh channel, on the N. by the Briſtol channel, the Severn, and the Thames. It comprehended the countries of the Danmonii, Durotriges, Belgæ, Attrebatii, Regni, and Cantii; which are now Cornwall, Devonſhire, Dorſetſhire, Somerſetſhire, Hampſhire, Wiltſhire, Berkſhire, Surrey, Suſſex, and Kent. This province was not firſt eſtabliſhed, but the countries comprehended in it made a part of the one province in Britain, from the time when they were ſubdued, to the reign of the emperor Severus. When that emperor divided the Roman territories in Britain into two provinces, theſe countries made a part of the ſouthern one, and ſo continued until Conſtantine the Great formed them into a diſtinct province, which was called Flavia Cæſarienſis, from Flavius, one of the names of that emperor. The other four provinces were Britannia Prima, Britannia Secunda, Maxima Cæſarienſis, and Valentia. Britannia Prima was probably ſo named becauſe it contained ſome of the countries which firſt ſubmitted to the Romans, in this iſland. This province was bounded on the ſouth by the Thames, on the eaſt by the Britiſh ocean, on the north by the Humber, and on the weſt by the Severn; and comprehended the countries of the Dobuni, Cattivellauni, Trinobantes, Iceni, and Coritani; which are now Glouceſterſhire, Oxfordſhire, Buckinghamſhire, Bedfordſhire, Hertfordſhire, Middleſex, Eſſex, Suffolk, Norfolk, Cambridgeſhire, Huntingdonſhire, Northamptonſhire, Leiceſterſhire, Rutlandſhire, Lincolnſhire, Nottinghamſhire, and Derbyſhire.

Britannia Secunda perhaps received that name, when Severus divided the Roman dominions in Britain into two provinces, of which this was the ſecond. It was bounded on the ſouth by the Briſtol channel and the Severn, on the weſt by St. George's channel, on the north by the Iriſh ſea, and on the eaſt by Britannia Prima. This province contained the countries of the Cornavii, Silures, Demetæ, and Ordovices, which are now Warwickſhire, Worceſterſhire, Staffordſhire, Shropſhire, Cheſhire, Herefordſhire, Radnorſhire, Brecknockſhire, Monmouthſhire, Glamorganſhire, Caermarthenſhire, Pembrokeſhire, Cardiganſhire, Montgomeryſhire, Merionethſhire, Caernarvonſhire, Denbighſhire, and Flintſhire. For an account of the other two provinces, ſee MAXIMA CÆSARIENSIS and VALENTIA.

FLAVIANO, ST. a town of Naples, in Abruzzo Ultra, near the Adriatic; 12 miles N.E. of Teramo.

FLAVIANUS, in *Biography*, patriarch of Antioch in the fourth century, is diſtinguiſhed for his zeal in oppoſing Arianiſm. Upon the death of Meletius, he was elected his ſucceſſor, in the year 381, by the ſuffrages of the council of Conſtantinople, notwithſtanding Paulinus, the colleague of Meletius, was ſtill living, and that Flavianus himſelf had formerly ſworn not to conſent to the election of any ſucceſſor to Meletius during the life of Paulinus. His election cauſed a conſiderable ſchiſm in the Chriſtian world. The weſtern biſhops declared themſelves on the ſide of Paulinus, and the greater part of the eaſtern biſhops defended the rights of Flavianus. The death of Paulinus, and the prudent conduct of Flavianus, put the latter in quiet poſſeſſion of his ſituation. After this he ſignalized himſelf in defence of orthodoxy, and in perſecuting the heretics; he entitled himſelf to the gratitude of the citizens of Antioch by his ſucceſsful interpoſition on their behalf at the court of Conſtantinople, when they had incurred the emperor's diſpleaſure, and dreaded his reſentment. For during the courſe of a popular tumult, occaſioned by the impoſition of a new tax, various outrages had been committed, and the ſtatues of the emperor Theodoſius and his empreſs were overthrown. The moſt exemplary vengeance was threatened, but, by the eloquent interceſſions of the patriarch, pardon was obtained for the offenders. The addreſs which he delivered on this occaſion was ſaid to have been compoſed by St. Chryſoſtom, who thought very highly of Flavianus, as one of the greateſt ornaments of the church. Flavianus died in the year 404. He publiſhed ſome epiſtles and ſome homilies. Moreri.

FLAVIANUS, patriarch of Conſtantinople in the fifth century, was elected to that dignity in the year 447. An unfortunate miſunderſtanding took place between Flavianus and Chryſaphius, the firſt chamberlain and favourite of the emperor, which terminated in the ruin of the patriarch. He was depoſed and baniſhed; and, unable to ſuſtain the ſeverities inflicted on him, died in 450, at Hypæpa in Lydia, the place of his exile. Flavianus was the author of "Two Letters" to pope Leo, which are extant in the fourth volume of the "Collectio Conciliorum;" and alſo of "A Declaration of Faith delivered to the Emperor Theodoſius." Moreri.

FLAVIGNAC, in *Geography*, a town of France, in the department of the Upper Vienne; 12 miles S.W. of Limoges.

FLAVIGNY, VALERIAN DE, in *Biography*, a French eccleſiaſtic, was born at Laon early in the ſeventeenth century. He was admitted to the degree of doctor of divinity by the faculty of the Sorbonne in the year 1628, and ſhortly was made canon of Rheims. In the year 1630 he was nominated profeſſor of the Hebrew language in the college-royal of France, and diſcharged the duties of that office with high reputation. In 1656 he became dean of the college-royal, and died at Paris in 1674, at an advanced age. He was eſteemed very learned in theology and the oriental languages, but was diſtinguiſhed by much violence of temper and a very bitter ſpirit, which he diſplayed on many occaſions. In 1663 he lodged a formal complaint before the faculty of the Sorbonne, againſt a theſis that had been maintained by the jeſuits of the college of Clermont, the object of which was to prove, that as the doctrine of Copernicus was contrary to ſcripture, condemned by the Vatican, and anathematized by the inquiſition of Rome; it was decidedly inconſiſtent with the faith of the church, and ought not to be defended in France. M. Flavigny, in anſwer to this, attempted to prove that the theſis went to violate the rights of the king and kingdom, and to ſet at nought the authority of parliament. He engaged in many other diſputes, but his controverſies relative to the Polyglott publiſhed by M. le Jay, and the purity of the Hebrew text, is his moſt important work. It is known by the title "Epiſtolæ de Heptaplis Pariſienſibus." Moreri.

FLAVIGNY, in *Geography*, a town of France, in the department of the Coté d'Or, and chief place of a canton, in the diſtrict of Semur, ſeated on the Ozerain; 27 miles W.N.W. of Dijon. The place contains 1305 and the canton 12,392 inhabitants, on a territory of 300 kiliometres, in 23 communes.

FLAVIOBRIGA, in *Ancient Geography*, VERMEO or BERMEO, a town and colony of Spain, in the Tarragonenſis, ſituated on the coaſt, at the bottom of a ſmall gulf, in the country of the Autrigones; called alſo, according to Pliny, AMANUM PORTUS.

FLAVIONAVA, or FLAVIUM, a town of Spain, in the Tarragonenſis, in the territory of the Perſici, according to Ptolemy; ſituated on the ſea-coaſt in the country of the Cantabri; ſuppoſed to be the modern SANTANDER.

FLAVIOPOLIS, a town and colony of Thrace, which, according to Pliny ſucceeded the ancient Zela, and not far from Bizyar. It derived its new name from Veſpaſian and Titus, who were of the Flavian family.—Alſo, a town of Aſia, in Bithynia; called alſo Cratea and Cratia.—Alſo, a town of Aſia, in Cilicia, ſituated at the foot of mount Taurus, and near the ſources of the Calycadnus, probably the Flaviada of the Itinerary of Antonine, who marks it on the route from Cæſarea of Cappadocia to Anazarbe

FLAVITAS, in *Biography*, patriarch of Conſtantinople, the immediate ſucceſſor of Acacius, was raiſed to that high dignity, from the ſituation of preſbyter of the church of St. Thecla, by means of a ſtratagem, which the ſuperſtition of Zeno furniſhed him with an opportunity of practiſing. The prince, on the death of Acacius, depoſited on the altar of the great church a blank letter, ſealed with his own ſeal, and accompanied with a writing, in which he and the whole church bound themſelves to chooſe ſuch a perſon whoſe name ſhould be found written within the blank letter. The church was ſhut up, and all the avenues carefully guarded by night and by day. Forty days faſting was enjoined, during which prayers were offered up to the Almighty, that he would be pleaſed to direct an angel to inſcribe in the letter the name of the perſon moſt adapted to the office. Flavitas bribed the ſoldiers or their commander, broke the ſeal, and inſcribed his own name. Such, however, was his renown for piety, that no ſuſpicion of fraud fell upon him, and when it was found that his name had been written by an heavenly hand, he was with loud acclamations proclaimed biſhop of Conſtantinople. His hypocriſy was of little avail, though it cheated the fooliſh emperor and his ſuperſtitious court, for he had no arts to ward off the hand of death, to whoſe ſummons he yielded in a few weeks after his advancement. The fraud was now diſcovered; the eſtate of Flavitas was confiſcated, and the perſon participating in the villainy was condemned to die. Moreri.

FLAUTINO, *Ital.* a ſmall, or octave flute.

FLAUTO, *Ital.* a flute.

FLAW, at *Sea*, ſignifies a ſudden guſt of wind, otherwiſe called *ſquall.*

FLAX, in *Botany*. See LINUM.

FLAX, *Carolina*. See POLYPREMUM.

FLAX, *Purging*. See LINUM *Catharticum*.

FLAX, *Toad*. See LINARIA and ANTIRRHINUM.

FLAX, *Baſtard-toad*. See THESIUM.

FLAX, in *Agriculture*, is the name of a plant cultivated equally for the bark, or covering of its ſtalk, and its ſeed; the former being uſed in making linen cloth, and the latter for oil which is drawn from it by preſſure, and for the refuſe or cake. The ſtem of the plant, which is round and hollow, grows to the height of about two feet, and then divides into ſeveral branches; theſe are terminated by blue flowers, conſiſting of five petals, and are ſucceeded by capſules divided within, into ten cells, in each of which is encloſed a bright, ſlippery, elongated ſeed. The leaves are long, narrow, ſharp-pointed, and placed alternately along the ſtem and branches of the plant.

Soil. The moſt proper ſort of ſoil for flax is a deep, free loam, ſuch as is not liable to become too much charged with moiſture, or too dry; but which has been rendered fine by tilth, ſuch as thoſe ſituated in a valley bordering upon water, or as is thrown up by rivers. If there be water at a ſmall depth below the ſurface of the ground, it is thought, by ſome ſtill better, as is the caſe in Zealand, which is remarkable for the fineneſs of its flax; and where the ſoil is deep and rather ſtiff, with water almoſt every where, at the depth of a foot and a half, or two feet, underneath it. It is ſaid to be owing to the want of this advantage, that the other provinces of Holland do not ſucceed equally well in the culture of this uſeful plant; not but that fine flax is alſo raiſed on high lands, if they have been well tilled and manured, provided the ſeaſons are not very dry and unfriendly to its growth in that way.

It has been remarked, in the papers of the Dublin Agricultural Society, that moiſt ſtiff ſoils yield much greater quantities of flax, and far better ſeed, than can be obtained from light lands; and that the ſeed ſecured from the former may, with proper care, be rendered full as good as any that is imported from Riga or Zealand. M. du Hamel, however, thinks that ſtrong land can hardly yield ſuch fine flax as that which grows on lighter grounds. With due pulverization and preparation, there can be no doubt but that ſtrong lands will afford excellent crops of good flax. It is ſeldom that either light ſandy or gravelly ſoils anſwer well for crops of this kind. Land for flax ſhould neither be in too great a ſtate of fertility, or be too much exhauſted, as in the former caſe the flax is liable to become too luxuriant, and the produce in conſequence of it, of a *coarſe* quality; while under the latter circumſtance the quantity of produce is very ſmall.

It has been ſtated by Mr. Donaldſon, that flax is ſown after all ſorts of crops, but is found to ſucceed beſt on lands lately broken up from graſs. And that in Scotland, the moſt ſkilful cultivators of flax generally prefer lands from which only one crop of grain has been taken, after having been ſeveral years in paſture. When ſuch lands have been limed or marled, immediately before being laid down to graſs, the crop of flax ſeldom or never miſgives, unleſs the ſeaſon prove remarkably adverſe to it. It ſucceeds in general better after green crops, than thoſe of the grain kind.

Preparation. The land, in order to render it fit for the growth of this ſort of crop, requires to be rendered perfectly fine and mellow, by being repeatedly ploughed over, and broken down by ſevere harrowings. Where graſs land is to be broken up for this crop, it ſhould be done in the autumn, and left expoſed to the influence of the atmoſphere, until the early part of the following year, when it ſhould be well pulverized and broken down by heavy harrowing, then in the courſe of a week or two ploughed again, in which ſtate it may remain till the period of putting in the ſeed, when another light harrowing ſhould be given, and the ploughing performed afterwards by a very light furrow. But in caſes where the crop is ſown after grain, or other crops that have the property of keeping the land clean from weeds, the firſt ploughing need not be given till January, when it may remain in that ſituation until it becomes pretty dry in the early ſpring, being then well reduced by good harrowing and rolling; and after continuing in that ſtate about a fortnight, the ſeed may either be immediately put in, or another light ploughing and harrowing be firſt given.

Seed.—With regard to the choice of ſeed, the ſame writer ſtates that, that which is of a bright browniſh colour, oily to the feel, and at the ſame time weighty, is conſidered the beſt. Linſeed, imported from various countries, is employed. That brought from Holland is however in the higheſt eſtimation, as it not only ripens ſooner than any other that is imported, but alſo produces greater crops, and flax of that quality which beſt ſuits the chief manufactures of this country. American ſeed produces in common fine flax; but neither the quantity of flax, nor of the pods, provincially the "bolls" which contain the ſeeds, is ſo large as the produce from Dutch linſeed. The Riga ſeed yields a very coarſe ſort of flax, but a greater quantity of ſeeds than any other. It is common in ſome parts of Scotland to ſow ſeeds ſaved from the crop the preceding year, eſpecially when the crop was raiſed from ſeed imported from Holland. The ſucceſs of this practice is found to depend greatly on changing the ſeed from one ſort of ſoil to another of an oppoſite nature; but the ſaving in the expence of purchaſing that ſort of ſeed, in place of what is newly imported from Holland, is ſo inconſiderable, and the riſk of the crop miſgiving, ſo much greater in the one caſe than in the other, that it is ſuppoſed thoſe only who are ignorant of the conſequences, or who are compelled from neceſſity, are chargeable with this act of ill-judged parſimony in the buſineſs.

The cultivators of flax in Ireland prefer the American ſeed for the lighter and more elevated expoſed lands; but the Baltic or Dutch for thoſe which are of a heavier quality. The ſeed of home produce is often ſown for white flax in Yorkſhire; but the Baltic ſort is moſtly preferred where ſeed is the object; which for the enſuing year, and one or two afterwards, is found to anſwer as well as white-flax. But it is highly probable that if that which has been collected from the perfectly ripened ſeed of our own growth be made uſe of, it will be equally productive in both the flaxy ſubſtance and the quantity of ſeed, and the former be equally valuable for all the purpoſes of the manufacturer.

Proportion of Seed.—In reſpect to the quantity of ſeed uſed, it varies in different places according to the circumſtances of the ſoil, the methods of ſowing, and the uſes to which the crop is to be applied; but from two buſhels, to two buſhels and a half, the Engliſh ſtatute acre, is the ordinary allowance. In determining the proper quantity neceſſary for the acre, it is requiſite to pay great attention to the condition of the land. When the land is rich and fertile, and the ſeaſon ſo favourable that it can be got thoroughly pulverized, if too much ſeed is ſown the crop is in great danger of lodging; and when that happens, particularly before the pods are formed the flax proves inconſiderable in quantity, and very inferior in quality. When cultivated in the drill mode at narrow diſtances, a much leſs quantity will be ſufficient than in other caſes; and where the intervals are large, ſcarcely one half the quantity is required. When the crops are intended for ſeed, in whatever manner the ſowing is performed, much leſs will be neceſſary, than where flax is the main object of the grower.

Time of Sowing.—It may be obſerved, that this muſt depend much upon the ſoil and ſituation, but that the ordinary ſeaſon of ſowing flax-ſeed is from the middle of March to the middle or end of April; but the laſt week of March, and the firſt ten days of April, are eſteemed the beſt times; and, accordingly within theſe periods the greateſt quantity of flax-ſeed is ſown in this country. In the county of York, where this ſort of crop is grown on land broken up from graſs, the ſeed is commonly ſown before the ſecond week in April, where it can poſſibly be done; while on ſuch lands as have been in a previous ſtate of tillage, the ſowing is frequently deferred a week or ten days longer. Wherever it can be ſafely practiſed, early ſowing has the advantage of getting the flax plants to cover the ſurface of the land well, before they can run much riſk of injury from the riſing of weeds, or the parching effects of heat.

In ſome of the ſouthern counties of Europe, however, the huſbandmen who raiſe flax ſow part of their ſeed in September and October; ſo that the plants which ſpring from thence remain of courſe in the ground all the winter; and this may be a judicious practice in thoſe places, becauſe plants which have not covered the earth well before the ſummer heats come on, are apt to be parched by the heat and drought which uſually prevail in that ſeaſon. They ſow linſeed again alſo in the ſpring; but the latter does not yield ſo large a crop; the flax, however, which it produces is more eſteemed, becauſe it is finer than that ſown in autumn. M. du Hamel ſeems indeed to think, that the autumnal ſowing yields the beſt ſeed; but, however that may be, in places where the winter is apt to be ſevere, and where the flax, which is but a tender plant, would in courſe be in danger of being deſtroyed during that ſeaſon, almoſt all the flax is ſown about the end of March, or in the beginning of April, as already ſtated.

It may be laid down as a general rule, that the land which is intended for flax crops ſhould be brought to an exceeding fine tilth, in the way directed above, before the ſeed is put in; and that it ſhould be enriched by ſome ſort of manure ſuited to the quality of the ſoil. Thus, when paſture lands are broken up, in order to their being ſown with flax, they muſt be well wrought during ſeveral months, before they will be fit for producing ſuch crops, in the manner juſt deſcribed. To defray the expence of this culture, ſome other crops may be got off the land in the mean time, eſpecially of ſuch plants as do not occupy it long, and particularly of thoſe which are remarkably benefited by frequent ſtirring of the earth whilſt they grow; ſuch as beans, peaſe, turnips, &c. becauſe theſe repeated ſtirrings render the mould fine and looſe, and help to kill the weeds, which would otherwiſe do great damage to the flax. It is aſſerted that the Livonians, when they clear wood-lands, burn the wood upon them, then plough them, and in this ſtate prefer them to any other kind of ſoil for flax crops. If the land which is intended for flax be ſtiff, great care ſhould be taken not to work it when it is wet, for fear of kneading it; but it is often an excellent plan to work it deeply before winter, when dry, laying it up in very high ridges, in order that the winter froſts may the more effectually moulder and looſen its parts. In the month of February, where the land is not too wet, ſome very rotten dung ſhould be laid on, and immediately covered over with the mould. The ſeed ſhould afterwards, at the proper ſeaſon, be ſown, and harrowed in with a light or buſh-harrow, ſo as not to bury it too deep. As this, when young, is a very tender plant, and is more eaſily injured and checked in its progreſs by weeds than any other that is uſually cultivated in the field, it is indiſpenſably neceſſary that the danger of injury in this way ſhould be well guarded againſt, in order to ſave future trouble and expence.

Methods of Sowing.—Where the principal object of the grower is flax, the moſt general method of putting in the crops is that of ſowing them broadcaſt over the ſurface of the land. In performing the buſineſs, much care is neceſſary that the ſeed be diſperſed as evenly as poſſible over the ground, to prevent the plants riſing in an unequal or tufty manner. It ſhould be afterwards covered in by regular harrowing, once or twice in a place, with a light common or buſh-harrow, as juſt noticed, not covering it in too deep.

But where the ſeed conſtitutes the chief intention of the cultivator, it is contended by ſome that the drill mode is preferable, as requiring much leſs ſeed in ſowing, and affording a much better and more abundant produce. Beſides, the ſmoothneſs and weight of the ſeed render it extremely proper for being drilled; and the crops can be kept clean with greater facility.

In this method, the diſtances of the rows or drills ſhould vary according to the circumſtances of the ſoil, and the manner in which the crops are to be kept clean. Where the hand-hoe is to be chiefly depended upon, narrow diſtances may be proper, as ten or twelve inches; but where the work is to be principally executed by the horſe-hoe or cultivator, larger intervals may be more ſuitable, as thoſe of eighteen or twenty inches. Slight harrowing and rolling are ſometimes afterwards neceſſary, eſpecially the latter in dry ſeaſons.

It has been obſerved that thick ſown flax runs up in height, and produces fine ſoft flax; but that when ſown thin it does not riſe to ſuch a height, but ſpreads out more, ſending off a greater number of ſide branches, which produce a great abundance of ſeed, which is much better filled, more plump and heavy than that which is produced from thick ſown flax crops. Flax crops cultivated in this way are not ſo liable to be beaten down in bad weather, the ſtems being ſtronger and better fortified by the more free admiſſion of ſun and air among them; and they are not ſo much expoſed to danger in weeding or cleaning the rows.

After-Culture of the Crop.—Where flax crops are ſown in the broad-caſt method, they are ſeldom much attended to afterwards: it is, however, highly uſeful and neceſſary that they ſhould have one good hand-hoeing, or weeding, as ſoon as ever the crop is ſufficiently up; care being taken not to injure the plants by too much treading amongſt them.

In the drill manner of ſowing, the after-culture of the crops muſt be regulated by the diſtance of the rows; but they may in general be cleaned from weeds, and kept in vigorous growth, by proper implements and horſe labour. The ground between the rows is moſtly wrought by a proper horſe-hoe, cultivator, or ſmall hoe-plough, taking care that none of the mould is thrown againſt the rows; to prevent which, the intervals may be hoed with a triangular harrow, having a proper number of iron tines in it, and guided by two handles fixed behind. By theſe handles the tines are made to go deeper or ſhallower at pleaſure; and if the intervals are cultivated with this inſtrument, beginning before the earth is become ſtale, and while the weeds are ſmall, the land may be kept very clean, and in fine tilth, at much leſs expence than by hand-hoeing: for one horſe is ſufficient for this work. A great deal may be done in a day; and by a frequent repetition of the hoeings, eſpecially when the earth is dry, the weeds may be ſo effectually kept down, as never to riſe to any height. But the rows muſt be weeded by hand.

With ſome it has been a cuſtom to ſow, with their linſeed, either annual or perennial graſs-ſeeds, when they intend to lay the land down for paſture after the crop is taken off. But as graſs plants grow but weakly under the flax, it is a practice by no means to be recommended. No other ſort of crop ſhould, however, be ever grown with this, as much injury may be done by it.

Flax is ſometimes damaged by inſects, when it is about three or four inches high. Theſe, it is ſaid, may be deſtroyed by a ſlight ſtrewing of ſoot, aſhes, &c. over the crop. At all events, this dreſſing will give vigour to the flax, though it may not kill the inſects.

If any weeds appear afterwards among the flax, as is almoſt always the caſe, they muſt be thoroughly rooted out: and that the flax may be as little damaged as poſſible in the doing of this, the weeders ſhould work as carefully as poſſible.

The fineſt flax is moſt liable to be laid, particularly in countries ſubject to ſtorms. To guard againſt this accident, ſome people run acroſs their flax-fields ſlender poles fixed to ſtakes: but a better method is to run ſmall ropes acroſs the field, both lengthwiſe and breadthwiſe, where neceſſary; for theſe being faſtened where they interſect one another, and ſupported by ſtakes at due diſtances, form a kind of net-work, which is proof againſt almoſt every accident that can happen from tempeſtuous weather. Theſe practices are, however, both troubleſome and expenſive, and are ſeldom or ever neceſſary where the crops have not been ſown too thick on the ground.

Pulling the Flax.—Opinions are divided in regard to the degree of ripeneſs at which it is beſt to pull flax crops. Some think it ſhould be pulled whilſt it is green, in order that its fibres may be the ſofter and finer. Others, with the ſame view, pull it up before its ſeeds are quite formed. And others, again, think that it ſhould not be pulled till ſome of the capſules which contain the ſeeds have begun to open; being of opinion that the fibres of green flax are too tender, and that they fall into tow. On the other hand, it is certain that the fibres of flax which has ſtood till it is very ripe are always ſtiff and harſh, that they are not eaſily ſeparated from the reed, and that they do not bleach well. Here, therefore, as in moſt other caſes, both extremes ſhould be avoided; and it conſequently ſeems moſt reaſonable to think, that the propereſt time for pulling flax is when its ſtalks begin to turn from a green to a yellow, when its leaves begin to fall, and when its ſeeds begin to be of a browniſh colour.

Mr. Donaldſon obſerves, that a crop of flax frequently grows ſhort, and runs out a great number of ſeed-bearing branches. When that is the caſe, the ſeeds, not the flax, ought to be the farmer's chief object; and the crop ſhould be allowed to ſtand till the ſeeds are in a great meaſure perfected. But that when the crop thrives, and is likely to become more valuable for the flax than the ſeeds, it ſhould be pulled ſoon after the bloom drops off, and before the pods turn hard and ſharp in the points. Whenever the ſeed is the main object, the crops ſhould be perfectly ripened, which is clearly ſhewn by the points of the ſeed-pods turning hard and ſharp, and the capſules beginning to crack. It uſually takes place towards the end of July, or beginning of the following month.

Where the object is the flax, the crop is pulled up by the roots, and placed in ſmall parcels, uſually termed *beats*, upon the ſurface of the land, ſo as that it may be as fully as poſſible expoſed to the benefit of the ſun. It is afterwards tied up, in order to be conveyed to the place where it is to undergo the proceſs of watering.

In the work of pulling the flax, it is uſual, when it is intended to ſave the ſeeds, to lay it in handfuls, partly acroſs each other: the reaſon for which is, that the buſineſs of *rippling* is thereby facilitated; as the ripplers, in place of having to ſeparate each handful from the bundle, find it, by this ſimple precaution, already done to their hand.

It may be further obſerved, that although it is of much importance, yet it very ſeldom happens, that much attention is beſtowed to ſeparate the different ſorts of flax from each other, in pulling the crops. In moſt fields there are varieties of ſoils: of courſe, ſome parts of a field will produce fine flax, others coarſe; ſome long, and ſome ſhort; in a word, crops of different lengths and qualities. It cannot be ſuppoſed that all theſe ſorts of flax will undergo an equal degree of watering, graſſing, breaking, and heckling, without ſuſtaining great injury. Therefore, when flax of various qualities is promiſcuouſly mixed together in pulling, it is impoſſible to prevent ſome part of it from being loſt in the after-management; a loſs which might be avoided with a ſmall ſhare of attention, and ſome additional trouble when the crop is pulled. Thoſe who rent flax-mills are often blamed for embezzlement; but, there is reaſon to believe, very unjuſtly. Becauſe the crop of a particular part of a field yields ſuch a quantity of flax from one mill, it does not follow that the manager of another mill ſhould return an equal quantity from the ſame ſpace, probably, of very inferior land. It is certain, in very many caſes, that the inattention of flax-farmers to the above very neceſſary precaution is the cauſe why crops of flax often turn out of ſo little value, and is the principal reaſon why the proportion of tow or inferior flax ſo often exceeds, in ordinary ſeaſons, that of ſuperior quality; the millers and hecklers being obliged, in the courſe of their operations, owing to the mixed ſtate in which they receive the crop from the grower,

grower, to reduce the quality of the whole to a lower ſtandard than there would be any occaſion for, were the different qualities ſorted, and put into their hands in that ſtate.

As the flax is pulled, when for ſeed, it is, as has been obſerved above, laid together by handfuls, with the ſeed-ends turned to the ſouth. Theſe handfuls ſhould neither be quite in a line with each other, nor directly acroſs, but a little ſlanting upwards, ſo that the air may eaſily paſs through them. Some, inſtead of this method, tie the handfuls of flax looſely at the top, then ſpread out their roots, and thus ſet ſeveral of them together upright upon their roots. In either of theſe ways the flax is generally left twelve or fourteen days in the field to dry it. This drying is certainly not neceſſary for the rippling, becauſe the ripple will ſeparate the capſules from the flax as effectually before it has been dried as it will afterwards; and if it be done with a view to ripen the ſeed, it ſhould be conſidered, that the flax will be more hurt by the longer time of ſteeping, which will become neceſſary in conſequence of this drying, than the ſeed can be benefited; becauſe the more the ſubſtance or membrane which connects the fibres to the reed is dried, the greater muſt be the degree of putrefaction neceſſary to looſen and deſtroy the coheſion of this connecting medium or membrane: the finer parts of the flax itſelf muſt neceſſarily be deſtroyed by this degree of putrefaction; and if the putrefaction does not ariſe to ſuch a degree as to deſtroy the coheſion of this ſubſtance or membrane, the fibres of the flax will adhere ſo ſtrongly to the reed, that the force neceſſary in ſcutching will prove equally detrimental to the flax. The practice adopted in ſome parts of Brittany ſeems therefore much more rational, which is, to ripple the flax after it has lain in the air two or three days; but even one day will be ſufficient if the weather is dry. In fact, it is the beſt method to do it as ſoon as poſſible after the flax has been pulled.

Rippling the Seed.—In order to ripple, or force off the ſeed-capſules of the flax, which is the next operation, a large cloth ſhould be ſpread on a convenient ſpot of ground, with the ripple placed in the middle of it. This is a ſort of comb, conſiſting of ſix, eight, or ten long triangular teeth, ſet upright, ſo as to have the angles approaching pretty near each other, by which the parts containing the ſeed are removed from the flax. In performing the buſineſs, the pods containing the ſeeds are forced from the ſtalks by means of this iron-comb, which is called a *ripple*, and which is firmly fixed on a beam of wood, on the ends of which two perſons ſit, who, by pulling the ſeed-ends of the flax repeatedly through between the teeth of this comb, execute the operation in a very complete manner, and with great diſpatch.

After the flax has been rippled, the ſeeds and pods thereby obtained ſhould be ſpread out thinly upon a cloth in the ſun to dry and harden. Thoſe ſeeds which ſeparate from the pods of their own accord are the fulleſt and ripeſt, and ſhould therefore be ſet apart for ſowing, in caſe the precaution of raiſing ſome flax purpoſely for ſeed has not been attended to. The pods or capſules are then broken, either by lightly treading, or by threſhing, in order to get out the remaining ſeeds, the whole of which, as well as the former, ſhould be carefully ſifted, winnowed, and cleaned from dirt and chaffy matter. When the ſeed is laid up, which ſhould be immediately done, it muſt be frequently ſtirred and ventilated, to prevent its heating.

This ſecond ſort of ſeed affords a conſiderable profit by the oil which it yields, and alſo by being uſed when broken for fattening of cattle. The cakes of linſeed, after the oil has been preſſed out of them, are likewiſe found to be uſeful for this laſt purpoſe, though they are thought by ſome to render the fat of cattle yellow; for which reaſon it is adviſed not to give it them till within a few weeks before the beaſts are to be killed. They are likewiſe of great utility as a manure, but from the expence can ſeldom be employed in that way with advantage. See Oil-Cake.

It has been remarked by the author of the "Preſent State of Huſbandry in Great Britain," that thoſe who beſtow moſt attention on the cultivation of flax in Scotland, generally ripple off the ſeed, even when there is no intention of ſaving it; as it is found, when flax is put into water without taking off the pods, the water ſoon becomes putrid, in conſequence of which the flax is greatly injured. This imperfectly ripened ſeed is improper for being ſown, but may be expreſſed for the oil. But when it is propoſed to ſave the ſeeds of flax, the pods are carried home from the field as ſoon as they are ſeparated from the flax; and either laid on cloths, and expoſed to be dried by the influence of the ſun; or they are ſpread on barn-floors, and turned two or three times a day, till they are ſo dry that the ſeeds can be eaſily threſhed out in the ordinary way. This is the general mode adopted in Scotland. But in Dorſetſhire they allow the flax to be on the field after it has been pulled, till the pods become ſo dry, that the ſeeds can be threſhed out with a ſtick; which is done on a board, or log of wood, placed in the field for the purpoſe. It is likewiſe the practice with ſome expert flax growers, where the chief object is the ſeed, to ſet it up, after being tied up into ſheaves, in the manner of corn, and, when thus rendered perfectly dry, to ſtack it until the ſpring following; at which time, by placing the tops of the ſheaves ſo as to incline towards each other, and making uſe of a roller, the ſeed is readily forced out. It is ſuppoſed that in this mode more time is allowed in the after-management of the produce.

It may be ſtated, that the quantity of ſeed produced on the ſtatute acre is generally from ſix to eight, but ſometimes as high as ten or twelve buſhels; and that the price depends in a great meaſure on that of foreign ſeed imported; as, when ſold to oil-makers, it is generally about one-half of that of Dutch ſeed, ſold for the purpoſe of ſowing. The price of home-cultivated linſeed is conſiderably advanced of late in ſome of the ſouthern and weſtern counties of the kingdom, in proportion to what it is in thoſe of the northern, owing to the circumſtance of its being much uſed as food for fattening cattle. The average price of the linſeed cultivated in the kingdom at large cannot, it is ſuppoſed, be rated higher than from three to four ſhillings the buſhel. It has, however, lately been conſiderably higher.

Watering.—This is the next operation that becomes neceſſary with this ſort of produce. The intention of this proceſs, is that of inducing the ſeparation of the flaxy material, by exciting a ſlight degree of fermentation in the ſubſtance which attaches it to the ſtem of the plant. It is accompliſhed in two ways, namely, by ſteeping the flax in water; and expoſing it to the action and influence of the atmoſphere. The former is the moſt common and ſafe method; the latter being leſs certain and exact in producing the neceſſary changes. The firſt mode is termed *water-retting*, and the laſt *dew-retting*.

In *water-retting*, when the flax has been cleared from the ſeed, it is looſely tied up into ſmall bundles, and put into pools or ponds of ſoft ſtagnant water, where it is ſuffered to continue ſeveral days, according to the natural warmth of the water. As ſoft clear ſtagnant water has been found by long experience to be ſuperior for this purpoſe to any other, where that cannot be obtained without art, a pit or canal may be formed adjoining a river or ſtream, whence water can be readily brought. This pit or canal is filled with water for ſome time (a week or two) before it be propoſed to pull the flax: by this means the water acquires a greater degree of warmth than river-water poſſeſſes, and which contributes greatly to facilitate the object farmers have in view in immerſing green flax in water, namely, to make the harl or flaky ſubſtance part eaſily and completely from the boon or reed.

With reſpect to the period that flax ought to remain in the water, it depends on various circumſtances; as the ſtate of ripeneſs in which it was pulled, the quality and temperature of the water, &c. The moſt certain rule by which to judge when flax is ſufficiently watered is, when the boon becomes brittle, and the harl ſeparates eaſily from it. The method of depoſiting the flax in the water is in general that, after having it tied in ſmall bundles, often at both ends, of placing it in a ſort of ſquare bed, the bundles being laid lengthways and croſſways of each other, ſo as to bind firmly together; the whole is kept down by having a weight laid upon it. Some, however, inſtead of this mode, have the ſmall bundles ſet in an erect poſition, the tops of every layer, except the loweſt, being upwards; and in place of keeping them down by the application of heavy weights, they uſe ſods or earth, treading the whole down occaſionally, once or twice at firſt in the courſe of the day, ſo as to keep the whole below the ſurface of the water, as, where the contrary happens, the flax is greatly injured by being rendered black. The firſt is, moſt probably, the beſt mode of management.

When the flax has remained the proper length of time in theſe pits, it is taken out by means of a tool called a drag, and depoſited in a ſtraight manner on the ſides or banks of them, in order to its becoming in ſome meaſure dry, and in a ſtate for being ſpread out on the graſs.

With regard to *dew-retting*, although it is in general the practice, where flax is cultivated in this country, to immerſe it in water for ſome time after it is pulled, yet in Dorſetſhire, and the neighbourhood, it is ſeldom done. There the flax is allowed to arrive at that ſtate in which the harl parts moſt eaſily from the boon or reed, by a more gradual proceſs, that of ripening or producing the neceſſary putrefaction, by the action and influence of the dew, which is nothing more than expoſing the flax to the influence of the weather thinly ſpread out upon a graſs field for a longer period than is neceſſary, when the operation of watering has been previouſly performed. When the flax has been ſo long expoſed as to be judged ſufficient for effecting the ſeparation of the harl, nothing more is requiſite than putting it up in parcels, or bundles, in order to its being broken and ſcutched.

Graſſing,—After ſteeping the flax, where the watering method is purſued, the only other operation which properly falls under the farmer's attention is graſſing it. For this purpoſe it is commonly ſpread very thin on the ground, and in regular rows; the one being made to over-lap the other a few inches, with a view of preventing, as much as poſſible, its being torn up and ſcattered by gales of wind. Old graſs-ground, where the herbage does not grow to any great height, is the beſt for the purpoſe; as, when the graſs or weeds ſpring up ſo as to cover the flax, it is frequently rotted, or at leaſt greatly injured thereby.

Flax is allowed to remain on the ground, being occaſionally turned, till, by repeated trials, it is found that the boon has become very brittle; ſo that on being broken, and rubbed between the hands, it eaſily and freely parts from the harl. It is then taken up, a dry day being choſen for the purpoſe: and, being bound in ſheaves, is either ſent directly to the mill, which is the uſual practice in the northen diſtricts, or broken and ſcutched, in the manner they do hemp, by a machine or tool contrived for that uſe.

But before theſe operations are capable of being performed, it is neceſſary that the flax ſhould be expoſed to the heat of the ſun, by placing it againſt a wall or paling, in a ſloping direction, or to the gentle heat of a fire, by putting it over hurdles, or by introducing it into an oven, heated by the refuſe flax. The heat in any way ſhould be very moderate, and regulated in an equal manner. And in either caſe the flax ſhould only be ſuffered to remain juſt long enough to diſpel any dampneſs that it may have acquired. The ſun is, however, always to be preferred where it can be had.

With reſpect to the produce, there is ſcarcely any crop that is more variable than that of flax in the quantity and quality. From twenty to ſeventy ſtones of fourteen pounds each have been produced from an acre of land; but from forty to fifty ſtones may be conſidered a medium crop. The expence of the cultivation, and management of this crop afterwards, cannot be eſtimated on the average at leſs than from nine to twelve or fifteen pounds the acre, where flax is the object.

It has been calculated in theſe ways in a northern and ſouthern diſtrict of the kingdom, before the late great advance in the price of labour.

Expence per Acre.

	£.	s.	d.
Working land	0	16	0
Seed and ſowing	1	1	0
Cleaning and weeding	0	5	0
Pulling	0	10	0
Loading and watering, &c.	0	10	0
Taking and graſſing	0	12	0
Turning and taking up	0	5	0
Rent of Land, as let	5	5	0
Dreſſing 50 ſtone of flax, at 1*s.* 6*d.* *per* ſtone	3	15	0
Profit	7	11	0
	20	10	0

Produce.

50 ſtones of flax, at 8*s.* *per* ſtone	20	10	0

The neat profit ſtands higher in the following:

Expences per Acre.

Preparation of land for ſowing	6	0	0
Rent, tythes, and taxes, &c.	2	13	4
	8	13	4

Produce.

Forty ſtones of flax. at 9*s.* *per* ſtone	18	0	0
Bounty, at 4*d.* *per* ſtone	0	13	4
	18	13	4
Profit	10	0	0

In Scotland, where the flax is often ſold before it is pulled, the uſual price was formerly from ſix to ten pounds the ſtatute acre.

The produce and value of the ſeed has been ſhewn above.

It ſeems, on the whole, not improbable but that flax crops may be grown in many ſituations with advantage.

It is uſual for farmers in different parts of Scotland, who rent lands in the vicinity of large towns or villages, to let fields to the inhabitants, for the purpoſe of raiſing flax; which is ſuppoſed by ſome the moſt advantageous mode of any that can be adopted in cultivating the crop. The rents in theſe caſes are moſtly fixed at from 3*l.* 10*s.* to 4*l.* the ſtatute acre, according to the quality of the land, the farmer conſtantly undertaking to cultivate the land in a proper manner. The ſame practice, with a little variation, is alſo eſtabliſhed in ſome parts of England; the farmer rents or lets the land to a perſon who is denominated a middleman, or flax-jobber, and whoſe buſineſs it is to perform all the various operations after the ſeed is ſown; which, as in the former caſe, is always furniſhed by the renter, the farmer having nothing more to do than to plough and harrow the ground.

When not grown upon newly broken upland, flax may ſucceed turnips and potatoes with great propriety. The ſeed is uſually called *linſeed*, which ſee. See alſo OIL.

FLAX-*Dreſſing*, denotes the various operations which are neceſſary for bringing flax into a ſtate of preparation proper for being formed into cloth or other articles. Theſe are very different, and require different ſorts of implements and machinery, in order to their being properly performed. Flax, for the purpoſe of being formed into cambric, fine lawn, thread and lace, is dreſſed in a rather different manner to that which is commonly employed. It is not ſcutched ſo thoroughly as common flax, which from the ſcutch proceeds to the heckle, and from that to the ſpinner: whereas this fine flax, after a rough-ſcutching, is ſcraped and cleanſed with a blunt knife upon the workman's knee, covered with his leather apron; from the knife it proceeds to the ſpinner, who, with a bruſh made for the purpoſe, ſtraightens and dreſſes each parcel, juſt before ſhe begins to ſpin it.

And in the Swediſh Tranſactions for the year 1747, a method is given of preparing flax in ſuch a manner, as to reſemble cotton in whiteneſs and ſoftneſs, as well as in coherence. For this purpoſe, a little ſea-water is directed to be put into an iron pot, or an untinned copper kettle, and a mixture of equal parts of birch-aſhes and quick-lime ſtrewed upon it; a ſmall bundle of flax is to be then opened and ſpread upon the ſurface, and covered with more of the mixture, and the ſtratification continued till the veſſel is ſufficiently filled. The whole is then to be boiled with ſea-water for ten hours, freſh quantities of water being occaſionally ſupplied in proportion to the evaporation, that the flaxy matter may never become dry. The boiled flax is to be immediately waſhed in the ſea, by a little at a time, in a baſket, with a ſmooth ſtick at firſt, while hot; and, when grown cold enough to be borne by the hands, it muſt be well rubbed, waſhed with ſoap, laid to bleach, and turned and watered every day for ſome time. Repetitions of the waſhing with ſoap expedite the bleaching; after which the flax is to be beat, and again well waſhed; when dry, it is to be worked and carded in the ſame manner as common cotton, and preſſed between two boards for forty-eight hours. It is now fully prepared and fit for uſe. It loſes in this proceſs nearly one-half its weight, which, however, is abundantly compenſated by the improvement made in its quality, and its fitneſs for the fineſt purpoſes.

FLAX-*Brake*, a hand-inſtrument, or machine, which was originally, and for many ages, chiefly employed in breaking and ſeparating the boon or core from the flax, which is the cuticle or bark of the plant. In performing this buſineſs, the flax being held in the left hand, acroſs the three under teeth, or ſwords of the brake, ſhewn at A, *Plate* (*Flax*) *Agriculture*, *fig.* 1, and *a*, *fig.* 2: the upper teeth or ſwords B, *fig.* 1, and *b*, *fig.* 2, are then, with the right-hand, quickly and often forced down upon the flax, which is artfully ſhifted and turned with the left hand, in order that it may be fully and completely broken in its whole length,

FLAX *Foot-Brake*, an implement or machine of the brake kind, invented in Scotland, by which flax is broken and ſcutched with much greater expedition than by the hand-inſtrument juſt deſcribed; and in a more gentle and ſafe manner than by the flax-mill. By this contrivance, the boon or ſtem is well broken, and the ſloping ſtroke given as with the ſcutcher, while the machine is moved by the foot. The treadle is of conſiderable length, on which account it is put in motion with great facility, and aſſiſted in it by means of a fly. The ſcutchers are fixed upon the rim of a fly-wheel. But though theſe machines may be highly uſeful where mills turned by water cannot be eſtabliſhed, they are probably much inferior in point of expedition, and the economy of labour. A brake of this kind is repreſented, in different views, at *figs.* 3 and 4, in which is ſhewn, by A, the three under-brake teeth, or ſwords, ſeventeen inches long, three inches deep, one and a quarter inch thick at the back, and a quarter of an inch at the fore-part or edge.

B, the edges, two and three quarters of an inch aſunder at the end next the guide B, and two inches aſunder at the other end.

C diſplays the two upper teeth, about an inch ſhorter than the under teeth; and

D repreſents the brake-mallet, about thirty-three pounds Engliſh weight.

E is a compound foot-treadle, which is eight feet four inches between the fulcra F, raiſed at F eight inches above the ground, (or rather five inches higher than the ſtance of the workman); E is two feet four inches between the fulcra G, and is raiſed at G eighteen inches above the ground; that is, fifteen inches higher than the ſtance of the workman.

H, the ſword, or upright timber-rod, which turns the wheel by the treadle-crank.

I, the treadle-crank, of ſeven and a half inches radius.

K, the fly-wheel, four and a half feet diameter, above ſixty pounds Engliſh weight. As here repreſented, it is beat or caſt-iron, but it may alſo be made of timber.

L, braſs cods or buſhes.

m M, the lifting crank; M is fixed firm upon the axle of the fly, while the crank *m*, about eight inches radius, plays freely round the axle. In poſition firſt, M begins to take round the crank (which by the lever R pulls up the mallet); when it comes to poſition ſecond, the mallet is again at liberty, and by its weight pulls up the crank (faſter than the fixed pieces move) into poſition third.

It may be obſerved that the treadle-crank is advanced about one-eighth part of the circle before the lifting crank.

n, a ſmall pulley which turns eaſily round on the end of the crank, and to which a rope is fixed.

O, a piece of timber which prevents the rope from falling in upon the axle, but which ſhould not rub againſt the rope in its coming down.

P ſhews where the rope paſſes between two friction-rollers, which are ſo placed, that it comes down three or four inches, or half the radius of the lifting crank, on the ſide of the plummet line, croſſing the centre of the wheel; that is, to the ſide on which the crank turns when it pulls down the rope.

Q, a pillar, which ſerves only to ſupport the guard for the rope O, and the friction rollers at P.

R, the lever.

S, the lever-pillar.

T, part of the mallet-frame.

U, two pillars which guide the brake-mallet.

V, an iron ſpring which receives the leap of the mallet, and throws it the quicker down.

W, the pillars which ſupport the fly.

X, U, the pillars which bear the brake-teeth and mallet.

Y, Y, the ſpur and croſs that ſupport the pillars.

Z, Z, the bottom frame-piece.

a, the broad ſtool upon which the workman ſtands, three inches above the ground.

The lifting-crank and pulley are ſhewn ſeparately, in different views, at M *m n*, and *m n*.

The brake teeth are made of good beech or plane-tree; the brake mallet of plane-tree, aſh, elm, birch, or oak; and the ſword, or upright timber-rod, between the treadle and the treadle-crank, of beech, aſh, or oak. The fly-wheel, if timber, ſhould be made of oak, aſh, beech, elm, or plane-tree. All the other parts of timber worth mentioning may be made of fir-wood.

At *fig.* 5. is ſhewn the ground plant of the whole.

This brake may at any time be converted to a beater of flax and hemp, by removing the brake teeth, and putting in their place flat boards. In the upper of theſe boards may be driven 32 nails, the heads about three-quarters of an inch long, and the points of the heads about a quarter of an inch in diameter; the points of the nail-heads may be placed one inch clear aſunder, and at equal diſtances, as in this way any of the nails may moſt eaſily be drawn out in repairing the mallet. An iron hoop put about the mallet will prevent its burſting with the driving in of the nails. In the time of beating, the narrow end of the mallet is placed towards the workman, and where there is much work in that way, the mallet and fly may be made heavier, and then two or more workmen can work together upon the foot-treadles, which may alſo be made equally long.

Flax *Heckle*, an inſtrument or tool conſtructed for the purpoſe of heckling or ſtraightening the fibres of the flax, which is ſeen at *figs.* 6 and 7. It has many teeth, fixed in a ſquare flat piece of wood, as ſeen at A and B. When uſed, it is firmly fixed to a bench before the workman, who ſtrikes the flax upon the teeth of the heckle, and draws it quickly through the teeth. To perſons unacquainted with this kind of work, this may ſeem a very ſimple operation; but in fact it requires as much practice to acquire the method of heckling well, and without waſting the flax, as any other operation in the whole manufacture of linen. The workmen uſe coarſer and wider-teethed heckles, or finer, according to the quality of the flax; generally putting the flax through two heckles, a coarſer one firſt, and then a finer one in finiſhing it.

Flax *Mill*, a mill contrived for the purpoſe of breaking and ſcutching flax in a more expeditious manner than by the hand or foot methods. It was invented in Scotland many years ago, but has been lately much improved, and by being driven by water, makes great diſpatch, and in ſkilful and careful hands generally gives ſatisfaction. It has been generally conſtructed ſo as to break the boon by three indented rollers, placed one above the other; the middle one of which, being forced quickly round, takes the other two along with it; and one end of the handfuls of the flax being by the workmen directed in between the upper and middle rollers, a curved board or plate of tin behind the rollers directs the flax to return again between the middle and undermoſt rollers; and thus the operation is repeated until the boon be ſufficiently broken. Great weights of timber or ſtone placed at the ends of levers are alſo employed to preſs the upper and under rollers towards the middle one.

The buſineſs of ſcutching is carried on by the mill in the following manner: four arms, ſomething like the hand-ſcutchers before deſcribed, project from a perpendicular axle; a box placed around the axle incloſes theſe projecting ſcutchers, and this box is divided among the workmen, each having ſufficient room to ſtand and handle his flax, which, through ſlits in the upper part and ſides of the box, they hold into the ſtroke of the ſcutchers, which, moving round horizontally, ſtrike the flax acroſs or at right angles, and ſo thraſh out or clear it of the boon.

The breaking of the flax by rollers is ſcarcely ſubject to any objection, except that it is dangerous to workmen not ſufficiently on their guard, who ſometimes allow the rollers to take hold of their fingers, and thereby endanger their whole arm being inſtantly drawn in; in this way many have loſt their arms. To avoid this danger, a brake, upon the general principles of the hand-brake before deſcribed, has been lately adapted to water machinery, and uſed in place of rollers. The horizontal ſtroke of the ſcutchers was long thought too ſevere, and waſteful of the flax; but very careful experiments have diſcovered, that the waſte complained of muſt be charged to the unſkilfulneſs or negligence of the workmen, as, in good hands, the mill carries away nothing but what, if not ſo ſcutched off, muſt be taken off in the heckling with more loſs, both of time and flax; but to obviate this objection of the violence of the horizontal ſcutchers, an imitation of hand-ſcutching has been applied to water. The ſcutchers there project from an horizontal axle, and move like the arms of a check-reel, ſtriking the flax neither acroſs nor perpendicularly down, but ſloping in upon the parcel exactly as the flax is ſtruck by the hand-ſcutcher. This ſloping ſtroke is got by raiſing the ſcutching-ſtock ſome inches higher than the centre of the axle; and by raiſing or lowering the ſtock over which the flax is held, or by ſcrewing it nearer to, or farther from, the ſcutchers, the workman can temper or humour the ſtroke almoſt as he pleaſes.

A flax or lint mill, with horizontal ſcutchers upon a perpendicular axle, requires a houſe of two ſtories; the rollers or break being placed in the ground ſtory, and the ſcutchers in the loft above; but a mill with vertical ſcutchers on an horizontal axle requires but one ground ſtory for all the machinery which is required.

Flax *Rippling-comb*, an inſtrument or tool which is formed by ſetting ſix, ſeven, or more long, ſquare teeth, nearly upright, in a long narrow piece of plank, ſo as that their different angles ſhall come nearly to touch each other. By drawing the flax through between theſe teeth, the bolls or pods in which the ſeed is contained are forced off. It is ſeen at A and B, *fig.* 8. If the flax is to be regarded more than the ſeed, it ſhould, after pulling, be allowed to lie ſome hours upon the ground to dry a little, and ſo gain ſome firmneſs, to prevent the ſkin or harl, which is the flax, from rubbing off in the rippling; an operation which ought by no means to be neglected, as the bolls, if put into the water along with the flax, breed vermin, and otherwiſe ſpoil the water. The bolls alſo prove very inconvenient in the graſſing and breaking. In Lincolnſhire and Ireland they think that rippling hurts the flax; and therefore, in place of it, they ſtrike the bolls againſt a ſtone. The handfuls for rippling ſhould not be great, as that endangers the lint in the rippling comb. After rippling, the flax-raiſer will perceive that he is able to aſſort each ſize and quality of the flax by itſelf more exactly than he could before have done it.

Flax *Stock* and *Scutcher*, are implements for breaking, cleaning, and ſcutching flax in the old method of dreſſing it. In this buſineſs the workman with his left hand holds the flax over the ſtock, ſhewn at *figs.* 9 and 10. while with his right hand he ſtrikes or thraſhes the flax with the ſcutcher, ſhewn at *fig.* 11. in the plate.

Flax *Seed*, the ſeed obtained from flax by means of beating or rippling off the pods or bolls which contain it. This is a ſubſtance which was long ſince recommended for ſtall-fattening cattle by Mr. Marſhall, in his "Rural Economy of Glouceſterſhire," where he ſtates, that next to hay, oil-cake made of linſeed is the main article of ſtall-fattening: but the price of this article is at length become ſo exorbitant, that it no longer, he is afraid, leaves an adequate profit to the conſumer. Some years back he recollects, it was the idea of men of experience, that it could not be uſed profitably as an article of fattening for cattle at a higher price than three pounds a ton. Now, (1788,) it is in ſome places more than twice that price. The loweſt price at the more diſtant mills is, he is well informed, five pounds; at Berkeley mills ſix pounds; at Eveſham ſix guineas; at Stratford ſix pounds ten ſhillings a ton. This ſubſtance has, however, ſince that period, advanced to more than double that price, and is ſtill continued as one of the principal articles in the ſtall-feeding of animals, but it muſt *now* be too expenſive to leave any conſiderable profit in this application. See **Oil**-*Cake*.

Flax-*Seed Jelly*, is the mucilaginous and jelly-like ſubſtance prepared from the ſeed by gentle boiling, &c.

It has been obſerved by the author of the "Rural Economy of the County of Glouceſter," that the late extravagant price of oil-cake has induced ſome ſpirited individuals to try the linſeed itſelf in feeding, boiled to a jelly, and mixed with flour, bran, or chaff; and that, from the information he has had, with favourable ſucceſs. This novel practice, ſays he, requires a few minutes reflection. From the preſent ſcarcity and dearneſs of cakes it may be inferred, that the demand is greater than the quantity in the markets can ſupply. If, therefore, the ſeed can be profitably uſed, though with only a ſmall increaſe of profit, and with this even on a contracted ſcale, the uſe of it may operate very beneficially by leſſening the demand, and thereby lowering the exorbitant price of the cakes. It is highly probable, however, that it may be uſed with much greater advantage than cakes at their preſent price. The writer has by him a ſample of American ſeed (nearly equal to the beſt Dutch ſeed he has ſeen), which may now (1788) be imported for thirty-eight to forty ſhillings a quarter, of eight Wincheſter buſhels. Suppoſing the buſhel to weigh 50lbs. the price of this prime ſeed is not, he ſays, twelve pounds a ton. Ordinary ſeed might be had cheaper. It is farther probable, he thinks, that the ſuperior kind of nutriment which the cakes afford, proceeds from the unexpreſſed oil they may contain, rather than from the huſks of the ſeed of which they appear to conſiſt. This being admitted, and ſeeing the exceſſive power which is uſed in extracting the oil, we may, without riſk, he thinks, conclude that a ton of ſeed contains more than twice (perhaps five times) the nouriſhment which remains in a ton of cakes.

It is ſuppoſed, that the principal objection to flax, or linſeed jelly, is the trouble of preparing it. In an inſtance in which it was uſed with ſucceſs, the method of preparing it was this. The proportion of water to ſeed was about ſeven to one. Having been ſteeped in part of the water eight and forty hours previous to the boiling, the remainder was added, cold; and the whole boiled gently about two hours; keeping it in motion during the operation, to prevent its burning to the boiler; thus reducing the whole to a jelly-like, or rather a gluey, or ropy conſiſtence. After being cooled in tubs, it was given in this inſtance with a mixture of barley-meal, bran, and cut chaff; each bullock being allowed about two quarts of the jelly a day, or ſomewhat more than one quart of ſeed in four days: that is, in this caſe, about one-ſixteenth of the medium allowance of cake. This is, however, only thrown out as a general idea, not drawn as an inference; the comparative effect of theſe two materials of fattening forms, the writer thinks, an important ſubject for the deciſion of experiment. Viewing the preſent ſubject in a partial light, it might, he ſuppoſes, be ſaid, that an unlimited and exceſſive uſe of a foreign article of fattening for cattle might leſſen the demand, and thereby lower the value of our own productions, applicable to the ſame purpoſe, to the injury of the landed intereſt. If, however, we conſider, that by the uſe of foreign lin, or flax ſeed, an influx of the firſt vegetable manure we are acquainted with, would be diffuſed over the oils of this country, and that wheat may be exported at a price more than equivalent to the preſent price of linſeed, the landed intereſt would ſeem to have no cauſe of alarm; while in a more general point of view the importation of linſeed from America might be a national good. It is underſtood, from intelligence of the firſt authority, that ſome of the fineſt provinces of that country are in a great meaſure deſtitute of marketable returns, for the produce and manufactures of this kingdom; and, further, that linſeed, which can there be grown in unlimited quantities, is at preſent a drug in the American markets. Further trials have not, however, ſhewn that the jelly of flax ſeed can be employed as a ſubſtitute for oil-cake in the ſtall-fattening of cattle, though it may be uſed with advantage for many other purpoſes. See **Oil-cake** and **Stall** *feeding*.

Flax-*plant*, is a name which we may give to a plant that ſerves the inhabitants of New Zealand, inſtead of hemp and flax. Of this plant there are two ſorts; the leaves of both reſemble thoſe of flags, but the flowers are ſmaller, and their cluſters more numerous; in one kind they are yellow, and in the other a deep red. Of the leaves of theſe plants, with very little preparation, they make all their common apparel, and alſo their ſtrings, lines, and cordage, for every purpoſe, which are ſo much ſtronger than any thing we can make with hemp, that they will not bear a compariſon. From the ſame plant, by another preparation, they draw long ſlender fibres, which ſhine like ſilk, and are as white as ſnow: of theſe, which are very ſtrong, they make their fineſt cloaths; and of the leaves, without any other preparation than ſplitting them into proper breadths, and tying the ſtrips together, they make their fiſhing-nets; ſome of which are of an enormous ſize. Hawkeſworth's Voyage, vol. iii. p. 39.

The ſeeds of this valuable plant have been brought over into England; but, upon trial, appeared to have loſt their vegetating power.

The filamentous parts of different vegetables have been employed in different countries for the ſame mechanic uſes as hemp and flax among us. Putrefaction, and in ſome degree alkaline lixivia, deſtroy the pulpy or fleſhy matter, and leave the tough filaments entire. By curiouſly putrefying the leaf of a plant in water, we obtain the fine flexible fibres which conſtituted the baſis of the ribs and minute veins, and which form, as it were, a ſkeleton of the leaf. In Madagaſcar different kinds of cloth are prepared from the filaments of the bark of certain trees boiled in ſtrong ley; and ſome of theſe cloths are very fine, and approach to the ſoftneſs of ſilk, but in durability come ſhort of cotton; others are coarſer and ſtronger, and laſt thrice as long as cotton: and of theſe filaments they make ſails and cordage to their veſſels. The ſtalks of nettles are ſometimes uſed for like purpoſes even in France; and ſir Hans Sloane relates, in one of his letters to Mr. Ray, that he has been informed by ſeveral, that muſlin and calico, and moſt of the Indian linens, are made of nettles. A ſtrong kind of cloth is ſaid to be prepared in ſome of the provinces of Sweden of hop-ſtalks; and in the Tranſactions of the Swediſh Academy for 1750, we have an account of an experiment relating to this ſubject: a quantity of the ſtalks was gathered in autumn, which was equal in bulk to a quantity of flax, ſufficient to yield a pound after preparation. The ſtalks were put into water, and kept covered with it during the winter. In March they were taken out, dried in a ſtove, and dreſſed as flax. The prepared filaments weighed nearly a pound, and proved fine, ſoft, and white; they were ſpun and wove into ſix ells of fine ſtrong cloth. Unleſs the ſtalks are fully rotted, which will take much longer time than flax, the woody part will not ſeparate, and the cloth will prove neither white nor fine. See Dr. Lewis's notes to Newmann's Chemiſtry, p. 428, 429.

FLAY-CRAKE, in *Agriculture*, a provincial term, which is frequently applied to the ſcare-crow employed to keep rooks from new-ſown lands.

FLAYL. See FLAIL.

FLEA, PULEX, in *Natural Hiſtory*, a genus of the *aptera* claſs of inſects; of a roundiſh compreſſed figure, with two eyes; ſix feet, formed for leaping, and filiform antennæ; the mouth is bent downwards, and conceals a ſmall ſting or piercer. The generation of this familiar vermin affords ſomething very curious, firſt diſcovered by Sig. Diacinto Ceſtone. See PULEX.

Fleas bring forth eggs, or nits, which they depoſit on animals that afford them a proper food; theſe eggs being very round and ſmooth, uſually ſlip ſtraight down; unleſs detained by the piles, or other inequalities of the cloaths, hairs, &c.

Of theſe eggs are hatched white worms, of a ſhining pearl colour, which feed on the ſcurfy ſubſtance of the cuticle, the downy matter gathered in the piles of cloaths, or other the like ſubſtances.

In a fortnight they come to a tolerable ſize, and are very lively and active; and, if at any time diſturbed, they ſuddenly roll themſelves into a kind of ball.

Soon after this, they come to creep, after the manner of ſilk-worms, with a very ſwift motion. When arrived at their ſize they hide themſelves as much as poſſible, and ſpin a ſilken thread out of their mouth, wherewith they form themſelves a ſmall round bag, or caſe, white within as paper, but without always dirty, and fouled with duſt. Here, after a fortnight's reſt, the animalcule burſts out, transformed into a perfect flea; leaving its exuviæ in the bag.

While it remains in the bag it is milk white, till the ſecond day before its eruption; when it becomes coloured, grows hard, and gets ſtrength; ſo that, upon its firſt delivery, it ſprings nimbly away. (Phil. Tranſ. N° 249). The flea, when examined by the microſcope, affords a very pleaſing object. It is covered all over with black, hard and ſhelly ſcales, or plates, which are curiouſly jointed, and folded one over another in ſuch a manner, as to comply with all the nimble motions of the creature. Theſe ſcales are all curiouſly poliſhed, and are beſet about the edges with ſhort ſpikes in a very beautiful and regular order. Its neck is finely arched, and much reſembles the tail of a lobſter; the head alſo is very extraordinary; for from the ſnout part of it there proceed the two fore-legs, and between theſe is placed the piercer or ſucker, with which it penetrates the ſkin to get its food.

Its eyes are very large and beautiful, and it has two ſhort horns or feelers. It has four other legs joined all at the breaſt. Theſe, when it leaps, fold ſhort one within another, and then exerting their ſpring all at the ſame inſtant, they carry the creature to a ſurpriſing diſtance. The legs have ſeveral joints, and are very hairy, and terminate in two long and hooked ſharp claws.

The piercer or ſucker of the flea is lodged between its fore-legs, and includes a couple of darts or lancets, which, after the piercer has made an entrance, are thruſt farther into the fleſh, to make the blood flow from the adjacent parts, and occaſion that red round ſpot, with a hole in the centre of it, vulgarly called a flea-bite.

This piercer, its ſheath opening ſideways, and the two lancets within it, are very difficult to be ſeen, unleſs the two fore-legs, between which they are hid, be cut off cloſe to the head: for the flea rarely puts out its piercer, except at the time of feeding, but keeps it folded inwards; and the beſt way of ſeeing it is by cutting off firſt the head, and then the fore-legs, and then it is uſually ſeen thruſt out in convulſions.

By keeping fleas in a glaſs tube corked up at both ends, but ſo as to admit freſh air, their ſeveral actions may be obſerved, and particularly their way of coupling, which is performed tail to tail; the female, which is much the larger, ſtanding over the male; they may alſo be thus ſeen to lay their eggs, not all at once, but ten or twelve in a day for ſeveral days ſucceſſively, which eggs will be afterwards found to hatch ſucceſſively in the ſame order. The flea may eaſily be diſſected in a drop of water, and by this means the ſtomach and bowels, with their periſtaltic motion, may be diſcovered very plainly, as alſo their teſtes and penis, with the veins and arteries, though minute beyond all conception. Mr. Leewenhoeck affirms alſo, that he has ſeen innumerable animalcules, ſhaped like ſerpents, in the ſemen maſculinum of a flea. Baker's Microſ. p. 191, and 194.

Flea is alſo an inſect which often does great miſchief to crops of the hop kind. See HOPS.

FLEA *bane*, in *Botany*. See CONYZA.

FLEA-*bane*, the common name of a plant of the weed kind, which is perennial, and common in paſture lands. It has a round, bending, ſolid, heavy ſtem. The leaves are oblong, ſharp-pointed, wrinkled, downy, and embrace the ſtalk, on which they grow very thickly, without any regularity. It has yellow flowers, radiated and incloſed in a flower-cup, compoſed of narrow ſcales like briſtles. And it has ſometimes the name of *flea-wort*.

FLEA-*bane*, *Marſh*, and *Middle*. See INULA.

FLEA-*bane*, *Shrubby African*, and *Flea-bane-tree*. See TARCHONANTHUS.

FLEA-*wort*, *Pſyllium*. See PLANTAGO.

FLEA-*wort*. See FLEA-*bane*.

FLEA-*bitten colour* of a horſe, is white, ſpotted all over with dark reddiſh ſpots.

FLEAK, a common name, ſometimes applied to a wattled hurdle, or kind of gate, which by negligent farmers is occaſionally ſet up in the gaps of their hedge-fences. See HURDLE.

FLEAM, a ſmall inſtrument of pure ſteel, compoſed of two or three moveable lancets, for bleeding a horſe, or the like.

A caſe of fleams, as it is called by farriers, comprehends ſix ſorts of inſtruments: two hooked ones, called drawers, and uſed for cleanſing wounds; a penknife, a ſharp pointed lancet for making inciſions; and two fleams, one ſharp, and the other broad pointed: theſe laſt are ſomewhat like the point of a lancet, fixed in a flat handle, only no longer than is juſt neceſſary to open the vein.

There are many ſurgeons in Germany who bleed, or perform the operation of phlebotomy with this inſtrument, which they uſe in this manner: they hold one finger upon the end of it, which ſerves as a handle, and applying the point to the vein they are to open, ſtrike upon the back over the point with one of the fingers of the other hand, opening the vein much as farriers bleed horſes. Others uſe a ſpring fleam, ſomething like a ſingle point of the ſcarifying inſtrument uſed in cupping; and others employ a ſort of inſtrument in form of a dart; but as the poſition and ſize of the veins is different, in different ſubjects, no inſtrument will ever be found ſo uſeful as the common lancet of a proper ſize.

FLECHA, MATHEW, in *Biography*, a Spaniſh Carmelite Monk, born at Prades, a ſmall town in Catalonia: he was Maeſtro di Cappella to the Emperor Charles V. Amongſt many other works in Spaniſh and French, he publiſhed "Divinarum completarum Pſalmos," "Sectionem Brevem," and a "Salve Regina," together with a book of Motets, at Prague, 1581; and died in 1604, in the Benedictine's College at Salſona, a large town in the ſtate of Catalonia.

FLECHE, LA, in *Geography*, a town of France, and principal place of a diſtrict, in the department of the Sarthe, ſeated in a pleaſant valley watered by the Loire; 21 miles S.S.W. of Le Mans. N. lat. 47° 42′. E. long. 0° 1′. The place contains 5,099, and the canton 15 453 inhabitants, on a territory of 255 kiliometres in 11 communes. In 1603, a college of Jeſuits was founded here, by Henry IV., for the deſcendants of nobility only: the centre is converted into a town-houſe, and the wings have been rebuilt as a ſeminary for the education of youth.

FLECHE, the name of a ſmall work uſed in *Fortification*, having two equal faces, generally ſtanding at an angle of about 85° or 90°, perhaps rather more, and deriving its deſignation from the French word *fleche*, meaning an arrow, to the head of which it bears much reſemblance. This work is generally conſtructed along the foot of the glacis, before the re-entering and ſaliant places of arms: it conſiſts only of a parapet, forming a ſaliant angle. The length of the faces may be from 20 to 25 toiſes, and the height of the work may be 8 feet; communicating with the covert-way by means of a cut through the body of the glacis in a direct line; ſo that, by means of traverſes, the defenders may make one or more ſtands, and prevent their aſſailants from making any lodgement within the fleche, or in any degree commanding the place of arms before which it may ſtand.

FLECHIER, ESPRIT, in *Biography*, a French prelate, was born at Pernes, in the county of Avignon, in the year 1632. Though his parents were but of low rank, they contrived to give him a good education; and he made a rapid progreſs in the different branches of literature. At an early age, he was appointed profeſſor of rhetoric in the college belonging to his order at Narbonne. In this ſituation he was called on to deliver, before the ſtates of Languedoc, a funeral oration for Claude de Rebè, archbiſhop of Narbonne. His diſcourſe was received with rapture; and the ſucceſs of this firſt attempt at ſuch compoſition indicated the road which would lead him to celebrity. Some circumſtances aroſe which induced him to try his fortune at Paris, where he was deſirous of diſtinguiſhing himſelf as a poet; but he not only failed in his expectation of a patron, but was obliged to drudge in the moſt ſubordinate duties of education to obtain a ſcanty livelihood. He was afterwards appointed preceptor to the ſon of M. de Caumartin, counſellor of ſtate, and remained ſome time in that ſituation. But ſtill thinking himſelf adapted for a more conſpicuous place, he determined to bend his mind to pulpit elocution, and almoſt immediately roſe to conſiderable celebrity: but his reputation is built on his funeral orations. In theſe he exerted all his talents, and with ſo much ſucceſs, that he ranks next to Boſſuet. Of Flechier's orations, that for the great Turenne is the moſt celebrated. In 1673, he was choſen one of the forty members of the French academy; and in 1679, he publiſhed his "Hiſtory of the Emperor Theodoſius the Great," which was drawn up for the inſtruction of the dauphin, as a model of a pious and Chriſtian monarch. After this he publiſhed "The Life of Cardinal Ximenes," in which he ſeems to have forgotten the character of this man as an intriguing politician. In 1685, Flechier was nominated by Lewis XIV. to the biſhopric of Lavaur, on which occaſion the ſovereign paid him the higheſt compliment: "I have," ſays he, "made you wait ſome time for a place which you have long deſerved, but I was unwilling ſooner to deprive myſelf of the pleaſure of hearing you." Two years afterwards he exchanged the ſee of Lavaur for that of Niſmes, but not without great reluctance; though in a pecuniary point of view he was much benefited by the tranſlation. Niſmes abounded with proteſtants, and the edict of Nantes had been juſt revoked. The perſecutions which had followed that revocation had produced a crowd of martyrs, though it had added very few, if any, real converts to the catholic religion. In theſe circumſtances, Flechier was conſidered as peculiarly qualified by his learning, eloquence, and zeal, to preſide over that ſee. His moderation gained him the eſteem of the proteſtants, who, in their retaliations on cruel perſecutors, always held his dwelling in reverence. He was eminent for benevolence; and, during the ſcarcity in 1709, his charities were very great, and equally divided between the proteſtants and papiſts. He was free from pride, but never at a loſs to chaſtiſe thoſe who were ready to look down upon him on account of his low origin. Some time before his death he had a dream, which he regarded as a preſage of his approaching diſſolution. He accordingly ordered a ſculptor to attend with ſome deſigns for his tomb: he ſelected the moſt ſimple, being anxious that after his death there ſhould be nothing oſtentatious erected to his memory. When he had made his choice, he ſaid to the artiſt, "Begin your work without delay, for there is no time to loſe." He died ſhortly afterwards, in the year 1710, lamented, ſays d'Alembert, by the catholics, and deeply regretted by the proteſtants; and leaving to his brethren a worthy model of zeal and charity, ſimplicity and eloquence. He was author of many works, which, in the year 1782, were collected and publiſhed at Niſmes, in ten volumes octavo. Of his funeral orations, d'Alembert ſays, "their ſtyle is not only pure and correct, but full of ſweetneſs and eloquence. They were truly pathetic; but this property became ſtill more ſenſible, when the orations were pronounced by the author. His ſerious action, and his ſlow and ſomewhat feeble voice, brought the hearers into a diſpoſition of ſympathetic ſorrow: the ſoul felt itſelf gradually penetrated by the ſimple expreſſions of the ſentiment, and the ear by the ſoft cadence of the periods. Hence he was ſometimes obliged to make a pauſe in the pulpit, that he might leave a free courſe to plaudits, not of the tumultuous kind which reſound at our profane ſpectacles, but expreſſed by that general and modeſt murmur which eloquence wreſts, even in our temples, from an audience deeply moved; a kind of involuntary enthuſiaſm, which not even the ſanctity of the places can repreſs." Moreri. Gen. Biog.

FLECKED, in *Rural Economy*, a term ſignifying pied, or ſtreaked with different colours, as is often the caſe with cattle.

FLECKERAC, or FLECKAREN, in *Geography*, an iſland near the coaſt of Norway, in the North ſea. Between the iſland and the continent is a famous harbour, which may be entered or quitted by the ſame wind. In the 17th century a fortreſs was built for its defence, ſo that the largeſt fleet may lie in it ſecure from ſtorms or enemies. N. lat. 58° 4'. E. long. 8° 18'.

FLEDWITE, or FLIGHT-WHITE, in our *Ancient Laws*, a diſcharge, or freedom, from amercements: when one, having been an outlawed fugitive, comes to the peace of our lord and king, on his own accord, or with licence. Raſtal.

Others rather take it to denote a mulct, or fine, ſet upon a fugitive to be reſtored to the king's peace.

FLEECE, the name of the woolly covering ſhorn from off the body of the ſheep, and rolled up in a long round form. Fleeces are of different weights and ſizes, according to the breed of ſheep. See WOOL, and SHEEP.

FLEECE, the *Golden*, is famous among the ancient writers. It was this that the Argonauts, under the command of Jaſon, went in purſuit of to Colchis, a province of Aſia, now called Mingrelia.

The myſtery of the golden fleece is variouſly explained; either of the profit of the wool-trade to Colchis; or of the gold that they commonly gather there, with fleeces, in the rivers. Arbuth. Diſſ. p. 224. See ARGONAUTS.

FLEECE, *Order of the Golden*. See GOLDEN *Fleece*.

FLEECY HOSIERY, a kind of manufacture of modern invention and uſe, conſiſting of fine fleeces of wool interwoven into cotton pieces of the common ſtocking texture. The proceſs of this manufacture may be thus deſcribed. Having twiſted ſilk, cotton, yarn, &c. in the common ſtocking-frame, let the work be begun as in the common hoſiery; and when a few courſes are wrought in the uſual method, in order to add a coating, draw the frame over the arch, and then hang wool or jerſey, raw or unſpun, upon the beards of the needles, and ſlide the ſame off their beards upon their ſtems, till it comes exactly under the ribs of the ſinkers; then ſink the jacks and ſinkers, and bring forward the frame, till the wool or jerſey is drawn under the beards of the needles; and having done this, draw the frame over the arch, and place a thread of ſpun materials upon the needles, and proceed in finiſhing the courſe in the uſual way of manufacturing hoſiery with ſpun materials. The article thus manufactured has, on the one ſide, the appearance of common hoſiery, and on the other ſide the appearance of raw wool.

FLEET, a number of veſſels, going in company, whether on a deſign of war, or commerce.

In times of peace merchants ſhips go in fleets, for their mutual aid and aſſiſtance: in times of war, beſides this ſecurity, they likewiſe procure convoys of men of war; either to eſcort them to the places whither they are bound, or only a part of the way, to a certain point or latitude, beyond which they are judged out of danger of privateers, &c.

The admirals of his majeſty's fleet are claſſed into three ſquadrons, *viz.* the red, white, and blue. When any of theſe officers are inveſted with the command of a ſquadron, or detachment of men of war, the particular ſhips are diſtinguiſhed by the colours of their reſpective ſquadron; the union is common to them all, and in thoſe of the red ſquadron it is diſplayed on a red field; on a white for thoſe of the white ſquadron, and on a blue field for the blue ſquadron. A fleet, whatſoever be the number of ſhips of which it conſiſts, is uſually divided into three ſquadrons; and theſe again, when the ſhips are numerous, into three diviſions, diſtinguiſhed by a particular flag or pendant, and uſually commanded by a general officer. The admiral, or principal officer, commands the centre; the vice-admiral, or ſecond in command, ſuperintends the van-guard; and the operations in the rear are directed by the rear-admiral, or officer next in rank. The moſt convenient order of a fleet, proceeding on a voyage, is that in which it is ranged into three lines or columns, each of which is parallel to a line cloſe-hauled, according to the tack on which the line of battle is deſigned to be formed. The fleet being thus more incloſed, will more readily obſerve the ſignals, and with greater eaſe form itſelf into the LINE *of battle*, which ſee. See alſo ENGAGEMENT.

The Spaniſh fleet ſent againſt England by Philip II. conſiſted of a thouſand veſſels. In the Eaſt there have been fleets ſeen of three thouſand veſſels.

Merchant fleets generally take their denomination from the place to which they are bound; as the Turkey fleet, Eaſt India fleet, &c.

The Spaniards call ſimply the fleet or flota, a certain number of veſſels, belonging partly to the king, and partly to merchants, ſent every year to Vera Cruz, a port of New Spain.

The flota conſiſts of the captain, admiral, and patach or pinnace, which go on the king's account; and about ſixteen ſhips, from four hundred to a thouſand tons, belonging to particular perſons. They are all ſo heavy laden, both going and coming, that they have much ado to defend themſelves when attacked. The fleet puts out from Cadiz about the month of Auguſt, and makes it eighteen or twenty months before its return.

The fleet ſent annually from the ſame port to Peru, they call the galleons.

When the two fleets put out together, they go in company as far as the Antilles, where they ſeparate; the galleons for Carthagena and Porto Bello; and the flota for Vera Cruz: at their return they join at the Havanna.

Of the two fleets the galleons are the moſt richly laden; not but the cargo of the flota is alſo very conſiderable.

FLEET is alſo a famous priſon in London, thus called from the river Fleet, on the border whereof it once ſtood.

To this priſon perſons are uſually committed for contempt of the king and his laws; or upon abſolute command of the king, or ſome of his courts, particularly that of chancery; and laſtly, for debt.

FLEET, in *Geography*, a river in Kirkcudbright-ſhire, in Scotland, is navigable from Murray's iſle in Wigton bay, into which it enters by a wide mouth, called "Fleet bay," up to Gate-houſe bridge. N. lat. 54° 54′. W. long. 4° 15′. —Alſo, a river of England, in Dorſetſhire, navigable for barges from Portland-Road at Paſſage-Houſe to near Abbotſbury, at the back of that remarkable ridge of pebbles and ſand called Cheſil-bank.—Alſo, a river of Nottinghamſhire, which runs into the Trent, 8 miles N. of Newark.

FLEETING, in *Sea Language*, is the act of changing the ſituation of a tackle, when the blocks are drawn together; or what is called block and block by ſailors. The uſe of fleeting is to replace the mechanical powers into a ſtate of action, and the operation is nearly ſimilar to that of winding up a clock or watch.

FLEETWOOD, WILLIAM, in *Biography*, a learned Engliſh prelate, was born in the Tower of London, in the year 1656. He was initiated in claſſical learning at Eton, from whence he was elected to King's college in the univerſity of Cambridge. He took orders about the time of the Revolution, and became diſtinguiſhed for the excellence of his pulpit talents. He ſoon obtained the honour of being chaplain to the king, and ſome other valuable preferment. He was appointed rector of St. Auſtin, and, almoſt immediately, lecturer at St. Dunſtan's, Fleet-ſtreet, where his ſermons attracted great crowds of hearers. In the year 1691, he publiſhed an uſeful introduction to the knowledge of antiquities, entitled "Inſcriptionum Antiquarum Sylloge, in duas Partes diſtributa," &c. octavo. The firſt part containing remarkable pagan inſcriptions, collected from Gruter, Reinſius, and other writers; and the ſecond conſiſting of ancient Chriſtian monuments: the whole illuſtrated with ſhort notes, which were partly original, and partly ſelected from other writers. This work was well received, and contributed not a little to maintain the high reputation which the author had already acquired during his reſidence at the univerſity. Mr. Fleetwood was next known as a theological writer. Of his works under this character, the principal was publiſhed in 1701, under the title of "An Eſſay on Miracles," which is reckoned a very ingenious performance, and was pronounced, by Mr. Farmer, as abounding in excellent reflections. A ſhort time before king William's deceaſe, Mr. Fleetwood was nominated by his majeſty to a canonry of Windſor; but, as the grant had not paſſed the great ſeal before the king's demiſe, the houſe of commons addreſſed queen Anne to beſtow that dignity upon their chaplain. She, however, attentive to the late king's wiſh, confirmed the grant in favour of Mr. Fleetwood, and alſo appointed him her own chaplain. About the year 1705, he reſigned his rectory and lectureſhip, and retired to a ſmall living which he had in the neighbourhood of Eton. He indulged his inclination for privacy, and applied much of his time to the ſtudy of Britiſh hiſtory and antiquities. In 1707 he publiſhed a work, entitled "Chronicon Precioſum," or "An Account of Engliſh Gold and Silver Money, the Price of Corn, and other Commodities, and of Stipends, Salaries, Wages, &c. in England, for ſix hundred Years laſt paſt." In the following year he was appointed, without his requeſt, and even without his knowledge, to ſucceed biſhop Beveridge in the ſee of St. Aſaph. At this period, party rage and animoſities ran very high, and no where more ſo than in the dioceſe of St. Aſaph: but ſo high was the reputation of the new prelate, ſo great his prudence and addreſs, ſo amiable and conciliating his manners, and ſo unblemiſhed and exemplary his life and conduct, that he not only eſcaped all indecent and diſreſpectful treatment, but ſecured the reverence and affection of his clergy, who almoſt all differed from him in principle. The queen now frequently attended the ſermons of her biſhop, many of which were made public at her deſire. He likewiſe conſtantly attended his place in the houſe of lords, where he conducted himſelf with dignity and ſpirit, maintaining his independence; and he was invariably governed in his votes by a regard to what he conſidered to be the true intereſts of his country. In his firſt epiſcopal viſitation, he delivered and publiſhed a charge, which has been generally regarded as one of the moſt perfect performances of that kind. This was early in 1710; and towards the cloſe of that year a change in the miniſtry took place, and tory principles became triumphant at court. From theſe the biſhop was very averſe, and nothing could induce him to give his ſupport to the meaſures of the new miniſtry, which he conceived to be equally prejudicial to the glory of the queen and the true intereſt of the nation. In the year 1711-12, he was appointed to preach before the houſe of Lords; but by ſome means it was known that the diſcourſe which he had prepared was very hoſtile to the ſentiments of miniſters, and they accordingly adjourned the houſe beyond the day on which it was to have been delivered. The biſhop determined to print what he was prevented from preaching, and publiſhed it under the title of "A Sermon preached on Faſt-day, Jan. 16, 1711-12, againſt ſuch as delight in War, by a Divine of the Church of England." In the political part of this diſcourſe, the biſhop ſpoke his mind with the utmoſt freedom, relative to what he judged to be the diſgraceful and ruinous meaſures of adminiſtration; which ſo exaſperated them, that they reſolved to loſe no opportunity of reſenting the inſult, as they deemed it. He next engaged in the controverſy reſpecting lay-baptiſm, excited by Mr. Dodwell and others. In 1712, the biſhop publiſhed four ſermons, which he had formerly preached with great applauſe on the deaths of queen Mary, the duke of Gloceſter, and king William, and on the acceſſion of queen Anne. In his preface he aſſigned the reaſons for their publication at this particular period, and made ſome ſevere animadverſions on the faſhionable politics of the day. It was now determined to cruſh the biſhop. With this view, miniſters carried in the houſe of commons a motion that the objectionable work ſhould be burned by the hands of the common hangman: to which it was replied, "the fire is certainly a concluſive, but not a convincing argument; it will deſtroy any book, but it refutes none." In 1713, biſhop Fleetwood publiſhed, without his name, "The Life and Miracles of St. Wenefrede, together with her Litanies, and ſome hiſtorical Obſervations made thereon." He undertook this work to counteract the artifices of popiſh emiſſaries, who made uſe of it to ſeduce to their faith the weak and unwary among the crowds who reſorted for the benefit of the waters to the well of Holywell, which was in his dioceſe. On the acceſſion of the houſe of Hanover, Dr. Fleetwood was tranſlated to the ſee of Ely; which new and unexpected dignity ſerved only to ſpur him on to be more diligent in the diſcharge of thoſe duties which belonged to the epiſcopal office. His indefatigable labours brought upon him infirmities, which produced a gradual decay, under which he ſunk at Tottenham, Middleſex, whither he had removed for the benefit of the air. This happened in 1723, when the worthy biſhop had attained his ſixty-ſeventh year. He had ever maintained an excellent character, and was a bright pattern of innocence of life, integrity of heart, and ſanctity of manners. Biog. Brit.

FLEGA, in *Geography*, a ſmall iſland in the gulf of Engia; 8 miles E. of Engia.

FLEICHER, JOHN CHRISTOPHER, in *Biography*, a very celebrated inſtrument-maker of Hamburgh, at the beginning of the laſt century. He had harpſichords from 60, 70, and 100, to 1000 dollars each. His theorbo and other lutes were in the greateſt requeſt; and in all his inſtruments the imitative ſtops were ingenious, and the mechaniſm excellent.

FLEISCHER, M., a Brunſwick compoſer of great merit, in 1772, whoſe church muſic, comic operas, and harpſichord leſſons, are all written in an elegant and pleaſing ſtyle.

FLEMEN, a term in *Surgery*, having two different ſignifications, *viz.* a tumour near the ankles, and the hardened furrows which occur on the hands and feet. Flemen (*quaſi flegmen*) is ſaid to be derived from *flecto*, to incline downwards.

FLEMENEFRIT, FLEMENEFRINTHE, or FLYMENAFRYNTHE, in our *Old Writers*, ſignifies the receiving or relieving of a fugitive or outlaw.

FLEMESWITE. Fleta, who writes of this word, interprets it *habere catalla fugitivorum*.

FLEMING, ROBERT, in *Biography*, ſon of a learned Scotch preſbyterian miniſter, was born in Scotland, where he received the early part of his education, which was completed at the univerſities of Leyden and Utrecht, where he proſecuted all thoſe branches of learning which were deemed neceſſary to qualify him for the miniſterial profeſſion. His firſt ſettlement was with the Engliſh church at Leyden, whence he afterwards removed to become miniſter of the Scotch church of Amſterdam. In the courſe of a few years, he accepted of an invitation as paſtor of a Scotch church in Lothbury, London. Here he expected to become more extenſively uſeful as a miniſter of the goſpel: he was moreover urged to make the exchange by king William, who often adviſed with him on the concerns of his own country. So great was his modeſty, that he requeſted he might at all times be called to court with the utmoſt privacy. His great learning and talents procured him much reſpect abroad, and alſo in this country, where he was greatly eſteemed by churchmen and diſſenters, as well as by thoſe belonging to the Scotch preſbytery. He was on terms of friendſhip with the archbiſhop of Canterbury; and was choſen one of the preachers of the lecture, inſtituted by the merchants of London, at Salters'-hall, every Tueſday. From his early years he was eminently devout; and he was firmly attached to the Britiſh monarchy and conſtitution. He died in 1716. He publiſhed ſeveral works; but that by which he was chiefly known is entitled "Chriſtology, a Diſcourſe concerning Chriſt." This excited much attention in the early part of the French revolution, on account of the ſtriking coincidence between the author's interpretation of the fourth vial in the book of Revelation, and the events which were taking place at that period. Gen. Biog.

FLEMING, CALEB, was born at Nottingham in the year 1698, and, while very young, he diſcovered an uncommon taſte for literature, and employed every leiſure moment in improving his mind, in which he had the aſſiſtance of a learned and liberal divine of his native town, who took the care of a ſmall number of pupils. He continued at Nottingham ſome years, engaged in a ſecular employment, and then removed to London. He became intimate with Mr. Holt, afterwards one of the tutors at Warrington, who aſſiſted and encouraged him in thoſe ſtudies which enabled him afterwards to embark in the work of the Chriſtian miniſtry. His abilities and acquirements had attracted the notice of Dr. Thomas, biſhop of Wincheſter, who was deſirous of making proviſion for him in the eſtabliſhed church. A living was offered him in Cumberland, and Dr. Thomas benevolently propoſed advancing a ſufficient ſum of money to defray the expences of his journey and removal to ſo great a diſtance. His ſcruples upon the ſubject of conformity prevented him from accepting this liberal and very handſome offer; but he never ceaſed to acknowledge with ſentiments of unfeigned gratitude the kindneſs of the worthy prelate. Nothing but a ſenſe of right, and an ardent love of the truth, could have led him to decline the proffered introduction to the national church; for he, at that time, had a wife and ſeveral children, and was almoſt deſtitute of every reſource to provide for their wants. In forming his determination, he was encouraged by the magnanimity of his wife, who aſſured him ſhe was ready to undergo any privations, and ſuffer any hardſhips, rather than accept of affluence at the expence of his integrity and peace. From this moment he reſolved to engage in the work of the miniſtry among the proteſtant diſſenters, and was, after an interval of ſome years, choſen paſtor of a congregation in Bartholomew-cloſe, London. Here he continued to officiate till the year 1752, when he was choſen aſſiſtant to the celebrated Dr. Foſter at Penners-hall, whom in a ſhort time he ſucceeded in the paſtoral office, the duties of which he diſcharged with exemplary diligence, until he became incapacitated for public ſervice by the infirmities of age. He died in the year 1779, in the eighty-firſt year of his age. He was the author of numerous publications on important and intereſting topics, relating to morals, the cauſe of Chriſtianity, and of civil and religious liberty. The titles of many of theſe are given in the General Biography. He was an able and judicious defender of the truth of divine revelation, and a cloſe and diligent inquirer into its doctrines. He was led to renounce what are called the orthodox tenets of eſtabliſhed ſyſtems, and to embrace the ſimple unitarian creed. He was a ſteady and reſolute aſſertor of the rights of conſcience, and of private judgment; and conſidered the interpoſition of human power in matters of religion as the principal ſource of the corruptions of Chriſtianity. His piety was cheerful and rational; his character and manners upright and exemplary; and his private and ſocial virtues ſuch as rendered him the object of warm eſteem among thoſe who enjoyed his acquaintance.

FLEMING, in *Geography*, a county of Kentucky in America, bounded N. by Maſon, S.E. by Virginia, S.W. and W. by Montgomery: it is mountainous, and watered by ſeveral ſtreams which fall into Sandy and Licking rivers; it contains 4,893 inhabitants, of whom 240 are ſlaves. The chief town of this county is *Flemingſburgh*, containing 123 people, and a poſt-office.

FLEMINGIANS, or FLANDRIANS, in *Eccleſiaſtical Hiſtory*, a ſect of rigid Anabaptiſts, who acquired this name in the ſixteenth century, becauſe moſt of them were natives of Flanders, by way of diſtinction from the Waterlandians. In conſequence of ſome diſſenſions among the Flemingians, relating to the treatment of excommunicated perſons, they were divided into two ſects, diſtinguiſhed by the appellations of Flandrians and Frieſlanders, who differed from each other in their manners and diſcipline. Many of theſe in proceſs of time came over to the moderate community of the Waterlandians; and thoſe who remained ſeparate are ſtill known by the name of the old Flemingians, or Flandrians; but they are comparatively few in number. Theſe maintain the opinion of Menno, with reſpect to the incarnation of Chriſt, alleging, that his body was produced by the creating power of the Holy Ghoſt, and not derived from his mother Mary.

FLEMINGS, natives of Flanders, a colony of whom were eſtabliſhed in South Wales by Henry I., in order to ſtrengthen thoſe provinces that remained under the power of England. During the reign of his father, a great number of them, having been driven out of their dwellings by an extraordinary inundation of the ſea on that coaſt, had come over to England; where they hoped to receive protection from the queen, who was a daughter of Baldwin earl of Flanders. The king entertained them with great hoſpitality and kindneſs, not only from a regard to her patronage of them, but from true notions of policy; with a view of increaſing, by ſuch an acceſſion of uſeful inhabitants, the wealth and ſtrength of his kingdom. Many of them were planted by William Rufus in the waſte lands of Northumberland, and about Carliſle; and others were diſperſed all over England, and began by their multitude to give ſome uneaſineſs, which Henry removed, and availing himſelf of them to ſtill greater advantage, he ſent them all to ſettle in South Wales; where he gave them the diſtrict about Tenby and Haverfordweſt, in which their poſterity remain to this day. They were very induſtrious, and, at the ſame time, very valiant; ſkilful in huſbandry, manufactures, and commerce, and equally expert in the uſe of arms: ſo that they anſwered all ends which can be propoſed in planting a colony, cultivation of lands, improvement of trade, and defence of the country. William of Malmſbury ſpeaks of them as a ſtrong barrier, which reſtrained the Welſh in thoſe regions from infeſting the Engliſh territories: and certainly ſuch a plantation was a more effectual ſecurity than any fortreſs or bulwark. This colony was farther ſtrengthened by Henry II., who allowed ſome of the Flemiſh mercenaries, whom, in the firſt year of his reign, he baniſhed out of England, to go to their countrymen eſtabliſhed in Pembrokeſhire, and ſettle among them. This proved in the event a very politic meaſure; for this reinforcement of brave and veteran ſoldiers was ſufficient to defend the Flemiſh colony, and a ceſſation of hoſtilities on the part of the Welſh ſoon followed that event. This colony was attacked in the year 1164, and their country ravaged by Rhus ap Gryffyth of Dynevowr.

FLEMINGS. If the Natives of Flanders and the Netherlands were not the inventors of counterpoint, many proofs are extant of their having ſucceſsfully cultivated it at a very early period. Almoſt all the elder great contrapuntiſts, of whoſe works there are many remains, ſuch as Okenheim, Juſquin du Prez, Adrian Willaert, &c. were Flemings; as the moſt curious ſpecimens of early counterpoint, among the printed muſic in the Muſeum, there is a collection of maſſes in four parts, the firſt that iſſued from the preſs after the invention of printing. They conſiſt of the firſt and third ſet of the maſſes which Juſquin compoſed for the pope's chapel, during the pontificate of Sextus the Fourth, who reigned from 1471 to 1484; the maſſes of Pierre de la Rue, ſometimes called Petrus Platenſis, a ſet of maſſes by Anthony de Feven or Feum, Robert de Feven, and Pierzon. The maſſes of John Mouton; ditto of different compoſers, ("Miſſæ diverſorum Auctorum,") *viz.* Obrecht, Phil. Baſiron, Brumel, Gaſpar, and de la Rue.

All theſe were printed by Ottavio Petruccio da Foſſembrone. He firſt publiſhed the maſſes of de la Rue at Venice, 1503, and in 1508 thoſe by different authors. In 1513, removing to Foſſembrone, in the Eccleſiaſtical State, he obtained a patent from Leo the Tenth in behalf of his invention of types, for the ſole printing of figurative ſong, ("Cantus Figuratus,") and pieces for the organ, ("Organorum Intabulaturæ,") during the term of twenty years. This patent is ſigned by the learned cardinal Bemboe, Leo's ſecretary.

The maſſes are followed in this collection by the ſecond, third, and fourth ſets of Latin motets, in four or five parts, called "Mottetti della Corona," from the figure of a crown ſtamped on the title page. The words of theſe excellent compoſitions conſiſt of ſhort portions of Scripture, and hymns of the Romiſh church, ſet by Juſquin, Carpentras, Mouton, Adrian Willaert, Conſtantius Feſta, and other great maſters of the ſame period: they were all printed at Foſſembrone, in 1519, by Petruccio, and publiſhed with the ſame patent as the maſſes.

The only Italian compoſer amongſt theſe is Conſtantio Feſta, but there is ſo much of that grace in his melody, clearneſs and facility in his harmony, as have always been the diſtinctive characteriſtics of maſters of the higheſt claſs in his country, that we can hardly think a genius ſo highly poliſhed ſtood alone among ſuch a number of foreigners at this early period; or that ſuch regular compoſitions, and learned and ingenious contrivances, could be attained by the gigantic ſtride of any one muſician, however ſuperior his genius may have been to that of his predeceſſors.

FLEMINGTON, in *Geography*, a ſmall poſt-town of New Jerſey, in Huntingdon county, about 6 miles N.E. of Amwell or Delaware river; 53 miles N.E. by N. from Philadelphia. It has a poſt-office and about 12 compact houſes.

FLEMISH, or the FLEMISH *Tongue*, is that which we otherwiſe called Low Dutch, to diſtinguiſh it from the German, whereof it is a corruption, and a kind of dialect. See *Flemiſh* BIBLES.

The Flemiſh is the language uſed throughout the provinces of the Netherlands. It differs conſiderably from the Walloon, which is a corrupt French.

FLEMISH *Bricks*. See BRICKS.

FLEMISH *Huſbandry*, in *Agriculture*, a name ſometimes applied to that ſort which was introduced from the Low Countries, and which conſiſted in the combining of the green crop ſyſtem with that of corn. It is ſuppoſed to have been practiſed there at an early period. See HUSBANDRY.

FLEMISH *School of Engravers*. See NETHERLANDS.

FLEMMING, RICHARD, in *Biography*, an Engliſh prelate, who flouriſhed in the fifteenth century, and who was founder of Lincoln college, Oxford, was born at Crofton, in the county of York. He finiſhed his ſtudies at the Univerſity college, Oxford; and was, in 1406, collated to a prebend in the cathedral church of York; and in the next year, he had the honour of being one of the proctors of the univerſity. He now eſpouſed warmly the cauſe of Wickliff, and, by his zeal, induced others to join in the ſame buſineſs. Some preferment in the exiſting church induced him to change ſides; and he became more violent in defence of what he had been in the habit of holding to contempt as groſs corruptions, than he had been in the cauſe of reform. He obtained the friendſhip of Henry V., and was promoted, in 1420, to the biſhopric of Lincoln. After this he was ſent deputy to the council of Conſtance, where he obtained great applauſe by an eloquent ſpeech delivered in the preſence of pope Martin V., in vindication of his country againſt the calumnies and aſperſions of the French, Spaniſh, and Scottiſh deputies. He was now probably appointed chamberlain to the pope; and, on his return, to exhibit his zeal, in ſubſerviency to the decree of the council of Conſtance, he cauſed Wickliff's bones to be dug up and burnt. The ſee of York being vacant, the pope, by his own authority, tranſlated Dr. Flemming from Lincoln to that archbiſhopric; but the king put in his veto, and the diſappointed prelate was obliged to be contented with Lincoln. After this he formed the deſign of founding a college, avowedly as a ſeminary for divines to write, preach, and diſpute againſt Wickliff. Before he had made much progreſs in the building, he died at Sleaford, in 1430-31; leaving, however, ſufficient money and effects in the hands of truſtees to complete the undertaking. Biog. Brit.

FLEN, in *Geography*, a town of Sweden, in Sudermania; 22 miles N.N.W. of Nykoping.

FLENSBORG, a ſea-port town of Denmark, ſituated on the eaſtern coaſt of the duchy of Sleſwic, in a gulf of the Baltic, called "Flenſborgerwieck," which extends about 18 miles inland, and forms a good harbour, ſo that the largeſt veſſels are unloaded at the quay, and ſecured from all winds by ſurrounding hills. It is the capital of a diſtrict, and one of the handſomeſt and moſt commercial towns in the duchy; 22 miles N. of Sleſwic. N. lat. 54° 47′. E. long. 9° 27′.

FLE'RON, a town of France, in the department of the Ourte, and chief place of a canton in the diſtrict of Liege. The place contains 950, and the canton 15,412 inhabitants, on a territory of 130 kiliometres in 23 communes.

FLESBERG, a town of Norway, in the province of Aggerhuus; 36 miles W. of Chriſtiania.

FLESH, in *Anatomy*, is underſtood to denote only the muſcular ſubſtance of an animal body, although in common language it ſeems to include all the ſoft parts of the frame, except the ſkin. Yet it is uſed ſometimes more looſely by the old anatomiſts, who ſpeak of muſcular fleſh, glandular fleſh, &c.

Flesh, in *Rural Economy*, the fine healthy fibrous matter that conſtitutes the principal value of domeſtic animials. The nature and properties of fleſh are of great importance to the breeding and grazing farmers, in reſpect to the feeding and fattening of their animals. Such breeds as do not poſſeſs perfectly good fleſh ſhould never be encouraged either in ſheep ſtock or neat cattle.

Flesh is alſo uſed, in *Theology*, in ſpeaking of the myſteries of the incarnation and euchariſt.

The word was *made fleſh*, *Verbum caro factum eſt*.

The Romaniſts hold, that the bread in the ſacrament of the ſupper is turned into the real fleſh of Jeſus Chriſt. See Transubstantiation.

Flesh, *Fungous*. See Fungus.

Flesh is ſometimes alſo uſed by botaniſts for the ſoft pulpy ſubſtance of any fruit, incloſed between the outer rind or ſkin, and the ſeeds, or ſtone; or for that part of a root, fruit, &c. fit to be eaten.

Flesh-*colour*. See Carnation.

Flesh *Bay*, in *Geography*, a bay of the Indian ſea, on the coaſt of Africa. N. lat. 34° 35′. W. long. 22° 20′.

FLESHY, Carnosus, in *Botanical Phraſeology*, is uſed to expreſs any more than ordinary degree of thickneſs or juicineſs in ſuch parts as are naturally in ſome degree pulpy, as leaves. Witneſs the whole tribe of ſucculent plants, comprehending the genera of *Aloe*, *Craſſula*, *Meſembryanthemum*, *Sedum*, &c. all which have *folia carnoſa*, fleſhy, or very pulpy, leaves. It is alſo applied to parts uſually dry or juiceleſs, when they happen, contrary to their general nature, to be pulpy, as the capſule in *Chironia baccifera*, and the receptacle of the ſeeds in the Strawberry; but in theſe laſt inſtances the word *baccatus*, expreſſing a fruit aſſuming the nature of a berry, is more preciſe. Several ſpecies of *Euphorbia*, *Pelargonium*, &c. have fleſhy ſtems; and a great number of perennial plants, few annual ones, have fleſhy roots. In all ſuch caſes the part is more durable, more tenacious of life, and leſs dependent on contingencies than it might otherwiſe be. The roots of ſome graſſes, as *Phleum pratenſe*, though naturally fibrous, become fleſhy, when they are expoſed to occaſional privations of food or moiſture, by which they become more independent of ſuch accidents in future. S.

Fleshy *Roots*, in *Gardening*, are all ſuch as are conſtituted of a large maſs of pulpy matter, whether in a laminated form, or the contrary. See Root.

FLESK, in *Geography*, a river of Ireland, in the county of Kerry, which flows into Lough Lane, better known as the lake of Killarney.

FLESUS, in *Ichthyology*, a name uſed by ſome authors for the common flounder; the *paſſer fluviatilis* of moſt writers. See Pleuronectes *Fleſus*.

FLET-Milk, in *Rural Economy*, ſuch milk as has been ſkimmed, or had the cream taken off from it. This ſort of milk is ſometimes employed in forming a poor kind of cheeſe, termed *ſkim-milk-cheeſe*.

FLETA, in *Biography*. It is not a little ſingular that this, which is the title to one of our early law-books, ſhould almoſt uniformly have been noticed as the name of a writer on law, and that by lawyers themſelves. Even profeſſor Blackſtone, in his Commentaries on the laws of England, ſpeaking of the legal period, which commenced in the time of Edward I., when enumerating the great law writers of that reign, mentions Britton, Fleta, and Hougham, as eminently conſpicuous. The commentary under the title Fleta was evidently written at the aſſigned period in 1340. But Nicholſon, in his invaluable work, "The Hiſtorical Library," obſerves, that the writer is unknown; that it was ſome perſon reſident in the Fleet, and who thence adopted the name of the place as a title for his work. Yet Moreri ſays the authors of it were ſome lawyers, who wrote it in the priſon of the Fleet, where they had been confined for the crime of concuſſion, the particular nature of which has been diſcuſſed at large by the learned Selden. Grand Dict. Hiſt.

FLETCHER, Giles, brother of Richard, biſhop of London, was born in Kent, and educated at Eton ſchool, whence, in 1565, he was elected king's ſcholar at Cambridge. He obtained at the univerſity the character of an accompliſhed gentleman and an excellent poet, and after he had taken the preliminary degrees, he took that of doctor of laws in 1581. He was employed by queen Elizabeth as commiſſioner in Scotland, Germany, and the Low Countries, and in 1588 was ſent ambaſſador to the czar Theodore Ivanovitch, with the charge of re-eſtabliſhing the commercial concerns of the Ruſſian company, which had fallen into decay. His reception at firſt was very unfavourable, but he at length ſucceeded in concluding an advantageous treaty, by which the former privileges of the company were renewed and confirmed. After his return, in 1591, he publiſhed an account "Of the Ruſſe Commonwealth," which contains many curious and authentic particulars of that country, then little known to the reſt of Europe. The freedom of certain remarks and ſtrictures in the book cauſed it to be ſuppreſſed, through fear of giving offence to the reigning prince, but it is to be found in Hakluyt's collection. After this he was made ſecretary to the city of London, a maſter of requeſts, and treaſurer of St. Paul's church.

Fletcher, John, a dramatic writer, ſon of Richard Fletcher, biſhop of London, was born in Northamptonſhire in 1576, and received his education at Cambridge. It does not appear that he followed any profeſſion except that of a poet, in which capacity he was the inſeparable companion of Beaumont. He died of the plague in 1625, and was buried in the church of St. Mary Overy. Several of the plays of Beaumont and Fletcher were publiſhed during their lives, and various editions have been given of them in a collective form. The ten volumes edited by Theobald, Sympſon, and

Seward, in 1751; and the ſame number publiſhed by Colman in 1778, are eſteemed the moſt correct. The poetical powers of Fletcher are advantageouſly diſplayed in a piece which was certainly his own unaided compoſition, entitled, "The Faithful Shepherdeſs," a dramatic paſtoral on the model of the Italian. "It poſſeſſes," ſays an able critic, "many beauties, and has been honoured with a cloſe imitation of ſome of its paſſages by Milton in his Comus. Its plot, however, is defective and unpleaſant, to which may be attributed its unfavourable reception on the ſtage." Biog. Brit.

Fletcher, Phineas, ſon of Giles, was educated at Eton ſchool, and from thence he was elected to King's college, Cambridge, in 1600. In 1621 he obtained the living of Helgay, in Norfolk, on which he appears to have paſſed the greater part of his mature life. Little more is known of this perſon but that he was addicted to poetical compoſition at a very early period. His principal works are "The Purple Iſland," "Piſcatory Eclogues," and "Miſcellanies," all printed together at Cambridge in 1633. An edition of his Piſcatory Eclogues, with ſome of his Miſcellanies, was publiſhed at Edinburgh in 1781; and all his poetical compoſitions have been received into Dr. Anderſon's collection. He wrote a book in proſe, entitled "De Literatis Antiquæ Britanniæ."

Fletcher, Andrew, ſon of ſir Robert Fletcher of Saltown, in Scotland, was born in 1653. Being left fatherleſs while he was a child, he was placed under the tuition of Dr. Gilbert Burnet, then rector of Saltown, from whom he imbibed the learning, piety, and attachment to the principles of a free government, by which that eminent prelate was diſtinguiſhed. He ſpent ſome years of his youth in foreign travel, and firſt appeared as a public character in the ſtation of a commiſſioner for Eaſt Lothian in the Scotch parliament. He became ſo diſtinguiſhed by his oppoſition to the arbitrary meaſures of the court, that he thought it adviſeable to withdraw to Holland, and upon being cited to appear by a ſummons from the lords of the council, which it was known he could not obey, he was outlawed, and his eſtate confiſcated. In 1683 he came over to England to aſſiſt, with his friend Mr. Baillie of Jerviſwood, in the conſultations held among the friends of liberty in England and Scotland, to concert meaſures for their common ſecurity; and by his prudence and addreſs he avoided giving any pretext to the miniſtry for his apprehenſion. He returned to the continent, and in 1685 engaged in the enterprize of the duke of Monmouth. He landed in the weſt of England, but was obliged to quit the country again on account of a diſpute which he had with a rude, vulgar, and violent man, whom he ſhot dead. From England he embarked for, and landed in Spain; he afterwards paſſed into Hungary, where he engaged in the war with the Turks, and diſtinguiſhed himſelf by his valour and ſkill. The intereſt which he took in the fate of his country ſoon brought him back to join in the conferences which were held among the Scotiſh refugees in Holland, for the purpoſe of effecting a revolution. When that event took place, he returned to Scotland, and reſumed the poſſeſſion of his eſtate. He was a member of the convention for the ſettlement of the new government in Scotland, and in all his political conduct he ſhewed himſelf the zealous aſſerter of the liberties of the people, without any regard to party diſtinction, and free from all views of his own intereſt. In 1698 he printed "A Diſcourſe of Government with relation to Militias." Alſo "Two Diſcourſes concerning the Affairs of Scotland." In one of theſe he ſuggeſts a plan for providing for the poor by domeſtic ſlavery, which, to ſay the leaſt of it, comes with a very ill grace from one ſo zealouſly attached to the cauſe of liberty as Mr. Fletcher. When a bill was brought into the parliament of Scotland for a ſupply to the crown, in 1703, he moved, that previouſly to this, or to any other buſineſs, the houſe ſhould conſider what acts were neceſſary to ſecure their religion and liberties in caſe of the queen's death, and he propoſed various limitations of the prerogative, which were received in the "Act of Security," paſſed through his exertions into a law, but rendered ineffectual by the ſubſequent union. Of this laſt meaſure he was a zealous oppoſer, and made many ſpeeches on the ſubject, but it was not a matter to be decided by eloquence, or elſe that of Fletcher, which was more nervous and correct than that of any other ſpeaker in the Scotch parliament, enforced by his known patriotiſm, would have had much weight. He died at London in 1716. His publications, and ſome of his ſpeeches, were collected in one volume octavo, entitled, "The Political Works of Andrew Fletcher, Eſquire." As a writer he poſſeſſed great power: his ſtyle was perſpicuous, elegant, and energetic, and his mind was enlarged by acquaintance with the beſt authors, ancient and modern, and by every ſpecies of knowledge which forms the politician. "He was," ſays one of his biographers, "a ſure friend, but an irreconcileable enemy: would loſe his life readily to ſerve his country, and would not do a baſe thing to ſave it. His thoughts are large as to religion, and could never be brought within the bounds of any ſect, nor will he be under the diſtinction of whig or tory, ſaying theſe names are only uſed to cloak the knavery of both parties." Hume.

Fletcher, in *Geography*, a townſhip of America, in Franklin county, Vermont, containing 200 inhabitants, having Cambridge on the S. E. and Georgia on the W.

Fletcher's *Nook*, a cape of America, on the coaſt of Main. N. lat. 43° 25′. W. long 70′ 29′.

FLETZ, or Flötz, among German miners, a term of high antiquity, generally denoting a layer of any kind of rock, the poſition of which approaches the horizontal line. The word, thus applied, being vague and inſignificant, it would ſcarcely claim our notice in this work, but for the more fixed and ſcientific meaning it conveys in the compounds "Fletz Mountains" (*Flötz gebirge*), and "Fletz-rocks" (*Flötz-gebirge-arten*), which terms, as proceeding from the country which may properly be called the cradle of mineralogy and geology, are now admitted into the technical dictionaries of moſt European languages. We too (in the ſucceeding article) have adopted the prefix "fletz," in preference to "ſecondary," which latter, (not to mention other objections againſt it,) cannot be adopted by thoſe who, with Mr. Werner, admit a formation of rocks, intermediate between the primitive and ſecondary rocks of other geologiſts.

With regard to the ſpelling here propoſed, it is to be obſerved that, although "flötz" with a diphthong may be conformable to the rules of modern German orthography, yet the ancient mode of ſpelling the word is "fletz;" and this we prefer, partly becauſe the ſound of the letter *ö*, as pronounced by the Germans, is foreign to the Engliſh language, and partly becauſe the old ſpelling and pronunciation (which latter is ſtill heard in ſeveral parts of Germany) are more correct, as they approach nearer thoſe of other words, which in various dead and modern languages equally convey the idea of a horizontal even plane, ſuch as *πλατυς*, *latus*, *flat*, *plat*, *fleet*, &c.

Fletz *Mountains*, *Fletz-Rocks*; *Flötz Gebirge*, *Flötz-Gebirge-arten*, Germ. The mountains and rocks to which theſe names are given by the German ſchool of geology, are obviouſly of much more recent origin than thoſe called primitive (ſee Rocks, *Primitive*). They bear more diſtinctly than theſe latter the marks of being depoſited from a fluid, and of their having been formed when animals and vegetables exiſted in abundance. They have their hiſtory imprinted in characters more legible than thoſe of all the other rocks, the alluvial alone excepted: but from the youngeſt fletz lime-ſtone, to the oldeſt of the primitive rocks we know, namely granite, the records before us become gradually more illegible, till at laſt not a character is found but the attempt to decipher it leads the obſerver into the mazes of fancy and ſurmiſe.

From the alluvial, the fletz rocks are diſtinguiſhed by all thoſe poſitive and negative characters that beſpeak an earlier origin, being the reſult of a general revolution that extended over the whole ſurface of the globe; while the former can, without any gratuitous aſſumption, be conſidered as partial formations produced by the detritus of all the others: they have originated, as it were, under the eye of the geologiſt, who diſcovers in their ſofter ſubſtance, in the compounds of loam, marle, &c. the remains of ſubſtances known to him, as belonging to the preſent creation, and ſwept together by partial inundations, by overflows of rivers, &c. (See Rocks, *Alluvial*). From the primitive, the fletz mountains are in general eaſily diſtinguiſhable: for while the former, (ſuch as the Hartz, the Saxon Erzgebirge, a great part of the Fichtelgebirge, &c.) uſually tower to a majeſtic height, divided up to their ſummits by ravines and chaſms, the fletz mountains are generally of a leſs bold and ſteep aſcent, and run along in more uniformly undulated ranges. Viewed on a large ſcale the fletz-rocks are much more compound than the primitive; but they appear much leſs ſo, and often of a perfectly homogeneous nature, when viewed in ſmall maſſes. Though lime-ſtone is already ſeen to occur in the primitive rocks, yet this formation owes its principal character to the ſiliceous and argillaceous earths, (from granite to clay-ſtone); while calcareous with argillaceous earth, appear to be the leading features in the compoſition of fletz-rocks. Very characteriſtic of theſe rocks are the petrifactions with which they abound, and which decreaſe in number as the fletz approaches the primitive formation where they are no longer obſerved. Theſe petrifactions conſiſt in part of vegetables, and ſhells of various marine animals, moſt of the prototypes of which no longer exiſt; and frequently one particular ſpecies occupies a ſtratum throughout a conſiderable tract of country, while the adjoining ſtratum is ſtocked with a ſpecies totally different from, and unmixed with the others. Bituminous foſſils, of rare and ambiguous occurrence in primitive rocks, have their principal depoſitories in fletz mountains. Thus coal, moſt frequent in the comparatively new formations, can ſcarcely be traced higher than to the oldeſt ſand-ſtone, where it becomes unfrequent and diſappears. But a great feature of the mountains under conſideration is their ſtratification, marked by many peculiarities not obſervable in other formations. The ſtrata generally run parallel with one another; their poſition, though ſometimes ſcarcely deviating from the horizontal, is often highly inclined; they accompany the ſides of primitive mountains, either partially, or they ſurround them; while the ſummit of the latter, projecting over the encompaſſing fletz-rocks, will often make the ſuperficial obſerver ſuppoſe to ſee a primitive rock ſuperincumbent on a more recent formation. Thus, for inſtance, we have the Schweitzerling, an old porphyry mountain, near Wettin, in the diſtrict of Halle, riſing in the ſhape of an inſulated maſs out of the ſurrounding fletz ſtrata. It has been ſaid above that fletz mountains are leſs rapidly riſing, and it may be added that they do not generally attain any conſiderable height, if we except ſome of thoſe belonging to the claſs which Mr. Werner calls the neweſt fletz-trapp formation, compriſing baſalt, wacke, &c. rocks, ſome of which, by other geologiſts, are claſſed with the genuine volcanic productions. If, however, the fletz mountains can be ſaid in general to poſſeſs many characters that keep them diſtinct from the primitive, this is not ſtrictly applicable to all of them; for there is a ſmall ſeries of rocks of an ambiguous nature, which, being often intermediate between the two formations, and participating of the characters of either, have frequently embarraſſed the framers of geological arrangements. Theſe rocks have been formed by Mr. Werner into a particular claſs, under the title *Ubergangs gebirge*, (ſee Transition Mountains); a diſtinction which is not admitted by Mr. Voigt and others.

As the ideas which the two laſt-mentioned geologiſts entertain relative to the origin of the fletz mountains have regulated their claſſification of the rocks belonging to that and the tranſition formation, it will be proper, before we proceed, to give a ſhort outline of their reſpective theories, as far as they relate to the ſubject under conſideration. Werner accounts for the difference that ſubſiſts between the rocks of his three firſt claſſes of the aquatic formation, from the oldeſt granite down to the neweſt fletz lime-ſtone, by the gradual diminution of the water on the ſurface of the earth. At that period, when the earth was in a chaotic ſtate, and entirely encompaſſed by the ocean, which contained their firſt materials, the primitive mountains were formed by the laws of cryſtallization. As the volume of the water gradually diminiſhed, and dry land made its appearance, in ſhort, when the earth paſſed into an inhabitable ſtate, a ſeries of rocks originated, which participate, in ſome meaſure, of the nature of the primitive, at the ſame time that they diſplay the firſt traces of remains of ſimple organic bodies that inhabited the ſea, and of mechanical depoſition, which could take place only near the ſurface of the water. The increaſe of theſe mechanical depoſitions correſponded to the diminiſhing level of the ocean, from the tranſition to the more recent periods, each of which furniſhed the ſucceſſive fletz-ſtrata with their peculiar contingents of organic bodies, moſt of which remain only as petrifactions. It is in this manner that the celebrated profeſſor of Freiberg aſſigns to all the known rocks their reſpective places in his arrangement, the whole forming an uninterrupted ſeries from the granite to the youngeſt of the alluvial mountains. There is, however, another aſſemblage of rocks allied to thoſe of the fletz formation, and which, (being ſuperimpoſed promiſcuouſly on other formations, from the primitive to the moſt recent,) is kept ſeparate by Werner, as one of the ſubdiviſions of that claſs; to this belong baſalt, the kindred wacke, porphyry-ſlate, amygdaloid, and other rocks enumerated by Werner as members of the fletz trapp formation. The whole of this is ſuppoſed by him to owe its origin to a poſterior deluge, or a ſudden riſing and retiring of water, and is conſidered as the neweſt member of the fletz formation.

Mr. Voigt, who has given a claſſification of rocks, though he reject the tranſition period adopted by Mr. Werner, ſtill divides the fletz rocks into thoſe of older, and thoſe of newer formation. As his ideas on this ſubject are but little known to the Engliſh reader, we ſhall here give a ſhort ſketch of his theory, omitted under the article Earth. His hypotheſis is, that in its primordial ſtate, our planet was entirely encompaſſed by water, in which, without having either mountains or valleys, it floated like the yolk in the albumen of the egg. Of the ſubſtances that compoſed the earth in this ſtate of ſubmerſion, ſome were apt to undergo fermentation, to ignite, to give out elaſtic vapours and gaſes, and to produce exploſions. It was by theſe energies that maſſes were raiſed from the bottom of the ocean towards its ſurface, where they formed iſlands, which afterwards conſtituted the principal ranges of primary mountains. The body of water diſplaced by theſe elevated maſſes filled up the ſpace the latter originally occupied; and this diminution of the water was the cauſe of the appearance of an additional portion of dry land. Of the detritus of theſe primary mountains, and by the depoſition of mineral ſubſtances, ſtill diſſolved or floating in the ocean, the fletz mountains were produced, which formed layers ſurrounding the original iſlands.

As according to this theory (which the reader will obſerve is not unlike that of Lazzaro Moro), no conſiderable time intervened between the formation of the primary and fletz mountains, it is no matter of ſurprize that the neweſt of the former ſhould ſhow conſiderable affinity to the oldeſt of the latter formation; and that intermediate kinds of rocks ſhould have been formed, which appear of an ambiguous origin only when viewed out of connection with the reſt.

But, though our author does not admit tranſition rocks in the ſenſe in which this word is taken by ſome geologiſts, he nevertheleſs thinks that there are ſtratified or fletz-rocks that, ſtrictly ſpeaking, might be referred to the primary; namely, ſuch ſtrata of lime and ſand-ſtone, that, according to his theory, were raiſed at the ſame time with the primary mountains on which they were depoſited at the bottom of the ſea. To this diviſion belong thoſe ſtrata which are ſometimes obſerved in ſuch places, which, from their elevation, cannot be ſuppoſed to have been reached by the water when the regular fletz rocks were depoſited. Thus, for inſtance, we ſee on the primitive granite mountains of the Hartz, not far from Clauſthal, a calcareous rock called the Hübigenſtein, which conſtitutes a reef almoſt entirely made up of corals, which prove its having been formed at the bottom of the ocean. Not leſs remarkable in this reſpect is the Hanskühnen-burg, a huge ſand-ſtone rock, on the high Bruchberg, one of the Hartz mountains, at an elevation which precludes the idea of its having been produced at the ſame time with the younger fletz-ſand-ſtone, from which it differs alſo in its external characters. In the ſame manner, our author refers to the older fletz rocks thoſe ſtrata that are met with on the declivities and in the chaſms of high primitive mountains, at a greater elevation than the younger fletz formation reaches; and which were depoſited ſoon after the ſummits of the primitive mountains were raiſed above the ſurface of the ocean. The *firſt* of Voigt's older fletz-rocks is what he calls the *old ſand-ſtone*, the ſame which has been above alluded to, and which is totally differeut from that of Werner, as we ſhall ſee hereafter. The old ſand-ſtone of Voigt is of a much rougher nature than the common fletz ſand-ſtone, and always occurs in very elevated ſituations. 2. The principal *coal formation*, conſidered by Werner as of much later date. The geognoſtic relation of this intereſting inflammable ſubſtance, much as has been written on it, is ſtill involved in obſcurity; more recent obſervations appear, however, to be in favour of Voigt's ideas reſpecting it. 3. *Slate-clay* (Schieferthon) nearly of the ſame age with coal and its ſand-ſtone, it being found alternating with theſe latter, and in general occurring under ſimilar circumſtances. In this rock are found the moſt perfect impreſſions of vegetables which the earth produced in its primordial ſtate; moſtly belonging to the arundinaceous and fern-tribe, the former of which required nothing for their growth but water, the latter nothing but naked rocks. 4. The *rough lime-ſtone*, as Mr. Voigt calls it, of yellowiſh, and ſometimes ſmoke-grey colour, coarſe grain, conſiderable hardneſs, and deſtitute of petrifactions. It never occurs diſtinctly ſtratified, but generally as inſulated amorphous maſſes and rocks in more elevated ſituations. The higheſt maſſes are ſeen at Reichl in the foreſt of Thuringia, where they reſt on high porphyry mountains; and lower down it frequently encompaſſes thoſe mountains in groteſque groups of maſſy rocks. Laſius has deſcribed the ſame kind of lime-ſtone in his work on the Hartz mountains. Some kinds of rocks, deſcribed by pupils of Werner, as tranſition lime-ſtone, appear to be the ſame with the oldeſt lime-ſtone of Voigt.

From what has been ſaid, (and from what remains to be ſaid under the article Transition-Rocks), it appears that, however the followers of different geological ſyſtems may be agreed with regard to the nature of primitive and fletz mountains in general, their opinion will be found to diverge at thoſe points where adjoining diſtinct formations, by mutually borrowing of each other geognoſtic and oryctognoſtic characters, baffle diſcrimination, and cauſe theoriſts to draw lines of demarcation that are more or leſs derived from hypothetical propoſitions.

In order to illuſtrate the different ſtrata of the fletz formation more generally acknowledged as ſuch, we ſhall caſt a view over the tract of country extending in an eaſtern direction, from the foreſt mountains of Thuringia to the Hartz, and enumerate them in the order in which they ſucceed each other, according to the obſervations of Mr. Voigt. This ſucceſſion, however, ſhould not be ſuppoſed to prove exactly the ſame in all parts of the world: the fact is, that often entire ſtrata, eſpecially ſubordinate ones, are wanting without being ſupplied by others, aud ſometimes ſtrata are ſubſtituted in their room that are foreign to other countries, ſuch as the vaſt rock-ſalt ſtrata in Hungary, Poland, the chalk in England, &c.

The ſtrata, which almoſt without interruption fill up the ſpace between the two above mentioned ranges of mountains, whoſe diſtance from each other is about twenty-two miles, are the following:

The old red ſand ſtone of Werner, called by the miners of Germany, das rothe Todt-liegende (*i. e.* the red dead or barren rock). It occupies the loweſt ſituation of all the newer fletz rocks. In the Hartz it reſts on grey-wacke, one of the tranſition rocks of Werner, but referred by Voigt to the primitive. (See Grey-Wacke.) Where this ſand-ſtone baſkets out it appears in pretty high mountains, and often covers conſiderable tracts of land, as, for inſtance, at Eiſenach, Eiſleben in Mansfield, &c. It is often difficult to diſtinguiſh it from the newer fletz ſand-ſtone, when not viewed in its connection with the formations that accompany it (ſee Sand-stone); but in general it is much harder, and of a coarſer grain than the latter, often appearing as conglomerate; and its colour is uſually brick and cochineal red, from which its name is derived; but is alſo found grey. The coarſe grained often alternates with fine grained varieties, in layers of various thickneſs. Mr. Jameſon inſinuates that, if the obſervations lately made in Germany by Karſten, Buch, and others, be correct, much of the red ſand-ſtone of England will be found to belong to this old ſand-ſtone formation. This ſtratum, in the above-mentioned tract of country, is regularly followed by

Bituminous Marl-Slate, for the deſcription of which, ſee Marl-Slate, *Bituminous*.

The moſt diſtinct line is drawn between this and the preceding ſtratum. It bears evident marks of being depoſted on the old red ſand-ſtone from a calm and undiſturbed fluid. Impreſſions of fiſhes are frequently ſeen in it, but none of vegetables. It is rich in metals, eſpecially copper ore, whence the appellation *copper ſlate-fletz*; ſometimes the metallic veins, thoſe of copper and ſilver, penetrate through the bituminous marl-ſlate to the ſurface of the old ſand-ſtone ſtratum underneath, which thus becomes metalliferous. (See SAND ORE.) The bituminous marl-ſlate is claſſed by Werner under his firſt lime-ſtone formation, as is likewiſe the

Zechſtein, which reſts on the preceding. This is a coarſe ſplintery aſh-grey compact lime-ſtone (in ſome places it approaches the nature of indurated marle); it does not paſs over into the adjoining ſtrata, but is ſeparated from them by a marked line. It contains neither bitumen nor metals, nor impreſſions of fiſhes as the bituminous marl-ſlate. This ſtratum, and the two following, are wanting in ſome parts of the foreſt of Thuringia, but their places are ſupplied by a bed of yellowiſh-brown lime-ſtone, accompanied by conſiderable beds of brown iron ſtone, and containing a great quantity of the petrifaction called Anomia gryphus. The zechſtein is ſucceeded, upwards, by a ſtratum of

Gypſum, called the firſt fletz-gypſum by Werner. It is compoſed of granular and compact gypſum, of a white and grey colour, often variegated and veined, penetrated, by bitumen, and containing ſelenite, fibrous gypſum, ſtink-ſtone, &c.; but petrifactions are ſeldom found in it. See GYPSUM *Compact*, *Granular*.

By what chemical combination it happened that the zechſtein-ſtratum, being a carbonate of lime, was immediately ſucceeded by a combination of lime with ſulphuric acid, is a queſtion not eaſily to be anſwered; but the circumſtance is the more ſtriking, as this ſulphate is immediately ſucceeded by another carbonate, called

Stink-ſtone, a ſtratum conſidered by Werner as ſubordinate to his firſt fletz-gypſum (See STINK-STONE.) On this reſts another,

Sand-ſtone, which appears to belong to the variegated or ſecond ſand-ſtone formation, as characterized by Werner. Its colour is partly yellowiſh-white, partly light grey-brown and red. This is ſucceeded by another ſtratum of

Gypſum, being the ſecond fletz-gypſum, which, though in ſome parts of Thuringia it aſſumes conſiderable thickneſs, is entirely wanting in others, as for inſtance in the principality of Fulda. But a more conſtant attendant on the laſt-mentioned ſand-ſtone is the ſuperincumbent ſtratum of

Clay, moſtly of a brown-red colour, often intermixed with other tints, ſuch as light mountain-green and blueiſh-grey. Mr. Voigt obſerves, that moſt rivers of Thuringia, Franconia, and Heſſia have cut their way through the fletz lime-ſtones, through this reddiſh clay and the gypſum (where they met with it) down to the laſt-mentioned ſand-ſtone; and in moſt low grounds and valleys of thoſe countries, the arable land conſiſts almoſt entirely of that clay, which, though unfavourable to vegetation in its pure ſtate, becomes the moſt fertile ſoil when mixed with ſand, gypſum, and lime, as is the caſe in the neighbourhood of Erfurt, and in ſeveral other parts of Thuringia.

The common clay belongs partly to the alluvial. partly to the fletz formation, and principally to that ſub-diviſion of the latter called the neweſt fletz trap formation by the Wernerian ſchool. The uppermoſt ſtratum, and the moſt conſiderable next to ſand-ſtone, is

Fletz-lime-ſtone. Like the ſand-ſtone, and almoſt all other rocks of the fletz formation, it is compoſed of ſeveral ſtrata, each conſtituting a different variety of compact lime-ſtone. Thoſe of Thuringia, according to Mr. Voigt, are, 1. A compact lime-ſtone of yellowiſh-white or blueiſh-grey colour, of even and earthy fracture, wrought as a marble at Weimar. Except cornua ammonis, few petrifactions are found in it; but often indiſtinct, vermicular, and ſerpentine elevations are diſcovered on the planes of its principal fracture. 2. A light aſh-grey lime-ſtone, entirely compoſed of ſmall petrified pectinites, and called by the provincial name of toad-eye. 3. A light aſh-grey ſplintery lime-ſtone, with here and there ſome petrifaction, and alſo containing nodules of grey flint, which, however, on account of its fracture not being conchoidal, does not anſwer the purpoſe of making gun-flints of. (See FLINT, GUN-FLINT.) 4. Compact lime-ſtone, apparently compoſed of irregularly cubic fragments, into which it ſeparates on being ſtruck upon; it is by far the moſt common variety in thoſe parts. 5. Lamellar lime-ſtone, fiſſile into thin layers; only found in the vicinity of Jena by profeſſor Voigt. Theſe five layers, conſtituting the above fletz lime-ſtone ſtrata, follow each other, though in irregular ſucceſſion. The whole formation correſponds with that of the ſecond fletz or ſhell lime-ſtone of Werner, ſo called from containing a great number of petrified ſhells, but ſeldom any other ſecondary foſſils; though in the upper of the beds alſo petrifactions of fiſhes, crabs, vermiculites, &c. are frequently met with. It is in this lime-ſtone that moſt caverns are found containing remains of land animals. Various diſtinct lime-ſtone formations are probably included in this; but the obſervations of well-informed travellers on this ſubject are as yet too ſcanty and imperfect to be turned to account by the geologiſt.

Mr. Werner has adopted twelve formations in the claſs of the fletz rocks. 1. Firſt or old red ſand-ſtone. 2. Firſt or oldeſt fletz lime-ſtone. 3. Firſt or oldeſt fletz-gypſum. 4. Second or variegated ſand-ſtone. 5. Second fletz-gypſum. 6. Second fletz or ſhell lime-ſtone. 7. Third fletz ſand-ſtone. 8. Rock-ſalt formation. 9. Chalk formation. 10. Fletz trap formation. 11. Independent coal formation. 12. Neweſt fletz-trap formation.

The principal of theſe formations being illuſtrated by the above ſeries of ſtrata in Thuringia, we ſhall here add a few words on thoſe that are not found in that diſtrict. Firſt, with regard to the ſecond of Werner's formation it is to be obſerved, that in ſeveral countries a ſtratum of porous grey lime-ſtone is found ſubordinate to it, called *rauch wacke*, which is wanting in that part of Thuringia; and the ſame is the caſe with *roe-ſtone*, conſidered as ſubordinate to the fourth of Werner's formations, and of which conſiderable ſtrata are ſeen in other countries, though it does not appear to conſtitute an independent formation. The ſeventh formation, being the third fletz ſand-ſtone, is repreſented by the commentators on Werner's arrangement as a very extenſive one; but its geognoſtic relations do not appear to be ſufficiently determined. It is ſuppoſed to be of much newer origin than the other preceding ſand-ſtone formations; it exhibits many traces of coal; is conſtantly of a white colour, and as negative characters are given its not containing any clay-galls, or gypſum, its not alternating with ſand-ſtone ſlate, or roe-ſtone. The hills formed by this ſand-ſtone have a peculiar appearance: they are conical and ſteep, and exhibit in the variouſly ſhaped and arranged maſſes of which they are compoſed, a ſtriking ſcene. "One of the moſt ſtriking appearances of this kind," ſays Mr. Jackſon, "is at Andernaeh in Bohemia, where we obſerve numberleſs cones, pyramids, and pillars, ſometimes iſolated, ſometimes joined together, and from two to three hundred feet high, ſpreading over a conſiderable tract of country. In other places, caverns or grottos appear, from which there iſſue many ſtreams, that give riſe to waterfalls, and thus increaſe the beauty of this ſtriking ſcene. Theſe caverns are wide at the mouth, but become very narrow towards their farther extremity, and are generally very ſhort. This form ſhews, that they owe their exiſtence to external agents, particularly water. A more near examination diſcovers, that the ſeams of the ſtrata of the different iſolated maſſes correſpond to each other, which renders it probable that all theſe cones, pyramids, and pillars, have been formerly united, and that the perpendicular rents or fiſſures have given riſe to this diſunion, which has been afterwards increaſed by the action of the air, and by the water carrying away the ſofter or more looſely aggregated parts of the ſand-ſtone, and leaving the harder parts in theſe various forms. A ſimilar appearance of ſand-ſtone occurs near Tunis; and, from its ſtriking reſemblance to ruins, is deſcribed as the remains of a great city, by ſome travellers who ſaw it at a diſtance. In the land of the Namaquas in ſouthern Africa, and on the banks of the Wolga, there are ſimilar appearances. This formation paſſes through Saxony, Luſatia, into Sileſia and Bohemia, and is wrapped around almoſt the whole of the Rieſen-Gebirge."

An excellent characteriſtic of this ſand-ſtone formation, as it appears in Bohemia, we poſſeſs from the able pen of Dr. Reuſs.

Another formation, not in the above ſeries of Thuringian fletz-rocks, nor, indeed, abundantly met with in many parts of Germany, is the rock-ſalt formation. It generally occurs with the firſt fletz-gypſum; and in the territory of Salines of Upper Auſtria may be conſidered as ſubordinate to the firſt fletz limeſtone, the principal formation of that country. It is almoſt conſtantly accompanied by beds of that clay called by Humboldt *ſalt-clay*, which being a variety but little underſtood, we ſhall here add Buch's deſcription of that occurring at Hallſtadt, Iſchel, &c. in the juſt-mentioned Auſtrian territory. Its colour is ſmoke-grey, and it alſo occurs greyiſh-black and greyiſh-white, more ſeldom reddiſh-brown and tile-red. It is perfectly dull, but always mixed with minute glimmering ſaline particles; fracture fine earthy, and in large pieces, flat-conchoidal; fragments indeterminately angular. It is perfectly opaque, does not ſoil, is ſoft, approaching to very ſoft, rather ductile, and not particularly heavy. Its ſtreak is light aſh-grey. This clay is ſaid to become of a darker colour when expoſed to the air, which is the more ſingular, as, according to Humboldt's experiments, it eagerly abſorbs the oxygen of the atmoſphere. It is quite penetrated by ſalt; and the ſmall angular fragments, approaching more or leſs to the cubical form, are often ſeen coated with a cruſt of ſaline particles. Rock-ſalt is generally found in huge maſſes, in low parts between mountains, or at their foot, ſuch as in Tranſylvania; though vaſt depoſitions of it alſo occur in high ſituations, ſuch as at the foot of the elevated range of mountains which, to the north-weſt from Tibet, encompaſſes Cachemire; a ſituation equally elevated with a great part of the European Alps. For a more detailed account of this intereſting formation, ſee the article Rock *Salt*.

The ſeventh of Werner's fletz formations, that of *chalk*, is but little underſtood with regard to its geognoſtic relation: all we know is, that its occurrence in low ſituations on the ſea coaſt, where it forms high and rugged cliffs, and its earthy aſpect, beſpeak its more recent origin. In England it occurs in conſiderable ſtrata, forming cliffs and high mountains. We do not know much of its occurrence in Germany; it is, however, ſaid to be found at Luneburg, alternating with thin ſtrata of clay. Chalk contains no metals except ſome iron ores, and but few petrifactions have been found in it; but the nodules of flint imbedded in this rock are almoſt characteriſtic of it. See Flint.

As to the eleventh or independent coal formation, we have already had occaſion to mention it as one of Mr. Voigt's older fletz-rocks. We ſhall here add a few words on Mr. Werner's coal formation in general. According to Emmerling, who gives us an expoſition of the Wernerian ſyſtem, the coal-mountains (Kohlen-gebirge) are to be divided into four diſtinct formations: to the oldeſt belong the coal ſtrata occurring in fletz-lime-ſtone, as, for inſtance, thoſe of the Bratenberg, near Kratigen, on the Thuner ſea. Younger than this, but of the ſame age with one of the newer ſand-ſtone formations, is the independent coal formation: of ſtill more recent origin is the coal which is ſubordinate to the trap formation: and the neweſt of all is that contained in alluvial mountains. Mr. Jameſon, on the other hand, informs us that Werner has aſcertained three diſtinct formations, without including the beds of coal found in ſand-ſtone and lime-ſtone formations, which latter, he ſays, are in general of no importance. According to that new arrangement, therefore, the independent coal formation is the oldeſt; the ſecond is that of the neweſt fletz-trap formation; and the third, that which occurs in alluvial land. Again, according to later accounts, it is underſtood that Mr. Werner has adopted another arrangement of that formation which approaches to that of Karſten, who makes the independent coal formation dependent on the older ſand-ſtone, and that of the lime-ſtone ſubordinate to the firſt fletz, or Alpine lime-ſtone. From theſe frequent changes it would appear that the hiſtory of the different formations of coal and their relative age are ſtill involved in conſiderable darkneſs. What is known with certainty amounts, we ſuppoſe, to this, that coal is of early as well as of late formation; the former is found under the older ſand-ſtone, ſometimes even reſting on primitive rocks; the latter, on the newer ſand-ſtone in the vicinity of the rocks that belong to Werner's younger fletz-trap formation. We are happy to find that Mr. Jameſon has promiſed to publiſh the reſults of his obſervations on the relation in which theſe formations of coal ſtand to the other fletz-rocks; and, indeed, many doubts remain to be cleared up reſpecting the determination of this point, as well as of many others intimately connected with the natural hiſtory of thoſe important mineral depoſitions.

The laſt of Werner's formations of fletz-rocks is called the neweſt fletz-trap formation, compriſing principally thoſe enigmatous maſſes, known by the names of baſalt, porphyry ſlate, wacke, and amygdaloid; rocks which, though they contain no organic remains, cannot be ranked with the primitive, ſince they reſt both on theſe and the fletz-mountains; rocks which are conſidered by many geologiſts as the principal products of volcanic agency, but which, according to Werner, are the reſults of a deluge or ſudden riſe of the waters at a more recent period than that in which the other fletz-rocks were formed. Beſides the juſt-mentioned, the following rocks are referred to this formation: green-ſtone, grey-ſtone, pitch-ſtone, compact feldſpar, obſidian, pumice; and thoſe that are mechanical depoſitions, *viz.* gravel, ſand, bituminous wood, brown coal, clay, and trap-tuf; to which articles we refer our readers, as likewiſe to the article Trap,

For further remarks on the ſubject of fletz ſtrata, and on the order in which they ſucceed each other in various parts of the world, ſee Strata.

Not unconnected with the hiſtory of the ſtrata of fletz-mountains are thoſe remarkable appearances well known to the miners under the appellations of *ſlips*, *ſhifts*, or *faults*. They are diſlocations that have happened to the ſtrata, after being divided by vertical fiſſures; the oppoſite ſides of the fiſſures, which are generally filled up, do no longer correſpond, the ſtrata of the one being either above or below thoſe of the other ſide, with which they were connected before the diſturbance took place. See the articles Slip and Vein.

FLEUKAN, Flookan, in *Mining*, denotes rubble and unconſolidated earth contained between the ſides of ſtrata vertically divided by a fiſſure and diſlocated. See Slip and Vein.

FLEUR-DE-LIS, Fleurette', *Fleuronné*, and *Fleury*, in *Heraldry*. See Flory.

FLEURENCE, in *Geography*, a town of France, in the department of the Gers, and chief place of a canton, in the diſtrict of Lectoure, ſeated on the Gers; 4 miles S. of Lectoure. N. lat. 43° 51′. E. long. 0° 15′. The place contains 3,021, and the canton 12,159 inhabitants, on a territory of 300 kiliometres, in 22 communes.

FLEURIEU, Cape, a cape on the W. coaſt of North America, ſo called by Perouſe. It is ſuppoſed to be the ſame with that which captain Dixon called Cape Cox. N. lat. 51° 45′. W. long. 128° 55′.

FLEURTIS, a term in French *Muſic*, now obſolete. It implied florid counterpoint, ſuch as is not note againſt note, but compounded of notes of different value and proportion as to meaſure. It likewiſe implied the graces or ornaments of a melody when too ſimple. See Broderies, Doubles, Variations, and Passages.

FLEURUS, or Florus, in *Geography*, a village of France, in the department of the Sombre and Meuſe, remarkable for having been the place near which three battles were fought, *viz.* the firſt Auguſt 10, 1622, the ſecond between the allies and the French, and the third between the Auſtrians and the French, in June 1794, in which the former were defeated with great loſs; 6 miles N. E. of Charleroy.

FLEURY, Andrew Hercules de, in *Biography*, cardinal and prime miniſter of France, was born in 1653. He was educated at Paris in the Jeſuits' college, and became, at a proper age, canon of Montpellier, and doctor of the Sorbonne. Poſſeſſing an agreeable perſon, and thoſe manners that never fail to recommend a man at court, he obtained the poſt of almoner to the queen, and afterwards to the king. In 1698, he was nominated to the biſhopric of Frejus, when Lewis XIV. paid him a high compliment; "I have made you wait a long time," ſaid the monarch, "but you have ſo many friends, that I was deſirous you ſhould be obliged for your advancement to no one but myſelf." Fleury, however, was not always pleaſed with his ſituation, the dioceſe was in a diſtant and diſagreeable country, and he became diſguſted, probably, for the want of that kind of ſociety which was conformable to his wiſhes. In a letter to a friend he ſubſcribed himſelf, "Fleury, by divine *indignation*, biſhop of Frejus." He nevertheleſs held the ſee many years, and on one occaſion, when the allies under the duke of Savoy and prince Eugene made an irruption into France, the biſhop, by his prudent conduct and engaging manners, ſaved his city and its neighbourhood from pillage, and perſuaded the generals to be contented with a moderate contribution. He was nominated by the will of Lewis XIV. preceptor to his ſucceſſor, the young king, with whom he ſo completely ingratiated himſelf, as to inſpire him with a profound eſteem and attachment. Nor was he leſs anxious to pay his court to the marſhal Villeroy, the king's governor, and to the regent the duke of Orleans, by the moſt reſpectful demeanor. The regent would have conferred upon him the archbiſhopric of Rheims, but he refuſed that ſplendid promotion, dreading, perhaps, that it might be a pretext for removing him from the perſon of the king. At the death of the regent, it was through his recommendation that the duke of Bourbon was appointed prime miniſter, though in truth it was Fleury who governed, by means of the influence which he poſſeſſed over the king's mind. This was put to the trial, when the duke, urged by his miſtreſs, attempted to exclude the biſhop from his private conſultations with the king. Fleury immediately retired, and wrote to his ſovereign a letter filled with expreſſions of tenderneſs and regret, the effect of which was ſuch, that it was impoſſible to pacify the king, till he was recalled and reſtored to his preſence. From this time Fleury became chief miniſter, without aſſuming the title and apparent functions which pointed out the premier. He was created cardinal in 1726, and at the age of ſeventy-three devoted the remains of life, which had hitherto challenged the public eſteem, to the ungrateful toils that attend miniſterial power, and at a period when the moſt ambitious are ready to ſeek repoſe, he avowedly entered the liſts of fame. The ſpirit of his adminiſtration was economy in the public revenue, and the preſervation of peace. The pacific diſpoſition of this great man correſponded with the immediate welfare of France, and he quietly left the kingdom to repair its loſſes, and to enrich itſelf by an advantageous and extenſive commerce, without making any innovations. This tranquil and unenterprizing diſpoſition was not calculated to gain the reſpect of a nation like the French, who have ever been more deſirous of being thought great, than anxious to be really proſperous. Peace the cardinal could not always attain, but he terminated in three years the war of 1733 with the emperor Charles VI., and obtained for France the important acquiſition of Lorraine. In the year 1741, Frederic III., king of Pruſſia, laid claim to four duchies in Sileſia; he ſuddenly entered that country, defeated the Auſtrians near Molwitz, and occupied the whole of the duchy. This victory was the ſignal for war to France; but Fleury, now in his eighty-fifth year, was but little inclined to relinquiſh the pacific ſyſtem that he adored, but he was overwhelmed by the impetuoſity of the mareſchal and chevalier de Belleiſle, who repreſented to Lewis that the period was now arrived of finally breaking the power of the houſe of Auſtria, and exalting that of Bourbon on its ruins; and that ſo favourable an opportunity never again would offer of raiſing the elector of Bavaria to the imperial throne. The monarch aſſented, and cardinal Fleury, tottering on the brink of the grave, yet ſtill deſirous of keeping his power, ſanctioned with his name an enterprize he had never approved, and conſented to preſide over a people whoſe councils he was not permitted to direct. This war embittered the cloſe of his life, which, however, by habitual temperance and natural cheerfulneſs, was protracted to nearly his ninetieth year. He died in 1743, and was buried in the church of the Louvre at the king's expence. In private life he was ſimple and modeſt, content with a moderate income, and remote equally from avarice and oſtentation. Moreri. Hiſtoire de France.

Fleury, Claude, was born at Paris in the year 1640. His father was an eſteemed advocate, and he intended his ſon for the ſame profeſſion. Claude, indeed, was admitted an advocate of the parliament of Paris in the year 1658, and from this period, for the next nine years, he diligently applied himſelf to the ſtudy of juriſprudence, and the belles lettres; after this he determined to embrace the eccleſiaſtical ſtate. To forward himſelf in this new courſe he attended the conferences which the celebrated Boſſuet held at his houſe on the ſcriptures, and on ſubjects of religion and literature. During his interviews with this excellent man he tranſlated his well-known work, entitled, "The Expoſition of the Catholic Doctrine." Fleury ſoon acquired a high character for abilities and literature, while he was equally the object of reſpect for his piety and virtues. In the year 1672, he was choſen preceptor to the princes of Conti, and afterwards ſuſtained the ſame character with reſpect to the count de Vermandois, the favourite natural ſon of Lewis XIV. In the year 1689, the king fixed upon him as the fitteſt perſon to be aſſociated with the great Fenelon in the education of his legitimate offspring, and made him ſub-preceptor to his grandſons, the dukes of Burgundy, Anjou, and Berry. In the year 1696, he was admitted a member of the French academy, at the meetings of which he aſſiſted as often as his other duties and engagements would permit. He had not been overlooked by the king in church preferment; but being a very diſintereſted man, he was content with comparatively ſmall emolument, and ſought nothing for himſelf till the priory of Argenteuil became vacant, which, from its proximity to Paris, offered a commodious retreat for ſtudy within reach of deſirable ſources of aſſiſtance and information. This benefice the abbe Fleury obtained from the king without difficulty; at the ſame time he reſigned an abbacy into the ſovereign's hands which he had held before. In his retreat at Argenteuil he continued till the year 1716, when he was drawn out of it by the duke of Orleans, the regent of the kingdom, after the death of Lewis XIV. to occupy the place of confeſſor to the young king. His own infirmities, and the intrigues of the Jeſuits, obliged him to reſign his office in the year 1722, and in the following year he died, leaving behind him a character eſtimable for extenſive learning, firm and nice integrity, true modeſty and candour, great purity and ſimplicity of manners, and ardent and unaffected piety. He was author of numerous works of merit, but his moſt conſiderable and important, the fruit of thirty years ſtudy, was his Eccleſiaſtical Hiſtory, in 20 vols. 12mo., of which the firſt was publiſhed in the year 1691, and the laſt in the year previouſly to his death. This work has been publiſhed ſince his death in 13 vols. 4to. It contains the hiſtory of the Chriſtian church, from the earlieſt times to the council of Conſtance in 1414: his facts are collected with great induſtry and impartiality from the beſt authorities, and they are, in general, combined in a ſimple and unornamented ſtyle. Moreri. Hiſt. de France.

Fleury, in *Geography*, a town of France, in the department of the Loiret; 2 miles N. of Orleans.—Alſo, a town of France, in the department of the ſtraits of Calais; 4 miles N.W. of St. Pol.

FLEWS, in *Rural Economy*, a name ſometimes provincially applied to the phlemes employed in bleeding cattle.

FLEXIBLE, in *Phyſics*, is applied to bodies that are capable of being bent, or changed from their natural form and direction.

A body is not capable of being inflected or bent, unleſs the whole thereof be at reſt. In bending a body, it conſtitutes, as it were, two levers; and the point it is to be bent in, is a fulcrum; hence, as a moving power, the farther it is from the fulcrum, it acquires a greater force; the longer the flexible body is, the eaſier it is bent.

FLEXION, in *Anatomy*, the act of bending, or the attitude into which any part of the body is brought by the action of the flexor muſcles. When the parts compoſing an articulation are ſo ſituated with reſpect to each other, as to form one ſtraight line, the joint is ſaid to be extended: when they are moved ſo as to form an angle with each other it is bent. Some joints, as thoſe of the hip, knee, and elbow, admit of being bent only in one direction; and from this bent attitude, they can be moved in the oppoſite courſe only ſo far as to bring the two parts of the limb into the ſame ſtraight line. In other caſes, as at the wriſt, motion is almoſt equally free in both directions, from the attitude in which the limb deſcribes a ſtraight line. Yet here the term flexion is confined to one of theſe motions; and the other is called extenſion, although the joint is not then ſtraight.

FLEXOR, a name given to thoſe muſcles, particularly of the wriſt, fingers, and toes, which have the office of bending thoſe organs: they are the antagoniſts of the extenſors.

Flexor *brevis minimi digiti manus*; flexor proprius; flexor parvus, Alb.; carpo-metacarpien. This is ſometimes wanting, and in all caſes it is a very ſmall muſcle. It ariſes from the annular ligament and os unciforme, is ſituated at the ſide of the abductor minimi digiti, and inſerted in company with it into the outer and anterior part of the firſt phalanx of the little finger. It is covered by the ſkin, and by the palmaris brevis, and covers the adductor oſſis metacarpi minimi digiti. It will bend the firſt phalanx of the little finger on the metacarpus.

Flexor *brevis minimi digiti pedis*; parathenas minor of Winſlow; tarſo-phalangien du petit orteil. This muſcle, ſituated within the abductor minimi digiti, has an elongated form, and is thicker in the middle than at the two extremities. It is attached, by means of aponeurotic fibres, to the under ſurface of the tarſal extremity of the laſt metatarſal bone, and to the ſheath of the peroneus magnus. Advancing forwards, it firſt increaſes in ſize, and then diminiſhes again, and is fixed to the metatarſal extremity of the firſt phalanx of the little toe, adhering cloſely to the joint. It is covered by the abductor, and by the palmar faſcia; while its ſuperior ſurface correſponds to the laſt metatarſal bone, and to the interoſſeous muſcle of the little toe. It bends the little toe on the metatarſus.

Flexor, *Carpi radialis brevior*
Flexor, *Carpi radialis longior* }. See Carpi.
Flexor, *Carpi radialis ulnaris*

Flexor *brevis pollicis manus*; thenar of Winſlow; carpo-phalangien; is a ſhort muſcle belonging to the ball of the thumb, and placed within the opponens pollicis. It has two origins, one from the annular ligament and os trapezium, the other from the os magnum and the third metacarpal bone. The two fleſhy portions of which it conſiſts run parallel to the metacarpal bone of the thumb, and unite at the oppoſite end, ſtill leaving a channel between them for the tendon of the flexor longus. It is inſerted into the two ſeſamoid bones of the thumb, being connected to the abductor and adductor muſcles of this organ. The abductor pollicis, the ſkin, the tendon of the flexor longus, that of the flexor profundus, and the two firſt lumbricales, cover this muſcle externally. It covers the firſt metacarpal bone, the tendon of the flexor carpi radialis, and the firſt interoſſei. This muſcle will bend the articulation between the metacarpal bone and the firſt phalanx of the thumb; and it will alſo draw the metacarpal bone towards the carpus.

Flexor *brevis pollicis pedis*; flexor brevis pollicis; thenar; tarſo-phalangien du pouce; is a ſhort and thick muſcle, ſimple behind, and bifurcated in front, and placed on the inferior ſurface of the firſt metatarſal bone. It ariſes by a flattened, but clearly marked tendon, from the under ſurface of the os calcis and two of the cuneiform bones, and the ligaments which join theſe. It is alſo attached to the plantar faſcia, where that covers the flexor brevis digitorum pedis, and the abductor pollicis. The fleſhy fibres, collected into a thick faſciculus, marked below with a groove for the tendon of the flexor longus, proceed forwards to the great toe, and are inſerted in two diviſions. The inner and largeſt, cloſely connected to the abductor, is fixed with it by tendinous fibres to the internal ſeſamoid bone, and to the correſponding extremity of the firſt phalanx. The external, which is ſmaller, is fixed to the external ſeſamoid bone. Both are cloſely attached to the ſynovial membrane of the articulation, which joins the great toe to the firſt metatarſal bone. Its upper ſurface is covered by the firſt metatarſal bone, and by the tendon of the peroneus longus; its under ſurface reſts on the tendon of the flexor longus and the plantar faſcia. By bending the great toe at its metatarſal articulation, this muſcle contributes to render the ſole of the foot concave.

Flexor *digitorum pedis acceſſorius*. See Flexor *digitorum pedis longus*.

Flexor *digitorum ſublimis*; ſublimis, Alb.; flexor perforatus; epitrochlo-phalanginien; fléchiſſeur digital ſuperficiel. This muſcle is thick, elongated, and flattened. It ariſes, 1ſt, by means of the common tendon, from the internal condyle of the humerus, and then from the correſponding lateral ligament, and from the coronoid proceſs of the ulna, by ſhort aponeurotic fibres; 2dly, from a ſeptum which ſeparates it from the flexor carpi ulnaris; 3dly, by tendinous fibres from a conſiderable portion of the front edge of the radius, between the ſupinator brevis and the flexor pollicis longus; 4thly, from ſepta which ſeparate it from the flexor carpi radialis and palmaris longus. From the origin juſt enumerated, a thin portion of muſcular fibres is produced; but the muſcle grows thicker towards its middle, runs in a direction parallel to the bones of the fore-arm, and divides into four fleſhy portions, correſponding to the four fingers; of which, the two belonging to the middle fingers are the moſt ſuperficial, and thoſe of the fore and little fingers the moſt deeply ſeated; the latter is the ſmalleſt. Theſe end in tendons proportioned to their bulk; which are completely diſengaged from the muſcular fibres at the annular ligament. The four tendons, connected together in the manner which will be preſently explained, paſs in the deep channel formed by the annular ligament, in front of the tendons of the profundus, ſeparate as they proceed, and continue their courſe towards the fingers under the palmar faſcia. They become broader and thinner, enter the tendinous thecæ of the fingers, and each preſents, at the commencement of the ſheath, a concavity adapted to the correſponding tendon of the flexor profundus. As the tendon paſſes over the firſt phalanx, it divides into two portions, which ſeparate to allow the paſſage of the tendon of the profundus, then unite together behind that tendon, ſo as to form a channel, with its concavity in front, lodging the tendon of the profundus; and afterwards ſeparate again to be implanted, diſtinctly from each other, in the lateral and anterior margins of the ſecond phalanx.

Thus each tendon is firſt concave poſteriorly, where it lies on the tendon of the profundus; then preſents a large ſlit for the paſſage of the latter; is afterwards concave anteriorly, from the two ſides of the ſlit uniting below, and then ends by a double inſertion in the bone.

On the fore-arm, the poſterior ſurface of this muſcle is in contact with the profundus, the flexor longus pollicis, and the median nerve; while its anterior ſurface is covered by the pronator teres, flexor carpi radialis, palmaris longus, and the faſcia of the fore-arm. It covers the profundus and lumbricales in the hand, and is covered by the annular ligament and palmar faſcia. In the fibrous ſheath of the fingers, it is placed firſt between the ſheath and the tendon of the profundus, and lower down between the latter and the bone.

Flexor *digitorum profundus*; profundus, Alb.; flexor perforans; cubito-ſous-onguien; fléchiſſeur digital profond. This muſcle is ſituated in the fore-arm, under the former, which it very much reſembles. It is thick, flattened, elongated in its form, fleſhy above, and tendinous below. It ariſes, 1ſt, from the aponeuroſis extended from the flexor carpi ulnaris to the ulna, and from the inner ſurface of that bone in one-third of its length; 2dly, from the anterior ſurface of the bone for three-fourths of its length, next to the elbow, and from the correſponding portion of the interoſſeous ligament, by aponeurotic fibres. Smaller at its origin, it ſwells in the middle, and diminiſhes again, dividing into four more or leſs diſtinct portions, terminated by four tendons, which are at firſt concealed by the fleſhy fibres, but become entirely diſengaged at the annular ligament, where they are cloſely connected by cellular ſubſtance. They paſs in the deep channel of the ligament, behind thoſe of the flexor ſublimis, ſeparate as they proceed into the hand, give origin to the lumbricales, enter the tendinous ſheaths, perforate the tendons of the flexor ſublimis, and lie in the channels formed on the anterior ſurfaces of the two firſt phalanges. Each tendon terminates in a ſlightly flattened form, by an inſertion in the anterior ſurface of the laſt phalanx.

In the fore-arm this muſcle is covered by the flexor carpi radialis, the flexor ſublimis, the median and ulnar nerves, and the radial artery; and it covers the ſurface of the ulna, the interoſſeous ligament, and the pronator quadratus. The bones of the carpus and metacarpus, and the interoſſei muſcles, lie behind it in the hand; and the lumbricales and tendons of the ſublimis are before it. In the fingers, its tendons lie on the bones, being covered by the tendons of the ſublimis and the fibrous ſheaths. It is furniſhed with certain ſynovial membranes, common to it with the preceding muſcle.

The annular ſynovial Membrane.—On cutting the annular ligament of the hand, and lifting up the ſubjacent packet of tendons, we obſerve a cavity terminated by a cul-de-ſac above and below, and formed by a membrane, which envelops the tendons of the flexor ſublimis and profundus of the flexor longus pollicis, and the median nerve; and which is ſpread over the ſurface of the annular ligament and the carpal ligaments. This membrane connects all the parts into one faſciculus, ſends numerous folds between them, is very ſoft and yielding, but contains ſo little ſynovia, that a doubt may be entertained whether it ſhould properly be regarded as a ſynovial membrane. Yet its office and uſe are exactly the ſame as thoſe of the burſæ mucoſæ; it enables the tendons to play eaſily in the channel of the annular ligament. The latter part confines the tendons in their proper ſituation; they would otherwiſe ſtart up from the wriſt when the hand is bent on the fore-arm, and deſcribe the chord of an arc formed by the fore-arm, wriſt, and hand.

Synovial Membranes and fibrous Sheaths of the Fingers.—Theſe membranes are expanded on the tendons of the two flexor muſcles juſt deſcribed, and on a canal containing them, formed partly of bone, and partly of a ſtrong fibrous ſubſtance. The anterior concave ſurface of the phalanges, and the front of their articulations, form the bony portion of the canal. The fibrous part is a denſe ſtrong layer, attached to the ſides of the bony channel, and terminating below by a connection to the flexor profundus. Thus the cavity ends in a cul-de-ſac. The ſheath is very thick and ſtrong at the middle of the firſt and ſecond phalanges, and compoſed of ſemicircular fibres of cartilaginous firmneſs; the reſt is weaker, and compoſed of decuſſating fibres. A ſynovial membrane lines this cavity, and is reflected at its commencement over the tendons, ſo as to form here alſo a cul-de-ſac. The tendons are completely unconnected in this ſheath, being lubricated, as well as the containing cavity, by a ſynovial fluid: there are, however, one or two ſlender vaſcular threads going from the ſheath to the tendon. The uſe of this ſheath is the ſame with that of the annular ligament, *viz.* to confine the tendons in their ſituation. When it is divided in the dead ſubject, and the muſcles are drawn ſo as to bend the fingers, the tendons immediately ſtart up from the bones. As they move conſiderably within the canal during the motions of the fingers, the neceſſity of the parts being lubricated by ſynovia is obvious. No ſimilar apparatus belongs to the extenſor muſcles of the fingers; becauſe thoſe members cannot be moved in that direction beyond the point at which they form ſtraight lines with the hand, and their extenſor tendons do not conſequently admit of diſplacement; which would be prevented too by the attachment of the lumbricales and interoſſei to thoſe tendons. At the wriſt the extenſor tendons are confined as well as the flexors; becauſe the hand can be moved in this direction beyond the ſtraight line, and the tendons would be ſubject to ſtart from the bones.

The *lumbricales* muſcles are ſmall, ſlender, and elongated muſcular faſciculi, ſo named from a compariſon to earthworms. Their number is four, and they are deſignated by numerical epithets, counting from the thumb to the little finger. They are placed in the palm of the hand, and derive their origin from the tendons of the profundus. The firſt ariſes from the anterior and radial ſide of the firſt tendon, and the ſucceeding ones from the bifurcations of the tendons, ſo that each of the latter has an attachment to two tendons. They accompany the tendons towards the fingers; are ſmall at firſt, then grow larger, and afterwards contract again, and end at the firſt phalanx in ſmall flattened tendons. Theſe turn round the articulation, which joins the metacarpus to the phalanges, and go towards the back of the fingers. The expanded tendons are connected to thoſe of the interoſſei, and are joined by a broad ſurface to the edge of the extenſor tendons. They then run along the ſide of the finger, and terminate by an inſertion at the back of the third phalanx. The firſt lumbricalis runs along the radial ſide of the fore-finger; and the ſucceeding ones hold the ſame relation to the other fingers. The middle or the ring-finger may have a lumbricalis on each ſide, and then the little finger has none. They are covered by the flexor ſublimis, the palmar faſcia, the digital nerves and veſſels, and lie upon the interoſſei muſcles. In the fingers their tendon covers the phalanges, and is covered by the ſkin.

The flexor ſublimis and profundus, and the lumbricales, are flexors of the three joints of the fingers: the firſt bending the middle joint; the ſecond, the laſt joint; and the third, the firſt or that which connects the metacarpus to the firſt phalanges. When the two firſt have produced their effect upon the articulations to which they belong, they have the further power of bending the firſt joint, concurring in this office with the lumbricales. Since the latter muſcles turn round the firſt joints, and run afterwards along the back of the phalanges, being confined in their ſituations by their connection to the extenſor tendons, they will extend the ſecond and third joints, although they are placed in the palm of the hand: for their peculiar courſe alters the direction of the force. It is neceſſary, in order to the flexion of the firſt joints by the lumbricales, that the flexor profundus ſhould be in action; that its tendons may be fixed, ſo as to afford a firm point, to which the lumbricales may move the fingers. Hence, where all the three joints are bent, as in clenching the fiſt, in graſping a ſtick, &c. the middle and laſt are bent firſt, and afterwards the firſt. The latter, however, may be bent, while the others are kept ſtraight; but this requires a painful effort. Here, the flexor profundus is put in action, and the extenſor communis alſo contracts, to prevent the fingers from being bent. By feeling in the fore-arm, we can aſcertain that both the flexors and extenſors are exerted on this occaſion, and the effort is attended with conſiderable pain. Thus a fixed point is produced for the action of the lumbricales. The ſublimis and profundus, after bending the fingers, or if the fingers are kept extended, will concur very powerfully, with the flexors of the carpus, in bending the wriſt. As they ariſe chiefly from the inner ſide of the fore-arm, they will alſo co-operate in turning the palm towards the ground, or producing the ſtate of pronation. Inaſmuch as any of their fibres are derived from the humerus, they will have the power of bending the elbow joint. We cannot avoid noticing, even on the moſt ſuperficial examination, the great ſuperiority in bulk of the flexors over their antagoniſts the extenſors of the fingers. The ſublimis or profundus alone contains twice or three times as many fibres as the extenſor communis: and this diſproportion becomes ſtill more ſtriking, when we obſerve that the internal condyle, from which the flexor muſcles ariſe, is very prominent, ſo as to give them a mechanical advantage in their action. The bending of the fingers is employed on many occaſions, which require great muſcular forces: the lifting of heavy weights is an example of this kind; where the ring of a weight is graſped by the fingers, and the weight elevated, it is entirely ſupported by theſe muſcles. Now any individual can eaſily lift, in this way, from fifty to a hundred pounds and upwards, by his little finger only. In ſeizing and holding bodies firmly great power is required, on occaſions which are conſtantly occurring, not merely among the laborious parts of the community, but alſo in thoſe who do not depend for ſupport on their perſonal exertions. In the latter, indeed, the fact is more obvious: the act of rowing, the handling of cables, the uſe of the hammer, the mallet, the pick-axe, and ſimilar inſtruments, all exemplify the great importance of the flexors of the fingers. No effects of any analogous deſcription are produced by the extenſors: they merely reſtore the fingers from their bent ſtate. The fingers may be rendered the fixed point, and then their flexor muſcles will bend the fore-arm on the hand. In climbing, we graſp firmly an object above our heads; and we then ſee the fore-arm moved upon the hand. The whole weight of the body is ſuſtained in that poſition, without any difficulty, by the flexors of one ſide; and it can be ſupported even by the flexors of a ſingle finger.

FLEXOR *longus digitorum pedis*; flexor profundus or communis, or perforans; tibio-ſous-onguien; grand fléchiſſeur des orteils; is placed on the poſterior ſurface of the tibia, between the bone and the muſcles of the calf, poſſeſſes an elongated form, is thin and flattened above, and divided into four tendons below. From its origin in the leg it enters the ſole of the foot, and receives, before dividing into its four tendons, the inſertion of the flexor acceſſorius, which comes from the under ſurface of the os calcis. The lumbricales pedis ariſe from its ſeparate tendons. It is attached on the inner ſide, by ſhort aponeurotic fibres, to the back of the tibia, from the oblique line of that bone to its inferior fourth part; on the outſide to a long aponeurotic ſeptum, which ſeparates it from the tibialis poſticus, and flexor longus pollicis pedis. From this double origin the fleſhy fibres deſcend obliquely on each ſide to a tendon, concealed in the ſubſtance of the muſcle at firſt, but ſoon appearing ſuperficially at the back of the muſcle. The fibres of the ſecond origin continue to enter the tendon as low as the ankle; but thoſe of the firſt ceaſe higher up in the leg. The tendon paſſes in a ſuperficial groove behind the internal malleolus, ſeparated by a fibrous ſeptum from that of the tibialis poſticus; and then paſſes behind the aſtragalus, turning afterwards horizontally forwards in the ſole of the foot. It now turns rather outwards; paſſes under the tendon of the flexor longus pollicis pedis, to which it is connected by a ſmall tendinous chord; then becomes conſiderably broader and flattened, and ſhews the marks of a diviſion into four portions. Here it divides into four tendons, which proceed towards the four ſmaller toes, entering with the correſponding portions of the flexor brevis into the tendinous ſheaths of the toes, paſſing in the ſlits of thoſe tendons, and inſerted into the lower and poſterior part of the laſt phalanges. The relative poſitions, the inſertions, and the fibrous ſheaths of theſe tendons are analogous in the toes to thoſe of the flexor ſublimis and profundus in the fingers; to the deſcription of which the reader is referred.

In the leg this muſcle is covered by the ſoleus, the faſcia of the leg, the poſterior tibial artery and nerve; and it covers the tibia and the tibialis poſticus. The tendon reflected behind the ankle, at its entrance into the ſole, is confined in a fibrous ſheath attached ſucceſſively to the groove at the back of the tibia, to the malleolus internus, the aſtragalus, and front of the os calcis. On ſlitting up this canal, we find it lined by a diſtinct ſynovial membrane, lubricated with a mucous fluid, and reflected over the tendon above and below ſo as to form two cul-de-ſacs. The deep-ſeated muſcles of the foot, and particularly the flexor acceſſorius, lie over the tendon in the ſole. The abductors of the great and little toes, the plantar nerves, and the flexor brevis, are under it.

The flexor acceſſorius, or maſſa carnea Sylvii, is a thin, flattened, and rather ſquare portion of muſcle, ſituated under the tarſus, and above the preceding tendon. There is nothing analogous to it in the profundus of the hand. It ariſes, by aponeurotic fibres, from the inferior and internal ſurface of the os calcis; theſe proceed horizontally forwards parallel to each other. The muſcle is inſerted, either by fleſhy fibres or by a tendon, into the upper and outer ſurface of the flexor longus, where it expands previouſly to the diviſion into its four tendons. It is interpoſed between the under ſurface of the tarſus and the tendon of the flexor longus.

The lumbricales pedis ariſe from the tendons of the flexor longus in the foot, as thoſe of the hand do from the profundus. Their number, ſize, figure, and courſe correſpond very much to thoſe of the lumbricales manus. They are inſerted, at the roots of the toes, into the metatarſal extremities of the firſt phalanges, detaching a thin production to the extenſor tendons.

The flexor longus will bend the laſt joints of the toes, and afterwards the middle and firſt articulations. In the latter effect it is aſſiſted by the lumbricales, which at the ſame time will give a ſlight degree of lateral motion. The toes being bent, or kept ſtraight by the extenſors, the foot will be carried back upon the leg by the flexor longus, in which caſe it aſſiſts the muſcles of the calf. It will alſo aid theſe muſcles in elevating the leg, and through it the whole body, while the foot reſts on the ground; it acts therefore when we ſtand on our toes, as well as in the office of progreſſion. When it bends the toes, or extends the foot upon the leg, it draws them at the ſame time inwards, ſo that the ſole faces backwards and inwards, in conſequence of its tendon going behind the internal malleolus. This effect is counteracted by the flexor acceſſorius, which draws the tendon outwards; and the toes are conſequently bent without any obliquity to either ſide. Its action, when the body is erect and ſupported by the feet, fixes the ſole to the ground; and by bending the front of the foot accommodates the organ to inequalities of ſurface. When the foot is firmly fixed to the ground, the flexor longus may draw the leg backwards upon the foot; in this way it will reſtore the legs to their upright bearing upon the aſtragalus, when the knees have been bent forwards.

Flexor *longus pollicis manus*; radio-ſons-onguien; grand fléchiſſeur du pouce; is a peculiar and ſeparate flexor of the thumb, placed on the ſurface of the radius, and on the ſame level, in the fore-arm, with the flexor profundus digitorum. It has an elongated form, and is flattened at the ſides. It ariſes from the anterior ſurface of the radius, commencing in a narrow pointed form juſt below the tubercle, and continued as far as the origin of the pronator quadratus; being alſo attached to a ſmall part of the interoſſeous ligament. Sometimes a ſmall faſciculus joins it from the coronoid proceſs of the ulna. From this origin the fibres deſcend ſucceſſively in an oblique direction, and terminate in a tendon lying on the front of the muſcle, and paſſing with the flexors of the fingers, to which it is united by the ſynovial membrane already deſcribed, under the annular ligament of the carpus. It then turns outwards, paſſes between the two portions of the flexor brevis pollicis, and between the two ſeſamoid bones; it is continued over the firſt phalanx of the thumb, and is inſerted in the root of the ſecond, being previouſly marked by an impreſſion dividing it ſuperficially into two portions. In the fore-arm, the flexor ſublimis, flexor carpi radialis, ſupinator longus, and radial artery and nerve lie on this muſcle, which covers the ſurface of the radius, a little of the interoſſeous ligament, and the pronator quadratus. In the hand, it occupies firſt the radial ſide of the channel formed by the annular ligament, and then is ſurrounded by the two portions of the flexor brevis pollicis: being afterwards contained in a fibrous ſheath. The latter is fixed to the two edges of the firſt phalanx of the thumb, and to the whole ſurface of the ſecond, where it is continuous with the inſertion of the tendon, and, together with the concavity of the bone, forms a complete canal including the tendon. It is lined by a ſynovial membrane, reflected at the commencement of the canal over the tendon, ſo as to form a cul de ſac. It will bend the laſt joint of the thumb towards the palm of the hand; and afterwards alſo the articulation of its metacarpal bone with the carpus. Further, it may aſſiſt in bending the wriſt on the fore-arm.

Flexor *longus pollicis pedis*; flexor longus pollicis; grand fléchiſſeur du gros orteil. The great toe, like the thumb, has a ſeparate long flexor, which is a thick and ſtrong muſcle, lying on the back of the fibula, and covered by the muſcles of the calf. On the outſide, it ariſes from a kind of ſeptum placed between it and the peroneus longus and brevis; on the inſide, from a more diſtinct tendinous production ſeparating it from the tibialis poſticus and the flexor longus digitorum; between theſe points, from the two inferior thirds of the back of the fibula, to which the above-mentioned ſepta are alſo attached. It has above a thin and pointed form, but grows conſiderably thicker as it deſcends; becoming thinner again below. A middle tendon receives the muſcular fibres, appears at the back part of the muſcle, from which it is completely diſengaged at the ankle. It goes behind that joint, and then turns horizontally forwards in the ſole of the foot; paſſes over the flexor longus digitorum, being connected to it by a portion of tendon, continues its courſe along the inner ſide of the foot, between the two portions of the flexor brevis pollicis, and afterwards between the two ſeſamoid bones of the great toe. Here it generally expands, then proceeds in a narrowed form, under the firſt phalanx of the great toe, and is inſerted into the under and back part of the ſecond phalanx. In the leg, this muſcle is covered by the ſoleus and by the faſcia of the leg; and covers the fibula and tibialis poſticus.

It then lies on the back of the tibia, and is confined to the aſtragalus and os calcis by a fibrous ſheath, lined with a ſynovial membrane. On the firſt phalanx of the great toe it is contained alſo in a ſheath with a ſynovial lining. This muſcle has the ſame uſes with reſpect to the great toe and foot, as the flexor longus digitorum has in regard to the other toes. See the account of the action of that muſcle.

Flexor *brevis digitorum pedis*; flexor perforatus or ſublimis; calcanéo ſous-onguien. This muſcle is placed in the middle of the ſole, and is one of the ſuperficial muſcles of the foot. It is moderately thick, of an elongated form, and poſſeſſes four tendons in front. It ariſes behind from the os calcis, on the ſides from two ſepta, which ſeparate it from the abductors of the great and little toe, and below from the plantar faſcia; proceeds in a ſtraight direction to the end of the metatarſus; and then divides into four portions, which give origin to four tendons. The latter paſs in the intervals of the double inſertions of the plantar faſcia, and enter the fibrous ſheaths of the toes. At firſt they are concave above, to receive the tendons of the flexor longus, then they are divided for the paſſage of the latter, unite again, and afterwards ſeparate to be attached by means of diſtinct portions to the edges of the ſecond phalanges.

The edges of this muſcle correſpond to the abductors of the great and little toes; its inferior ſurface is covered by the plantar faſcia; and the ſuperior by the flexor acceſſorius, tendons of the flexor longus, lumbricales, and plantar nerves and veſſels. By bending the toes, this muſcle renders the inferior ſurface of the foot concave, and thus enables it to accommodate itſelf to uneven ground, and in a manner to graſp ſuch unequal ſurfaces. This effect is much limited in the human ſubject by the practice of wearing ſhoes. By drawing the toes downwards, it tends to fix the foot to the ground.

Flexores *primi internodii digitorum*; a name given by ſome of the older anatomiſts to the lumbricales.

Flexor *primi internodii minimi digiti pedis*; is the name under which Douglas deſcribes the flexor brevis of the little toe: Cowper calls it flexor primi oſſis minimi digiti.

Flexor *ſecundi internodii digitorum*; is a name by which the flexor ſublimis of the hand, and the flexor brevis of the foot, have been deſcribed. The flexor profundus of the hand, and the flexor brevis of the foot, have been called flexores tertii internodii digitorum.

Flexor *primi internodii pollicis*; is the opponens.

Flexor *ſecundi internodii pollicis*; is the flexor brevis.

Flexor *tertii internodii pollicis*; is the flexor longus.

Flexor *primi et ſecundi oſſis pollicis* of Cowper, includes the adductor, opponens, and flexor brevis.

FLEXUOSUS Caulis, in *Botany*, a zigzag ſtem. See Caulis, n. 3.

FLEXURE, or Flexion, in *Geometry*, is uſed to ſignify that a curve is both concave and convex, with reſpect to a given right line, or a fixed point. And the point which limits the concavity and convexity is called the point of contrary flexure. See Retrogradation *of Curves*.

As to the method of finding the points of the contrary flexure, ſee Inflection.

FLIDETHRIFT, or more truly *Slidethrift*, is the game we now call *ſhovel-board*. It is otherwiſe called *ſhove-groat*, and is mentioned in the ſtatute 33 Hen. VIII. cap. 9.

FLIE, or Fly, that part of the mariner's compaſs on which the thirty-two winds are drawn, and over which the needle is placed, and faſtened underneath.

Flie, or *Vlie*, in *Geography*, a river or channel, which runs from the Zuyder ſea, near the coaſt of Frieſland, into the German ocean, between the iſland of Schelling and Vlielandt.

Flie's *Bay*, a bay on the W. coaſt of Africa. S. lat. 14° 50′.

Flies, a river of Luſatia, which runs into the Spree, near Luben.

FLIGHT, the act of a bird in flying; or the manner, duration, &c. thereof. See Flying.

The feathers of birds are admirably contrived, and fitted for the eaſe and convenience of flight. See Feathers.

Almoſt every kind of bird has its particular flight: the eagle's flight is the higheſt; the flight of the ſparrow-hawk and vulture are noble, and are fit for high enterprize and combat. The flight of ſome birds is low, weak, tranſient, and as they call it, *terra à terra*; the flight of the partridge and pheaſant is but of ſhort continuance; that of the dove is laboured; that of the ſparrow undulatory, &c.

The augurs pretended to foretell future events from the flight of birds.

Flight, in *Rural Economy*, a young brood of different ſorts of birds, as pigeons, &c.

Flight. In melting the lead ore in the works at Mendip, there is a ſubſtance which flies away in the ſmoke, which they call the flight.

They find it ſweetiſh upon their lips if their faces happen to be in the way of the ſmoke, which they avoid as much as poſſible. This, falling on the graſs, kills cattle that feed thereon; and, being gathered, and carried home, kills rats and mice in their houſes; that which falls on the ſand they gather, and melt upon a flag hearth, into ſhot, and ſheet-lead.

Flight, *Capon's*, in ſome *Cuſtoms*, is a compaſs of ground, ſuch as a capon might fly over, due to the eldeſt born of ſeveral brothers, in making partition of the father's effects with them, where there is no principal manor in a lordſhip. It is uſually eſtimated by a bow-ſhot.

Flight *of a Stair-caſe*. See Stair-*caſe*.

Flight, in *Heraldry*. See Vol.

Flight *of an Army*. Were it poſſible for each individual of an army to be ſufficiently impreſſed with the inevitable conſequences of "taking to flight," ſuch an occurrence would be extremely uncommon. Whatever may be the dangers of oppoſing an enemy front to front, they certainly fall very ſhort of thoſe inſeparable from that diſorderly evaſion, which, while it diſgraces the whole, ſubjects each to be maſſacred in detail. Very fortunately for the Britiſh ſervice, and with the moſt heartfelt pride do we declare it, very, very few inſtances could be adduced wherein our ſoldiery have ſo far loſt ſight of ſubordination, or been ſo far overcome by panic, as to induce them to adopt this ruinous conduct. That they have been led very improperly into ſuch ſituations as to render their valour and diſcipline of no avail, cannot be denied; but even under ſuch diſ-heartening circumſtances their exertions have kept pace with ſurrounding difficulties, and taught their enemies to reſpect them, even when compelled to ſurrender at diſcretion.

The flight of an army is uſually attended with great carnage, and with the total loſs of its artillery, ammunition, baggage, ſtores, treaſure, &c. This rarely happens when the diſcomfiture is unconnected with the precipitate abandonment of poſitions, and of the ordnance; in this latter caſe, the reſerve commonly offers an aſylum to the defeated corps, enabling them at leaſt to retire, if not to make head againſt their purſuers. The French, in their uſual mode of varniſhing over blemiſhes in their conduct, and of reconciling, at leaſt to themſelves, the errors of their generals, as well as the miſconduct of their ſoldiery, never admit the aſſertion that their troops were "put to flight," but with much *ſang froid* obſerve, that "they made a precipitate retreat." This is ſomething on a par with the defence made by a gentleman, who, having been unhorſed rather abruptly, was found lying in the mud; but denied having been *thrown*. Oh, no, "he had only *diſmounted*, to get a *better ſeat*."

In that neat little volume, "The Pocket Gunner," publiſhed by captain Ralph Willett Adye, of the Royal Artillery, is the following maxim, which cannot be too aſſiduouſly circulated, not only among artilleriſts, but among every claſs of ſoldiery. He ſays, "never abandon your guns till the laſt extremity. The laſt diſcharges are the moſt deſtructive; they may be your ſalvation, and crown you with glory."

FLIGHT *of a Shot or a Shell.* Reſerving ourſelves for an ample diſſertation on the flight of miſſiles in general, under the head of *projectiles*, (which ſee,) we take the opportunity of offering ſome remarks regarding thoſe very erroneous opinions which are, in many inſtances, prevalent regarding the line in which a ſhot proceeds from the mouth of the cannon to that object towards which it is directed.

The term *point-blanc* has been greatly miſunderſtood. It originated in the practice among the French artilleriſts, of firing at a *white* centre within various concentric circles of black; whereas we commonly make the centre of a target black; deſignating it "the bull's-eye." Therefore, when a piece was laid for the centre of the target, it was ſuppoſed to be exactly horizontal, ſo far as related to the line of the chace; the target being only eight feet in its whole height, which correſponds with the average height of a man on a middle-ſized horſe: the centre of the *point-blanc* (or white ſpot) was then about as high from the ground, ſuppoſing the intermediate diſtance to be level, as the muzzle of the gun.

Now it was found, that with the proper ſervice-charge, a gun would at a certain diſtance throw the ſhot to the height of the *point-blanc*, and, if correctly "laid," that it would ſtrike with exactneſs thereon. This gave riſe to the opinion, that the ſhot proceeded to that diſtance in a direct line, after which it began to form an angle downwards. That ſuch an error ſhould maintain its ground while ſcience was only in the womb of time, may not be extraordinary; but that any man who has either obſerved the practice, or conſidered the theory, ſhould for a moment attempt to uphold ſo falſe a poſition, muſt appear abſolutely wonderful. Were no ſuch opinions extant, we ſhould not have expended one drop of ink towards explaining the real flight of a ſhot, and to remove the vulgar errror of what are called *point-blanc* ranges, being rectilinear.

In confuting the popular opinion on this ſubject, we muſt obſerve that, excluſive of the perpetual tendency of all bodies in motion, (from whatever impetus,) to deſcend according to the rules of *gravity*, (which ſee,) certain circumſtances, particularly relating to artillery, ſeem to combine for the purpoſe of giving an aſcending direction to all ſhots impelled by the action of gunpowder. We are to conſider, that every piece of ordnance, when diſcharged, riſes from the ground in proportion to the quantity of gunpowder uſed, and to the weight of metal, of the carriage, &c. in oppoſing ratio. This alone would probably give ſome determination upwards to the ſhot at the moment of its quitting the piece, and when the air, oppoſed to the expanding flame, ſo forcibly occaſions the piece to recoil; but if we call to mind, that that flame being ſo much lighter than the atmoſphere, muſt inſtantly be forced upwards thereby, (eſpecially as the concuſſion upon the ſoil below would add to ſuch a tendency), we may at once find ſufficient cauſe for the aſcent of a ſhot at the very moment it quits the cannon; for both will, with the action of the cannon and the rarefaction of the air at its debouchure, whereby a rapid and ſtrong current of aſcenſion is given, tend to cauſe ſome departure from a horizontal direction.

The fact lies in a nut-ſhell; for, unleſs when following the line of gravity, which is every where locally perpendicular, and of courſe always points to the centre of that globe we inhabit, nobody can maintain a rectilinear motion; there will always be a tendency to gravitation. This being admitted, it follows, that in order to arrive at a certain level, at a certain diſtance, an elevation muſt, either naturally or artificially, be given, whereby the line of flight will be found to deſcribe that unequal curve called a *parabola*, (which ſee). Every boy that uſes a ſling, or throws up a cricket-ball, muſt be convinced of the truth of our poſition. The fact may, however, be fully certified to the eye, by ſtanding rather behind a cannon (the greater its bore the better) and at about an angle of 20° from the line of fire, when the flight of the ſhot will be ſeen to give a curve upwards.

With reſpect to ſhells, their lines of flight are exactly on the ſame principles, but their altitudes being conſiderably greater in proportion than their baſes, the parabolic curve generated aſſumes a different figure. It ſhould be particularly noticed, that, for the ſake of giving effect to the fuſes driven into ſhells, the ordinary periods of flight for particular ranges, *i. e.* diſtances horizontally, together with the charges of powder, and the angle of elevation, (uſually 45°) are to be carefully noted. If the powder were all of equal ſtrength, the fuſes all exactly ſimilar, and equally well driven, or filled, the weight of the atmoſphere always the ſame, and the angle of elevation ever fixed immoveably, the lengths of fuſes for particular ranges might be always determined; as it is, we ſee that conſiderable variation often takes place even with the ſame powder, the ſame gun, the ſame temperature, and, in fact, with every thing perfectly ſimilar, to all appearance. Obſerving that the more protracted the line of flight, the greater the force with which a ſhell will fall, we ſhall ſubmit the following table of ranges made with ſea-ſervice iron mortars, at 45° upon a horizontal plane.

13-Inch Mortar.			10-Inch Mortar.		
Charge.	Flight.	Range.	Charge.	Flight.	Range.
lbs. oz.	Seconds.	Yards.	lbs. oz.	Seconds.	Yards.
2	13	690	1	13	680
4	18	1400	2	18	1340
6	21	1900	3	21	1900
8	24½	2575	4	24½	2500
10	26½	2975	5	26	2800
12	29	3500	6	27	3200
14	29½	3860	7	29	3500
16	30	3900	8	30	3800
18	30½	4000	9	30¼	3900
20	31	4200	9 8	30½	4000

The great increaſe of velocity gained by the heavier charges muſt be apparent; in the firſt inſtances the time of flight is 13 ſeconds to about 680 yards of horizontal diſtance, which gives only 50 yards for each ſecond; whereas the latter flights gain on the ſeveral preceding ones ſo rapidly, as to give 400 yards in every added ſecond. From this we ſee, that, unleſs fired at an improper elevation, mortars cannot be uſed with their greateſt effect, unleſs ſo far removed from their object, as to admit of their being charged as high as the metal will bear.

FLING, in the *Manege*, is the fiery and obſtinate action of an unruly horſe.

To fling like a cow is to raiſe only one leg, and give a blow with it.

To fling or kick with the hind legs, ſee Yerking.

FLINGING, among *Bowlers*. See Bowling.

FLINK, Govaert, in *Biography*, a painter of hiſtory and portraits. He was born at Cleves in 1616. Early in his youth he exhibited a ſtrong inclination to painting, from which neither the deſire of his father that he ſhould purſue a mercantile occupation, the influence of his friends, nor the proſpect of making a fortune, could divert him. He was therefore placed under Lambert Jacobs. With him, at the ſame time, Barker alſo ſtudied under Jacobs, and the emulation which exiſted between theſe two greatly advanced their progreſs in the art, but Flink outſtepped his companion conſiderably. He afterwards entered in the ſchool of Rembrandt, and imitated the works of that extraordinary man with great ſucceſs, and his pictures are now frequently ſold as the productions of his maſter.

He very ſoon roſe into high repute, and was almoſt conſtantly employed in painting the portraits of diſtinguiſhed perſonages, although his genius inclined him to paint hiſtorical ſubjects, and ſeveral of his performances in that ſtyle were admired for the goodneſs of the deſign and the beauty of their colouring. He died in the year 1660, at the age of 44, very much regretted. After his death his collection of prints and drawings were ſold for twelve thouſand florins.

FLINT, in *Geography*, a ſmall borough town in the hundred of Coleſhill, and capital of the ſhire to which it gives the appellation. Though almoſt deſtitute of trade, it is conveniently ſituated upon the river Dee; diſtant from London 204 miles, and 12 W.N.W. of Cheſter. This place was formerly fortified, having been ſurrounded by a double foſs and vallum, and, during the ſtruggle of Cambria for her independence, was celebrated for its ſtrong caſtle, begun by king Henry II. but not completed till the time of Edward I. This fortreſs ſtands upon an iſolated rock in a low marſh, which is occaſionally overflowed by the tide. Anciently the eſtuary of the Dee laved the walls, and a communication was formed between the caſtle and the advanced works, called the barbacan, by means of a bridge; but the channel of the river is now at ſome diſtance. The ſtructure is formed of a reddiſh grit-ſtone from quarries in the vicinity. The form is a right-angled parallelogram, having three of its angles defended by polygonal towers, ſome remains of which are ſtill ſtanding, including an area within the walls of about an acre. At the ſouth-eaſt is a detached tower of ſingular conſtruction. It is of a circular form, conſiſting of two concentric arches, leaving a ſpace between for a gallery eight feet broad; the diameter of the inner circle is twenty feet. In this caſtle the unfortunate Richard II. took ſhelter, on his arrival from Ireland; when, quitting it, he was ſeized by the duke of Lancaſter, and carried priſoner to Cheſter. During the civil wars it was garriſoned for the king, but ſurrendered to general Mytton in 1646.

Flint is a corporate town, governed by a mayor, two bailiffs, and other inferior officers; and, in conjunction with Rhyddlan, Overton, Caerwys, and Caergwrle, ſends one member to parliament. The voters are ſuch as pay ſcot and lot in the reſpective places, and the returning officer is the mayor of Flint. The church, which is a chapel of eaſe to Northop, is a mean looking building, having for a ſteeple a boarded turret. In 1785 a new county gaol was erected upon the plan of one previouſly built at Ruthin; although the aſſizes are regularly held at Mold. In the ſummer ſeaſon Flint is frequented as a bathing place, but the marſhy nature of the coaſt, over which the ſea at high tides flows, renders the bathing incommodious, and the air rather inſalubrious. Though privileged as a market town, the market has been long diſcontinued. By the returns made to parliament in 1801, the number of houſes was 309, and inhabitants 1169.

A wood in the vicinity of Flint is celebrated, in the annals of hiſtory, for having been the ſcene of many a ſanguinary conflict, and as ominous to the Engliſh cauſe. Here Henry II. was twice defeated in one campaign, loſing not only his principal officers, among whom were included many of the nobility, but the king himſelf was frequently in imminent danger of being killed, and narrowly eſcaped being taken. Pennant's Tour in North Wales. Skrine's Tour.

Flint, a conſiderable river of America, in Georgia, which riſes in the country of the Creek Indians, and purſuing firſt a ſouth, and then a ſouth weſt courſe, joins the Appalachicola at its entrance into Florida. The territory adjoining this river affords a rich ſoil capable of profitable cultivation, and offering an uninterrupted navigation to the bay of Mexico and Atlantic ocean, and thence to the Weſt India iſlands, and other parts of the world. On this river there is a number of villages belonging to the Creek Indians.—Alſo, a ſmall river, about 28 miles long, in the Geneſſee country, in New York, which runs N.N.E. into Canandarqua creek.—Alſo, a river of Jamaica, which runs into the ſea, ſeven miles W. of Montego bay.

Flint *Iſland*, an iſland in the gulf of St. Laurence, near the eaſt coaſt of the iſland of Cape Breton. N. lat. 46° 10′. W. long. 59° 40′.

Flint, *Silex cretaceus*, Linn. *Igniarius*, Carth. et Wall. *Pyromachus*, Wern. *Quartz-Agathe pyromaque*, Hauy. *Feuerſtein*, Germ. *Flinta*, *Böſs-flinta*, Swed. *Pierre à feu*, Fr.

The flint, one of the moſt remarkable of the ſiliceous ſtones, has frequently been confounded with other hard ſtones of the ſame claſs; the quality it poſſeſſes in an eminent degree of giving ſparks with the ſteel, and the popular denomination it has thence derived among almoſt all nations, have been the principal cauſes of this confuſion, which may eaſily be avoided by a proper attention to its more diſtinguiſhing characters. It muſt, however, be confeſſed, that, in ſome caſes, its diagnoſis is rendered uncertain by its too great affinity to *Hornſtone* and Flint *ſlate*, (ſee thoſe articles,) and by its gradual tranſition into theſe kindred ſtones.

Its colour is chiefly grey, of which yellowiſh, blueiſh, and ſmoke-grey, are the more uſual ſhades, and theſe paſs, the latter into greyiſh-black, the former into all the well known tints of yellow, red, and reddiſh-brown, that approach it, to the carnelian. It is ſometimes found perfectly black, and alſo diſplaying ſeveral of the juſt-mentioned colours in ſtripes, zones, and ſpots.

Flint occurs maſſive, in angular pieces of various ſize, in globular boulders, frequently tapering at one end, (the *petrified melons of Mount Carmel*, vulgarly ſo called, belong to this variety): alſo in knobbed, branching, amorphous, perforated pieces, and as hollow balls filled with various ſubſtances. (See GEODE.) Beſides theſe forms, it ſometimes adopts thoſe of cryſtals, which however do not belong to it, as ſome writers have ſuppoſed, but are ſuppoſititious: from calcareous ſpar it derives the double three-ſided pyramid, as alſo the ſix-ſided priſm acuminated by three planes; and it has been likewiſe obſerved in cryſtals formed after thoſe of lamellar barytes or caulk. It is alſo frequently obſerved, (contrary to what we know of hornſtone,) in extraneous external ſhapes, as petrifactions of ſpecies of echinus, madrepora, coral, &c. Surface little gliſtening, and of various degrees of ſmoothneſs, often coated by, and paſſing into, a white or yellowiſh-white cruſt, of which we ſhall ſay more hereafter. Fracture conchoidal, never perfectly ſplintery; internal ſurface but little gliſtening, or dull, of an almoſt imperceptibly fine grain. Fragment ſometimes tabular, very ſharp-edged, and more or leſs tranſlucid in proportion to the lighter or deeper colours of the ſtone. It is eaſily frangible. Its hardneſs appears to be in a ratio with the depth of its colours: in general it will ſcratch quartz.

Specific gravity, according to Gellert, 2.581; Blumenbach 2.594; Gmelin 2.999. To theſe phyſical characters of flint we may add the one afforded by its phoſphoreſcence, and the peculiar ſmell, which are manifeſted when two pieces are rubbed together.

Flint is infuſible before the blow-pipe without addition, but loſes its colour and becomes opaque. By the intenſe heat excited by a ſtream of oxygen gas, Mr. Ehrmann found it to melt into a white gliſtening quartz-like globule. Its conſtituent parts are,

	Klaproth.	Vauquelin.	Wiegleb.
Silica - -	98.00	97.0	80
Lime - -	0 50	0	2
Alumine -	0.25	1	18
Oxyd of iron -	0.25		
Loſs - -	1.00	2	0
	100	100	100

Flint is met with in moſt parts of Europe, particularly in the north of France, in England, Saxony, Tyrol, Podolia, &c. Norway ſeems to be deſtitute of flint, as it is of chalk; alſo in Sweden it is ſcarce. In Denmark it is principally at Wordenborg and Taxoë, in the iſland of Seeland, that ſome chalk-hills with imbedded flints are found; and more copiouſly in the remarkable Steevens-Klint. It occurs but ſeldom in primitive mountains, and when found there, only in veins, as, for inſtance, in the Saxon Erzgebirge. Its principal geognoſtic ſituation is in fletz-mountains, where it occurs chiefly in common compact lime-ſtone or in chalk; in the ſand-ſtone formation, where it is alſo met with in the ſhape of thoſe conglomerates vulgarly called *Pudding-ſtone.* See this article.

Though the formation of flints is a ſubject which has engaged the attention of many naturaliſts, yet but few opinions have been broached reſpecting it that will at all ſtand the teſt of cloſer inveſtigation. The theory which explains their origin by a metamorphoſis of one earth into another, though it may appear abſurd to the chemiſt who is unable to produce the ſame changes in his laboratory, has notwithſtanding had its able and celebrated defenders. Some have endeavoured to prove that the argillaceous, others, that the calcareous earth, underwent this converſion into flint. Buffon was an advocate for the argillaceous origin of this ſtone; and the obſervations of Pallas appeared to corroborate the opinion of the French naturaliſt; for he found that the *Ephemera horaria*, which abounds in the Moſkua, had in ſome places perforated the clayey bottom of this river with innumerable tubes cloſely joined; and in the adjacent fields pieces of perfect flint frequently occurred that were pierced preciſely in the ſame manner as the clay, from which they were not found to differ in any reſpect but in fracture and hardneſs. In the ſame manner he ſtates that, in the ſmall river Sunghir, near Woldemir, black, globular, rolled maſſes occur, which, on being broken, exhibit, from their circumference to the central part, a gradual tranſition from real clay and clay-ſtone into what he conſiders as perfect flint. With all deference, however, to the great merits of this excellent obſerver, we cannot but ſee in his account one of thoſe frequent caſes in which hard ſtones of the ſiliceous claſs (and clay ſtone and jaſper belong to it) have been miſtaken for real flint merely by reaſon of their giving copious ſparks with ſteel: for this appears to be the character on which Pallas has chiefly founded his diagnoſis of the ſtone he deſcribes.

According to other geologiſts, it is lime-ſtone, and principally chalk, which have undergone a transformation into flint: an opinion which Wallerius endeavoured to ſupport both by geognoſtical and chemical facts, and which was followed by Linnæus himſelf. Alſo Gillet-Laumont and Girod-Chantrans, from obſervations they reſpectively made in various parts of France, were induced to conſider flint as a mere modification of chalk. The principal ground on which this hypotheſis appears to reſt is the geognoſtic relationſhip that ſubſiſts between the ſtrata of chalk and of flints, together with the intimate union of the boulders of flint and their white earthy cruſt; both theſe ſubſtances being ſo completely incorporated with one another, as to preclude the poſſibility of our aſcertaining the line where each may be conſidered as perfectly diſtinct from the other. This latter reaſon, though ſpecious, may, however, loſe much of its force by future analyſis of that white earthy ſubſtance. To us it appears that moſt of the boulders of flint, ſuch as they are found embedded in chalk, are but ſeldom furniſhed with a coating throughout calcareous: it ſeems to be compoſed of a twofold cruſt, *viz.* an outer chalky one, originating from the matrix of the ſtone; and an inner one paſſing over into the outer, and, by reaſon of the ſimilarity of colour, not diſtinguiſhable by the eye. This inner cruſt ſhews no efferveſcence with acids; it appears to be ſiliceous, and may perhaps be properly looked upon as the reſult of incipient decompoſition; eſpecially if it be conſidered that flints with uncoated ſurface, by a long expoſure to the influence of moiſture and other atmoſpheric agents, have been known to acquire another thin coating, (but not calcareous,) with loſs of weight.

Many geologiſts of the preſent day, who conſider the idea of a tranſmutation of the calcareous into ſiliceous earth as unworthy the advanced ſtate of modern chemiſtry, at the ſame time that they are unwilling to have recourſe to floods and other revolutionary agents for rolling fragments of flint into boulders, and diſpoſing them in the regular manner in which they are now found, have adopted, ſome, the hypotheſis of infiltration by means of a ſiliceous fluid; others, that of a forcible injection of melted flint into vacuities previouſly exiſting in the calcareous ſtrata. But either of theſe theories is open to objection; and, indeed, the ſame objections appear to apply to both. It is difficult to account for the ſtrange predilection the flinty fluid (whether its fluidity proceeded from water or fire) has manifeſted for fletz lime-ſtone, particularly for chalk; while other fletz and primitive rocks, ſeveral of which muſt be ſuppoſed to have been equally expoſed to it, remained perfectly untouched. Nor is it much eaſier to conceive how that ſuppoſed fluid can have found its way into ſo many approximate, but perfectly diſtinct, hollows in the chalk, without more or leſs penetrating the intermediate parts, or leaving traces of maſſes that were connected with the nodules as they now appear; not to mention the improbability that ſo many almoſt contiguous vacuities (eſpecially thoſe that muſt be ſuppoſed to have been the moulds for the frequently occurring tabular expanſions of flint) ſhould not have yielded to the preſſure of the ſuperincumbent ſtratum. As, moreover, theſe hypotheſes are ſilent reſpecting the origin of this flinty maſs, (although a ſubſtance ſo different in its appearance from common ſilex), another theory of the generation of the nodules of flint has been propoſed, which, however, is not likely to meet with any followers among thoſe geologiſts, whoſe exalted ideas of the preſent ſtate of chemical knowledge lead them to ſuppoſe that the reſult of their analytical and ſynthetical proceſſes muſt of neceſſity, in all caſes, ſquare with thoſe great operations that, with her ample means, and aſſiſted by a long ſeries of ages, have been accompliſhed by Nature in the vaſt laboratory of the earth. We allude to the hypotheſis, according to which all flint, whether it be found in nodules or as flat tabular plates, originates from the fleſh of a ſtratum of marine gelatinous animals, which periſhed by ſome revolution, and were buried in their ſhells. The internal aſpect of the nodules, and their being almoſt conſtantly found imbedded in fletz lime-ſtone, which, by moſt geologiſts, is allowed to owe its exiſtence to ſhells and other calcareous coverings of teſtaceous animals, ſeems firſt to have ſuggeſted this new idea; which, ſtrange as it appears, may be allowed to have as much plauſibility as any of the former; eſpecially as it may be adapted equally well to the ſyſtem of an igneous, and to that of an aquatic origin of terreſtrial bodies. Mr. Patrin is of opinion, that when the chalk was depoſited at the bottom of the ſea, in thoſe ſtrata which we now ſee, it met, on other ſtrata already exiſting, a vaſt number of marine bodies, ſhells, madrepores, &c. while others were carried along with the precipitating chalk itſelf, ſuch as meduſæ, &c. whoſe ſoft and gelatinous bodies, while they occupy much ſpace, contain but little ſubſtance. When all theſe marine animals were buried in the chalk, and their decompoſition took place, thoſe of a conſiſtence merely gelatinous left in their matrix an empty ſpace, nearly equal to the ſpace they occupied when alive: their ſubſtance, almoſt in a ſtate of fluidity, was abſorbed by the porous ſides of the cavity; and by the combination of this animal fluid with the chalk, theſe ſides were, by ſome unknown agent, converted into flint. In this manner Mr. Patrin accounts for the generation of nodules that are either hollow or filled up with chalk; which latter may have been depoſed there by means of ſome aperture, or may have penetrated through the flinty coat itſelf, when ſtill in a ſtate of ſoftneſs. As to thoſe nodules, the central part of which is of a more perfectly flinty nature than that nearer the circumference, they were, according to the ſame author, formed of marine animals of more conſiſtence or ſolidity; and it is in theſe particularly that veſtiges of animal organization are found. The more conſiſtent part of the body of theſe animals produced the more perfect flint, ſuch as we ſee it in ſuch ſolid nodules; while the fluid which eſcaped from the body, by the effects of decompoſition, formed the external layers of this nucleus, which, being mixed with the ſubſtance of the chalk, became leſs perfect flint the farther it removed from the central part. According to this explication, the moſt imperfect part of a nodule of flint would be that, which, in its original ſituation, occupied the loweſt place, and towards which the fluid which eſcaped from the more ſolid nucleus muſt naturally have taken its direction. This, however, is never found to be the caſe; nor has Mr. Patrin endeavoured to account for that circumſtance. What appears to be much in favour of this explanation is, that the whole body of echini in their ſhells has been found converted into flint: and Gillet-Laumont has frequently obſerved that thoſe echini, which he met with in the chalk ſtrata of Montreuil-ſur-Mer, were furniſhed with a flinty appendage iſſuing from their mouths, and which appears to have been the animal ſubſtance converted into a fluid ſtate by decompoſition. The ſame circumſtance is not ſeldom obſerved in bivalve ſhells, whoſe gelatinous inhabitants have been found in a perfectly ſiliceous ſtate; while the ſhells themſelves had retained their original calcareous nature, and were partly converted into ſpar. In caſes where the gelatinous marine bodies were in ſuch abundance that no intermediate ſpace was left for the depoſition of chalk, the flint has been formed into large maſſes and plates of conſiderable extent. Dr. Darwin's ideas on this ſubject are nearly the ſame, and modified only by his adopting a different theory for explaining the converſion of the gelatinous animals into flint. He conjectures that the nodules of flint found in chalk-beds have gained their form, as well as their dark colour, from the fleſh of the ſhell-fiſh from which they had their origin, but which have been ſo completely fuſed by heat, or heat and water, as to obliterate all veſtiges of the ſhell; in the ſame manner as (according to the doctor's opinion) the nodules of agate and onyx were produced from parts of vegetables, but which had been ſo completely fuſed as to obliterate all marks of their organization.

A remarkable circumſtance, relating to the geological hiſtory of flint, ſhould not be paſſed over unnoticed in this place: it is that ſir Henry Englefield has obſerved in the neighbourhood of Cariſbrook, and in other parts of the Iſle of Wight, an immenſe number of nodules of flint, all of which, though not removed out of their places, and retaining perfectly their original ſhape, were more or leſs burſt or ſhattered. Some few were only ſplit into large pieces, but the greater part were broken into ſmall fragments, and ſome abſolutely reduced to impalpable powder. The chalk ſtrata in which they were imbedded had an inclination of at leaſt 67 degrees, and perpendicular fiſſures traverſed the whole. Sir Harry conjectures, "that when the tremendous convulſion took place which ſunk them to the ſituation in which they now appear, (at which time the channel which ſeparates the Iſle of Wight from the main land was perhaps formed,) the ſtrata of chalk, in the act of ſubſidence, had a tendency to ſlide on each other; and this would be exerted moſt ſenſibly where, from the admixture of the flints, the coheſion of the parts of the chalk was the weakeſt. This motion, or rather ſtrain of ſo enormous a weight, might in an inſtant ſhiver the flints, though their reſiſtance ſtopped the incipient motion; for the flints, though cruſhed to powder, are not diſplaced, which muſt have been the caſe had the bed ſlipped ſenſibly." This theory appears to us very unſatisfactory, though we are not prepared to give a better. The advocates for the igneous origin of flint may, perhaps, be inclined to account for the phenomenon by an accidental ſudden cooling of the flinty maſſes.

We conclude this article by adding a few words on the *uſes* to which flint is applied, ſome of which are of conſiderable importance. The one derived from its giving copious ſparks with ſteel is the moſt ancient and generally known; but the art of cutting or rather breaking this ſtone into regularly ſhaped gun-flints is of more modern date, and was not practiſed till a conſiderable time after the invention of fire-arms. The mode of making gun-flints has for a long time been involved in fable and myſtery: the moſt abſurd and contradictory accounts having been given of it by various authors; and it was not till lately that we have been made fully acquainted (by Hacquet of Vienna, and by Dolomieu) with the ſimple manner in which theſe flints are manufactured in Gallicia and in France, where they conſtitute an important article of trade. (See Gun-Flint.) The art of ſquaring and chipping flint was practiſed long before that of making gun-flints; and as this latter requires exactly the ſame management and the ſame tools, the former cannot properly be called a loſt art, though, on account of the expenſiveneſs of ſuch ſquare pieces of flint, if employed for conſtructing walls and covering roofs, it is not much practiſed. The north wall of the Bridewell at Norwich, mentioned in a letter of Mr. Baker, in the 43d volume of the Philoſophical Tranſactions, was built of flints, "ſquared to ſuch a nicety, that the thin edge of a knife could not be inſinuated between the joints without a great deal of difficulty." And we learn from a note to that letter, that the gate of the Auſtin friars at Canterbury, the gate of St. John's abbey at Colcheſter, and the gate near Whitehall, Weſtminſter, are executed in the ſame taſte; and the platform on the top of the Royal obſervatory at Paris, which is paved with flint after the ſame manner, is adduced as a proof that the French have in ſome meaſure recovered the art. Flint is alſo often employed in the manufactory of glaſs, ſmalt, porcelain; and ſome of its lighter coloured and ſtriped varieties are made uſe of for ornamental purpoſes. They take an excellent poliſh, and are not unfrequently manufactured into ſnuff-boxes, &c.

Flint-*Slate*. The hiſtory of this foſſil preſents a labyrinth of blunders and confuſion. On one hand it has been deſcribed under the names of well defined Wernerian ſpecies of rocks, ſuch as horn-ſtone, trapp, &c.; on the other hand it has been jumbled together with various mineral ſubſtances, under the vague and unſyſtematic appellations of roche cornéenne, petroſilex, and particularly (by German mineralogical writers) under that of "hornſchiefer," or corneous ſlate. This latter was applied by ſome mineralogiſts to the ſubject of this article; but by others it was indiſcriminately given to hornblend-ſlate, to varieties of clay-ſlate, to mica, and to porphyry-ſlate; whence profeſſor Werner, to prevent the ſame confuſion that has been introduced into mineralogy, by the term "ſhorl," expunged that of hornſchiefer, (though he had made uſe of it himſelf,) applying to the foſſil in queſtion the name of *kieſel-ſchiefer*, now generally adopted in Germany, and of which "flint-ſlate" is a literal tranſlation. The juſt mentioned author has divided this ſpecies into two ſub-ſpecies, *viz.* into common flint-ſlate, and Lydian ſtone. The latter has been conſidered by ſome as a mere variety of the former; but there are good reaſons for keeping it diſtinct. See Lydian Stone.

Common flint-ſlate occurs generally of a dark grey colour, which has frequently an admixture of blue, of red, and of yellow; and theſe tints often paſs over into each other, or are ſeen ſeparately in the ſame fragments, as ſpots or ſtripes. The blood-red and browniſh-red varieties are the ſcarceſt. It is found maſſive and in rounded pieces, which latter have a ſmooth ſurface. Internally it is dull; now and then rather glimmering. In ſmall fragments its fracture varies; it is ſometimes ſplintery, and imperfectly conchoidal, and ſometimes paſſes into even; the blackiſh-grey variety with the latter fracture approaches the Lydian ſtone. In large maſſes it manifeſts its ſlaty nature. Its fragments are angular and ſharp, and but little tranſlucid at the edges. It is brittle, and its hardneſs nearly the ſame as that of quartz. Another pretty conſtant character of flint-ſlate is its being traverſed by veins of quartz, that are often of a greyiſh or reddiſh colour. Specific gravity, according to Gerhard, 2.860; according to Kirwan from 2.596 to 2.641. Thoſe varieties of flint-ſlate that have been chemically examined are not fuſible *per ſe*; nor do they much change their colour in the fire; the grey becomes rather lighter coloured, the black does not appear to be at all affected by the heat of the blow-pipe. Wiegleb's analyſis of flint-ſlate from Fulda (in vol. i. of Chem. Annalen, where, however, it is called hornſchiefer, and conſidered as of volcanic origin) has given the following reſult:

Silica	75.00
Lime	10.00
Magneſia	4.58
Oxyd of iron	3.54
Inflamm. particles	5.02
	98.14

Flint-ſlate appears to paſs over into Lydian ſtone, into horn-ſtone, quartz, and particularly into clay-ſlate; ſo that when ſeen in ſmall fragments, it is often difficult to ſeize its diſtinguiſhing characters. It is found in various parts of Germany, Bohemia, Sileſia, in Bareuth, the kingdom of Saxony, the Hartz, Palatinate, Salzburg, &c.; and, according to Mr. Jameſon, in various parts of the great tract of tranſition rocks in the ſouth of Scotland. The geognoſtic relations of flint-ſlate are not well aſcertained, and indeed it is difficult to aſſign it a proper place among the rocks. It is generally found in huge, cliffy, and craggy maſſes, particularly on granite and clay-ſlate, and more frequently as beds in tranſition, clay-ſtone, grauwacke, and grauwacke-ſlate. From the obſervations of ſome geologiſts it would appear that flint-ſlate is, in many caſes, to be referred to the tranſition rocks of Werner; and, according to Freieſleben, the ſpecimens in Laſius's collection of rocks, which by this author are deſcribed as varieties of trapp, belong to the tranſition flint-ſlate; whence its occurring as angular fragments in grey-wacke, and as rounded pieces in the old red ſand-ſtone can be no matter of ſurprize. Moſt frequently, however, it occurs in the ſhape of boulders, on plains, and in the beds of rivers.

Flint is uſed, in our military ſervice, for the purpoſe of affixing into a *vice* made at the top of the *cock* of a muſquet, or piſtol lock; ſo that when impelled againſt a piece of ſteel, called the *hammer*, it may ſtrike fire, and ignite the gun-powder contained in a *pan*, concealed by the *hammer*, until the latter is forced backwards on a pivot, by the great force with which the *cock* ſtrikes againſt it; when it not only produces fire, but, by its peculiar form, directs the ſparks towards the *priming* in the *pan*.

Flints are eaſily adapted to this purpoſe; thoſe great maſſes which are found chiefly in chalky ſoils, being broken by hammers, yield a number of wedge-like pieces, of which the ſides are trimmed to the proper width, and the backs brought into a proper form, which ſhould be rather concave. This concavity is, however, very little attended to, but is of great ſervice, ſince it embraces the ſcrew of the vice, and cauſes the flint to retain a much firmer hold than when its back is made either ſtraight, or convex ; the latter is a great fault, but is commonly overlooked.

The proper ſizes for flints are as follow ; for a muſquet, one inch and five-eighths, for the length, with a width of an inch and a quarter ; the thickneſs at the back one-third of an inch, and the tapering to be rather ſudden than gradual, ſomething like the end of a chiſel. Such flints fit well in the *vice*, being previouſly laid in a bed of thin ſheet-lead, or for want of it, in ſtout leather. The edge of a flint, thus formed, is far leſs ſubject to ſplinter, than where the angle is more acute. It may perhaps be objected, that a thin edge ſtrikes fire better than a thick one ; but that will be for only a few rounds ; whereas the thicker edge reſiſts better, and preſerves an equable facility of ſcintillating for a long time. All military men muſt know that nothing is more adverſe to the operations of a regiment, than the neceſſity (which too often occurs in conſequence of the proper form not being ſufficiently attended to) for men to quit their ranks for the purpoſe of either hammering, or changing their flints. To the brave man ſuch a neceſſity is painful, as well as dangerous, while to the leſs reſolute it ſerves at leaſt for a pretext to paſs into the rear, or eventually to relinquiſh his poſt altogether.

A carabine flint ſhould be one inch and a quarter in length, by one inch in width ; that for a piſtol, ſuch as is uſed among our military, ought to be rather more than an inch in length, by three quarters in width. In fixing them into the vice, great care ſhould be taken that their left ſides paſs down clear of the barrel, which they would otherwiſe hack very much, and be themſelves ſubject to ſplinter, while the cock itſelf might, by being unduly checked, be ſnapt at its neck.

When flints have a curve, they ſhould always be ſo fixed in the vice, as to give the curve a downward direction ; ſince, in that way, they act more forcibly, and offer the greateſt reſiſtance. Straight flints, after being ſo far rounded as to yield no ſparks, when their chamfered ſides may have been uppermoſt, may be again rendered ſerviceable by being reverſed, ſo as to bring their flat ſides uppermoſt. Soaking flints in water reſtores them partially, probably by ſupplying them with hydrogen, but in a very ſmall degree, and that not permanently.

The beſt flints are ſuch as, when acted upon by ſteel, produce ſtrong laſting corruſcations, which emit a ſulphureous ſmell, and are ſufficiently large to leave ſome little ſtain on tiſſue paper, or on fine lint. Such will not only be found to yield a certain fire, but to break up admirably under the hammer employed to reduce them to ſplinters, and to fit them for the ſoldier's uſe. On the contrary, however clear, black, and firm a flint may appear, if its ſparks are not vivid, and highly ſulphureous, it ought to be at once thrown aſide.

The hardeſt flints being generally the beſt, experiments were made with agates, cornelians, &c. all of which produce beautiful ſparks, but, being extremely brittle, could not be brought into general uſe ; however, in ſituations where they are obtainable, and where flints are not to be had, they become valuable ſubſtitutes. Various attempts have been made to produce flints by means of compoſition ; but ſuch have always proved vitreous, and conſequently weak both in ſubſtance, and in the production of ſparks. We cannot conclude this article without ſtrongly recommending, that more attention be paid at our arſenals to the rejection of flints of defective form and quality.

Flints are generally packed in ſmall caſks, called half-barrels, each of which contains,

	Number		qrs.	lbs.
Muſquet flints	2000	weighing	2	14
Carabine do.	3000		2	10
Piſtol do.	4000		2	15

The tonnage of this article is computed at 28 kegs of muſquet-flints to occupy 18 cwt. and 10 kegs of piſtol-flints to occupy 3 cwt. 2 qrs. which our readers cannot fail to obſerve by no means correſponds with the foregoing table of contents.

FLINTS, in the *Glaſs-trade*. The way of preparing flints for the niceſt operations in the glaſs-trade is this. Chooſe the hardeſt flints, ſuch as are black and will reſiſt the file, and will grow white when calcined in the fire. Cleanſe theſe of the white cruſt that adheres to them, then calcine them in a ſtrong fire, and throw them, while red-hot, into cold water ; waſh off the aſhes that may adhere to them, and powder them in an iron mortar, and ſiſt them through a very fine ſieve ; pour upon this powder ſome weak aqua fortis, or the phlegm of aqua fortis, to diſſolve and take up any particles of iron it may have got from the mortar ; ſtir this mixture ſeveral times, then let it reſt, and in the morning pour off the liquor, and waſh the powder ſeveral times with hot-water, and afterwards dry it for uſe. You will thus have a powder for making the pureſt glaſs, as perfectly fine and faultleſs, as if you had uſed rock cryſtal itſelf. Cramer's Art of Aſſaying Metals, p. 438.

The waſhing off the ferruginous particles with aqua fortis is not neceſſary when the glaſs intended to be made is to be tinged with iron afterwards ; but when meant to be a pure white, this is the method that will ſecure ſucceſs.

FLINTS, the ſmall, ſharp, hard, vitrifiable ſtones which often abound in ſoils of the more thin, poor kinds.

FLINTS, *oil* or *liquor of*, a name given by ſome to a preparation made of four ounces of flints, calcined and powdered, and mixed with twelve ounces of ſalt of tartar ; theſe being melted together in a large crucible, by a ſtrong fire, run into a glaſs, which quickly and ſtrongly attracts moiſture from the air, and is entirely ſoluble in water, except a very ſmall portion of earthy matter ; this glaſs, being afterwards powdered and ſet in a cellar, runs into an oil per deliquium ; with this and the calx of any metal is prepared one of the metallic vegetations. If any acid be added to the liquor of flints, ſo as to ſaturate the alkali, the flint, which was kept diſſolved in water by means of this alkali, will be now precipitated in the ſtate of a fine earth, which earth is entirely ſoluble by acids.

FLINT *Walls*. See WALL.

FLINT *Nodules*, in *Geology*, are a phenomenon of a curious and important kind, when their regular diſperſion through the chalk ſtrata are taken into conſideration, as well as the ſingular and ſomewhat regular ſhapes which they aſſume. The great aſſemblage of chalk ſtrata which form the uppermoſt but two of the aſſemblages of ſtrata in Britain, as far as is yet known, (*viz.* the London-clay and Bagſhot-ſand,) abounds with theſe nodules in about the upper half thereof, called the upper or flinty chalk, while the under part, called the lower or hard chalk, has few if any flints occurring in it, and theſe, at its upper part, if ſuch do occur. It is well aſcertained, that none of the chalk ſtrata are entirely free of minute grains of ſiliceous or gritty matter in them, whence the uſe of chalk or whiting in ſcowering tin, ſilver, and other veſſels ariſes ; and modern obſervations by Mr. Smith and his pupils have ſhewn, that where the layers of flints moſt abound, or are neareſt together, as they are near to the top of the whole ſeries, that there the intervening beds of chalk are moſt *free* or ſoft, as well as the whiteſt, and that from theſe ſituations it is, that the writing chalk uſed by carpenters, &c. and the beſt for the manufacture of whiting for lime for the plaſterer's uſes, or for chalking land by the huſbandmen, are taken. It has further been obſerved, that as the flints decreaſe in quantity, in deſcending the chalk ſeries, that more ſiliceous grains appear in the chalk itſelf, until the flints ceaſe altogether, and the lower-chalk commences; which lower chalk is much harder, more like lime-ſtone, and is more ſiliceous, which properties ſeem to render it preferable for the common purpoſe of mortar-making, than the ſofter chalks. This hard or inferior chalk, uſed for lime-burning in Bedfordſhire and the adjoining counties, is called hurlock; and it is obſerved, that the beds of this hard chalk become more hard and compact in deſcending the ſeries, as was a few years ago viſible to travellers in the cutting of the new road down Ruddle-Hill, a mile from Dunſtable, and as may again be ſhewn, if the tunnel which has been propoſed under the old road for avoiding the inconvenient bend occaſioned by the new one, ſhould be carried into effect. The hard chalk or hurlock continues to increaſe in its ſiliceous qualities until near the bottom of the ſeries, where it becomes a free-ſtone, which is in great repute there, under the name of Totternhoe-ſtone, which has a ſharp and fine grit, and inſtead of being lime-ſtone, poſſeſſes the properties of a *fire-ſtone*, under which denomination the ſtone of this ſtratum is brought to the metropolis from Ryegate, Godſtone, and other places on the ſouthern ſkirt of the North Downs of Surry. Thus it appears, that ſiliceous or flinty matter abounds in the chalk, through the whole ſeries, from the ſand ſtrata which lie above it (at Croydon), to the ſand ſtrata which lie below it (at Ryegate); but it is in the upper part of the chalk ſeries collected into nodules and layers of flint, and in the lower part of the ſeries is diſtributed in the maſs of chalk.

It ſeems probable, from the obſervations of Mr. Parkinſon, and other late obſervers, that the flint nodules of the chalk ſtrata, or great part of them, owe their origin, or rather perhaps occupy the place of the Alcyonium and others of the zoophytic tribes of the primitive creation. The vaſt number of hollow tubes in flint, which we meet with in the chalk pits at Harefield, near Rickmanſworth, Herts, and other places, though often miſtook for petrified *bones*, ſeem to us to be remains of the coralline tribe. *Echini* are often found among the flint nodules of the chalk ſtrata, ſome of them large and rather of a rude ſhape, compared with the delicate workmanſhip obſervable on many of echinus; this kind are found in vaſt numbers in the chalk-pits about Brandon in Norfolk, and are uſed in building walls and houſes, in a neat and very ſingular ſtyle.

FLINTSHIRE, in *Geography*, a county in North Wales, bounded on the ſouth and weſt by Denbighſhire; on the north by the Iriſh ſea; and on the north-eaſt is ſeparated from Cheſhire by the eſtuary of the Dee. At an early period this diſtrict formed a portion of the country to which the Romans gave the appellation of Ordovicia; the inhabitants of which ſo eminently diſtinguiſhed themſelves in their pertinacious reſiſtance to the Roman arms. Subſequent to the Romans leaving the iſland, it long conſtituted the territory known to the Britons by the name of Deheubarth; and ſeveral ſtrong caſtles ſtill remaining, ſhew it was formerly a ſcene of ſanguinary contention. In the time of Henry VIII, when Wales was incorporated with England, this was made one of the ſix counties of North Wales. This county extends in length 33 miles, and in breadth from 8 to 9, containing about 160,000 acres of land, of which, according to the report to the Board of Agriculture, only 20,000 are in an arable ſtate, 116,000 under paſturage, and the remainder in a ſtate of waſte. The principal rivers are the Dee, which riſing in Merionethſhire, after running through Denbighſhire, waſhes this county, and is navigable from Cheſter to the ſea. The Clwydd has its ſource in Denbighſhire, and, running in a northerly direction, is joined by the Alan below St. Aſaph, and falls into the Iriſh ſea. It is alſo watered by the Sevion, the Wheeler, and a few ſmaller ſtreams. The face of the country is much leſs diverſified than any other Welſh county. A ridge of low hills riſes abruptly on the north-eaſtern part of the county from the Dee, and, running parallel with that river, terminates at the ſea. The vale of Mold is a rich level country, and the vale, or rather valley of Clwydd, has has been long celebrated for its pictureſque beauty. The northern part is champagne, and abounds with corn; the vallies conſiſt of an argillaceous ſoil, and are productive in graſs. The cattle are ſmall, but conſidered excellent milchers. Quantities of honey are annually produced, which the inhabitants manufacture into a kind of wine called Metheglin. The hills are barren, but are internally rich, containing free-ſtone, lime-ſtone, coal, lead, copper, and calamine, the ores of which are ſmelted, and the metals exported viâ the port of Cheſter. The county politically is divided into five hundreds, *viz.* Coleſhill, Maylor, Mold, Preſtayn, and Rhyddlan, compriſing one city, St. Aſaph, one borough, Flint, and four other market towns, *viz.* Caerwys, Caergwrle, Mold, and Holywell; and twenty-eight pariſhes, 23 of which are in the dioceſe of St. Aſaph, and five in that of Cheſter. By the returns made under the population act to parliament, in 1801, the number of houſes was 7585, and inhabitants 39,622; out of which number it appeared 10,332 were occupied in the labours of agriculture, and 6989 employed in trade. Many of the latter find employment in the mines and ſmelting-houſes, and others in the linen trade, a manufactory of which was, by the patriotic exertions of Mr. Fitzwilliams, introduced into the county, and has ſince ſpread, and is at preſent in a flouriſhing ſtate. The county is repreſented by one member in the Britiſh ſenate.

FLINTY GRAVELS, are ſuch gravelly ſoils as contain a large proportion of flints in their compoſitions. They are met with in many ſituations.

FLINTY *Soils*, all ſuch as are conſtituted with a large proportion of flinty matters. Theſe ſoils are moſtly thin, and of no very great fertility. They prevail in many ſituations. See SOIL.

FLIP, a ſort of ſailor's drink, made of malt liquor, brandy, and ſugar, mixed.

FLISSINGUE, in *Geography*, a ſmall iſland or fortreſs in the Eaſt Indian ſea, a little to the weſt of Amboyna.

FLITTER-MOUSE, in *Zoology*, the *bat*. See VESPERTILIO.

FLIX, in *Geography*, a ſmall town of Spain, in Catalonia, formerly defended by a caſtle on an eminence, but now diſmantled, peninſulated by the Ebro; 8 leagues above Tortoſa, near the cataract of that river.

FLIX *Weed*, in *Botany*, a ſpecies of water-creſſes, which grows in uncultivated places, and by the ſide of foot-ways in many parts of England: it flowers in June, and the ſeeds, which ripen in Auguſt, are greatly recommended by ſome for the gravel and retention of urine.

FLIZE, in *Geography*, a town of France, in the department of the Ardennes, and chief place of a canton in the diſtrict of Mèzierés, ſeated on the Meuſe; 5 miles S.E. of Mèzierés. The place contains 92, and the canton 5362 inhabitants, on a territory of 155 kiliometres, in 26 communes.

FLOAT, or Fleet. See Flota, and Fleet.

Float *of a fiſhing-line*, &c. See Fishing-*float*.

Float, ſometimes called catamaran, alſo denotes a certain quantity of pieces of timber, joined together with rafters athwart, thrown into a river to be conveyed down the ſtream; and even ſometimes to carry burthens down a river with the ſtream. The invention of floats is of great uſe; it is ſaid to have been firſt put in execution at Paris in the year 1618. (See Boat.) The term alſo ſignifies to turn water upon meadow-land, with the view of dreſſing and improving it. And it likewiſe implies the paring off the ſurface, turf, or ſward of graſs lands. See Raft.

Float, in *Engineery*, ſignifies a low or ſhallow boat, often called a dirt-boat, uſed in the repairs of *canals*; which ſee. See Flatts.

Float-*boards*, thoſe boards fixed to water wheels of underſhot mills, ſerving to receive the impulſe of the ſtream, whereby the wheel is carried round. See *Water*-Wheel.

It is a diſadvantage to have too great a number of float-boards; becauſe, when they are all ſtruck by the water in the beſt manner it can be brought to act againſt them, the ſum of all theſe impulſes will only be equal to the impulſe made againſt one float board at right angles, by all the water coming out of the pen-ſtock, through the opening, ſo as to take place on the float-board. The beſt rule in this caſe is, to have juſt ſo many, that each of them may come out of the water as ſoon as poſſible, after it has received and acted with its full impulſe; or, which comes to the ſame thing, when the ſucceeding one is in a perpendicular direction to the ſurface of the water. As to the length of theſe float-boards, it may be regulated according to the breadth of the ſtream. See Deſaguliers, vol. ii. p. 425.

Float *Graſs*. See Festuca.

Float-*Ore*, in *Mining*, or ſhoad-ore, ſignifies, in ſome places, the ſame with ſtream-ore, or that found alluvial in the bottoms of vallies, as tin often is in the valleys in Cornwall.

Float-*ſtone*. See Quartz.

FLOATAGES. See Flotages.

FLOATING Bodies. *On the Stability and Equilibrium of Floating Bodies.*—Although the general principles relating to this ſubject will be conſidered in their proper order under the articles Fluids and *Specific* Gravity, yet there are a few intereſting theorems more particularly belonging to floating bodies, and which, forming a ſubject of themſelves, ſeem to merit attention in this place.

Taking for granted the elementary principles of hydroſtatics, as previouſly eſtabliſhed, we ſhall examine the caſes in which floating bodies are in equilibrium, when that equilibrium is ſtable, and when tottering or unſtable. In every ſyſtem of bodies, whether floating in fluids or acted on by the force of gravity, there are two ſtates of equilibrium, entirely diſtinct. In one, if the equilibrium be ever ſo little deranged, the bodies which compoſe the ſyſtem only oſcillate about their primitive poſition, and the equilibrium is ſaid to be firm or ſtable. This ſtability is abſolute if it takes place, whatever be the nature of the oſcillations; it is relative if it only takes place in oſcillations of a certain kind; in the other ſtate of equilibrium, if the ſyſtem be ever ſo little deranged, all bodies deviate more and more, and the ſyſtem, inſtead of having any tendency to re-eſtabliſh itſelf in its primitive poſition, is overſet, and aſſumes a new poſition, entirely different from the former.

We may form a juſt conception of theſe two ſtates, by ſuppoſing an ellipſe placed vertically on an horizontal plane: if the ellipſe is in equilibrium on its ſmaller axis, it is evident that, upon a ſlight derangement, it will tend to regain its original poſition, after ſeveral ſmall oſcillations, which will ſoon be terminated by the friction and reſiſtance of the air; but if the ellipſe be placed in equilibrium on its greater axis, if once it deviates from this poſition, it will continue to deviate more and more, till it finally turns itſelf on its leſſer axis. In the above example there is this remarkable circumſtance; the four poſitions of equilibrium of the ellipſe on the extremities of its two axes are alternately ſtable and unſtable; and this takes place in every caſe. For ſuppoſe two poſitions of ſtable equilibrium to take place in any body, and ſuch that there does not exiſt between them any poſition of the ſame kind, if the body is placed in one of theſe poſitions, and is made to deviate from it, and to approach the other, according as this deviation is greater or leſs, the body will either return to its original ſtate, or will arrive at the other poſition. There will evidently, therefore, be ſome intermediate poſition in which the body will neither tend towards one or the other of the former, but will remain at reſt: but this ſtate of equilibrium will be unſtable, ſince, if the body be made to deviate ever ſo little towards one of the other poſitions, it will neceſſarily arrive at it. Hence it appears, that if a body turning round a fixed axis paſſes through ſeveral poſitions of equilibrium, they will be alternately ſtable and unſtable.

The ſtability of a floating body is the greater as its centre of gravity is lower than that of the diſplaced fluid, or as the diſtance between theſe centres is encreaſed; it is for this reaſon that ballaſt is put in the lower part of veſſels to prevent them from being overſet.

The nature of the equilibrium, as to ſtability, depends on the poſition of a certain point, called the meta-centre, or centre of preſſure. The term was firſt adopted, we believe, by Bouguer, in his Traité du Navire.

When the meta-centre is above the centre of gravity, the equilibrium is ſtable; on the contrary, when the meta-centre is lower than the centre of gravity, the equilibrium is tottering; when the meta-centre coincides with the centre of gravity, the body will remain at reſt in any poſition it is placed in, without any tendency to oſcillation.

The determination of the meta-centre, and of the nature of the ſmall oſcillations of a floating body about its primitive poſition, is a problem of conſiderable importance.

Laplace gives the following rule for determining whether the force which ſolicits the ſyſtem tends to reſtore it to the ſame ſtate again, when deranged from its primitive poſition.

"If, through the centre of gravity of the ſection of the ſurface of the water on which a body floats, we conceive a horizontal axis to paſs, ſuch that the ſum of the products of every element of the ſection, multiplied by the ſquare of its diſtance from this axis, be leſs than relatively to any other horizontal axis drawn through the ſame centre; the equilibrium will be ſtable in every direction, when this ſum ſurpaſſes the product of the volume of the diſplaced fluid, by the height of the centre of gravity of the body above the centre of gravity of this volume."

This rule is principally uſeful in the conſtruction of veſſels which require ſufficient ſtability to enable them to reſiſt the effects of ſtorms, which tend to ſubmerge them.

In a ſhip, the axis drawn from the ſtern to the prow is that relative to which the ſum above-mentioned is a minimum; it is eaſy therefore to aſcertain and meaſure its ſtability by the preceding rule.

In order that a floating body may remain in equilibrium, it is alſo neceſſary that its centre of gravity be in the ſame vertical line with the centre of gravity of the diſplaced fluid, otherwiſe the weight of the ſolid will not be completely counteracted by the preſſure of the diſplaced fluid.

When the lower ſurface of a floating body is ſpherical or cylindrical, the meta-centre muſt coincide with the centre of the figure, ſince the height of this point, as well as the form of the portion of the fluid diſplaced, muſt remain invariable in all circumſtances. The place of the meta-centre is determined by the doctrine of Forces combined with the elementary principles of hydroſtatics, by conſidering the form and extent of the ſurface of the diſplaced portion of the fluid compared with its bulk and with the ſituation of its centre of gravity. According to Dr. Young, if a rectangular beam be floating on its flat ſurface, the height of the meta-centre above the centre of gravity will be to the breadth of the beam as the breadth to twelve times the depth of the part immerſed. Hence, if the beam be ſquare, it will float ſecurely when either the part immerſed, or the part above the ſurface is leſs than $\frac{21}{100}$ of the whole, but when it is leſs unequally divided by the ſurface of the fluid it will overſet. If, however, the breadth be ſo increaſed as to be nearly one-fourth greater than the depth, it will poſſeſs a certain degree of ſtability, whatever its denſity may be. *Plate* VIII. *Hydraulics*, *fig.* 1, taken from Dr. Young, is intended to illuſtrate this.

Two ſquare beams floating at the depths ſhown at A and B, will have a certain degree of ſtability, but if they ſink, as at C, they will overſet; but a beam of the breadth ſhewn at D will always float ſecurely.

Theory of the Stability and Oſcillations of floating Bodies.— When a floating body is in equilibrium, if it be deranged from this ſtate by any cauſe whatever, it is the object of this inveſtigation to determine the circumſtances in which it will return to this ſtate, or continue to deviate more and more from it.

In the ſtate of equilibrium (*fig.* 2.), the ſtraight line GO, which joins the centre of gravity G, of the body DFE, to the centre of gravity O, of the diſplaced fluid AFB, is vertical. Let this line be taken as the axis of z; (ſee FORCE, where this method of analyſis is explained). If the body be deranged, this line GO becomes inclined, and O is no longer the centre of gravity of the diſplaced fluid aFb; the derangement is here ſuppoſed infinitely ſmall; the plane of x and y is taken as horizontal, and paſſing through G, the axis y is projected as a point in G. Gx is the axis of x. AB repreſents the *floating ſurface* in a ſtate of equilibrium, ab in its new poſition; the co-ordinates y are ſuppoſed parallel to the axes of theſe ſurfaces, which ſeparate the immerged part of the body from that which is above the fluid; this axis may be called the axis of the floating ſurface: it is projected on the point C. The point O may be placed lower than G, without changing any of theſe conſiderations. The figure ſuppoſes a body not homogeneous, but having the inferior part artificially rendered ſpecifically heavier than the fluid, as in the caſe of ſhips. The angle $aCA = \theta = GOV$ is ſuppoſed infinitely ſmall; ſo that we may imagine the elementary ſolid ACa as formed by the revolution of the ſurface AC, round the axis C of the floating ſurface. The ſame may be ſaid of BCb; qq', and pp', are the projections of the arcs deſcribed by the centres of gravity of BC, AC.

Neglecting the vertical motion of the body, we may conſider aFb as equal to AFB; ſo that the portion ACa out of the fluid is equal to the part BCb, which is immerged in it. If it were otherwiſe the weight of the body would no longer be equal to the preſſure of the fluid; and theſe two forces acting on C would produce a vertical motion in the body; beſides which it would turn round C as a fixed centre; and as this laſt motion is independent of the firſt, and the only one which we are to inveſtigate, this hypotheſis ſimplifies the queſtion by confining it to the latter motion only. The expreſſions, therefore, for the volumes ACa, BCb, are to be made equal, that is, $AC \times pp' = CB \times qq'$; and ſince the *momenta* of the areas AC and BC are equal with reſpect to the axis C, the centre of gravity of the ſurface AB, or ab, is ſituated on this axis. The equilibrium being diſturbed, we are to conſider the motion which the body will take. Let $GO = a$, the volume $AFB = aFb = S$; alſo ſine $\theta = \theta$, coſ. $\theta = 1$.

The preſſure of the fluid on the immerged portion aFb is equal to the weight of the diſplaced fluid; this force acts on the centre of gravity of aFb, and ſince it is the poſition of this centre which is to determine the motion of the body about the point G, its poſition muſt be determined by taking the momenta relatively to the planes xz, yz.

$aFb + aCA$ is the ſame as $AFB + CBb$; and it can be ſhewn, that conſidering the volumes aFb, aCA, as concentrated in their reſpective centres of gravity, as likewiſe thoſe of AFB and CBb, and taking their momenta relative to any plane, their momenta will be equal. Let them be taken relatively to the plane yz, or the plane perpendicular to the figure, and then $AFB \times GV = Sa$; ſin. $\theta = Sa\theta$, is the momentum of AFB, ſuppoſed concentered in O.

$CBb \times qi$ will be that of CBb, becauſe q differs but an infinitely ſmall quantity from the extremity of the vertical paſſing through the centre of gravity of BCb.

Likewiſe, $aCA \times ip$, will be that of aCA.

Let gn be the projection of the vertical paſſing through the centre of gravity of aFb, then $aFb \times Gn = Sx$ will be the momentum of aFb, ſuppoſing $Gn = x$. The momentum of aCA ſhould be taken with a contrary ſign from that of aFb, ſince the weight and the preſſure tend to make them revolve in contrary directions round the axis y. Hence

$$Sx - ACa \times ip = Sa\theta + CBb \times qi,$$

and $Sx = Sa\theta + CBb \times pq$.

To determine the centres of gravity of the elementary portions ACa, BCb, we muſt divide the ſum of the momenta of their elements by their volumes; let any element, ε, be taken of the ſurface AC, whoſe diſtance from the axis of the floating body C is ρ, then $\theta\rho$ is the arc of rotation of AC round this axis, or the height of the little elementary parallelopiped which it deſcribes; $\theta\rho\varepsilon$ will equal its volume, $\theta\rho^2\varepsilon$ its momentum relatively to a vertical plane paſſing through C; $\theta\int(\rho^2\varepsilon)$ is the ſum of theſe momenta, therefore, $\theta\int(\rho^2\varepsilon) = ACa \times Cp$.

In the ſame manner will be obtained $Ccb \times Cq$; and by addition $BCb \times pq = \theta b^2$; b^2 expreſſing the momentum of inertia of the area AB relative to its axis, which momentum is poſitive and known, ſince this axis is parallel to that of y, and paſſing through the centre of gravity of AB; laſtly, the abſciſſa Gn of the preſſure of the fluid is

$$x = \left(a + \frac{b^2}{S}\right)\theta.$$

The momentum of the volume AFB is poſitive, only becauſe the centre of gravity O of the diſplaced fluid is more elevated than that of the body. If, on the contrary, the point O had been loweſt, the perpendicular GV would have fallen on the oppoſite ſide, then the momentum of

AFB

A F B would have tended to turn in a contrary direction, and we ſhould have had

$$x = \left(-a + \frac{b^2}{S}\right)\theta.$$

The general formula is therefore $x = \left(\frac{b^2}{S} \pm a\right)\theta$; the ſign + for the caſe of the centre of gravity of the body being lower than that of the fluid, the ſign — for the contrary.

The co-ordinate x being thus determined, it now remains to determine y.

We have already a F b + a C A = A F B + C B b, and taking the momenta relatively to the plane of $x\,z$, that of a F b is S y, that of A F B is zero, ſince the centre of gravity O is in the plane $x\,z$; we have therefore only to eſtimate thoſe of the two elementary ſections.

Let us ſuppoſe that the ordinates of their reſpective centres of gravity in the direction of the axes of y are poſitive, the element ε taking upon C B gives the elementary parallelopiped $\theta\rho\varepsilon$, ρ denoting its diſtance from the plane $x\,z$; $\theta\rho\varepsilon r$ denotes its momemtum; the ſum of theſe momenta is therefore $\theta\int(\rho\varepsilon r)$, obſerving that their ſigns muſt vary with the ſign of r, that is, as theſe elements are ſituated on one or the other part of the plane of $x\,z$, the momentum of B C b is therefore $\theta\int(\rho\varepsilon r)$: a ſimilar expreſſion will be obtained for a C A, but with a contrary ſign, ſince the preſſure relative to B c b and a F b acts evidently in a contrary direction to the weight of A C a: this negative expreſſion, tranſpoſed on the contrary ſide of the equation, becomes poſitive, hence $Sy = \theta\int(\varepsilon\rho r)$; and $y = \frac{\theta}{S}\int(\varepsilon\rho r)$. The ſymbol $\int$ denotes the integration relatively to the whole floating ſurface, and of a right line which is the interſection of this ſurface with the plane of $x\,z$, it may therefore be conſidered as known, but it is not neceſſarily poſitive, like $\int(\varepsilon\rho^2)$ ſince the elements vary with their ſigns; therefore the co-ordinate y of the meta-centre may become either poſitive, negative, or zero with $\int(\varepsilon\rho r)$. If the body is cut ſymmetrically in two equal parts by the plane of $x\,z$, $\int(\varepsilon\rho r) = o$ and $y = o$, and the co-ordinate x of the centre of gravity is given by the formala found above, $x = \left(\frac{b^2}{S} \pm a\right)\theta$.

When $x = o$, the centres of gravity, and the diſplaced fluid, are in the ſame vertical G z, therefore the equilibrium ſubſiſts in the new poſition of the body: this happens when a, being negative, $a = \frac{b^2}{S}$, but when this is not the caſe, as the preſſure of the fluid acts upwards, it is evident that when x is poſitive, the body tends to regain its former poſition, and the equilibrium is then ſtable; this happens when a is poſitive, or when a is negative, and at the ſame time leſs than $\frac{b^2}{S}$. Finally, if a is negative, and leſs than $\frac{b^2}{S}$, x is negative, which denotes that the centre of gravity of a F b is on the other ſide of the vertical G z, the preſſure of the fluid then cauſes the body to deviate more and more from its original poſition, and the equilibrium is tottering or unſtable. This point in the axis of z, which is met by the preſſure of the fluid, is called the meta-centre, and hence is derived the theorem mentioned above. That a floating body is in a ſtable equilibrium when the meta-centre is above the centre of gravity of the body, that the equilibrium is unſtable when the meta-centre is below, and that when the two centres coincide the body has no tendency to oſcillate. It is evident that the point g is more or leſs elevated than the point G, or coincides with it according as the value of G n is poſitive, negative, or zero.

We ſhall conclude this article with the following theorem from Dr. Young, which will ſerve to illuſtrate the preceding theory.

If a floating body have its ſection made by the ſurface of the fluid a parallelogram, its equilibrium will be ſtable or tottering, accordingly as the height of its centre of gravity above that of the fluid diſplaced is ſmaller or greater than one-twelfth of the cube of the breadth, divided by the area of the tranſverſe vertical ſection of the immerſed part.

Let the body be inclined in a ſmall degree from the poſition of equilibrium A B C into the poſition D E F; then the triangles G H I and K H I will be equal, ſince the area of the ſection immerſed muſt remain conſtant, and G K and I L will ultimately biſect each other in H. Now the centre of gravity of the ſection I L E is the common centre of gravity of its parts I H M F and L H M, making K M = G I; but N, the centre of gravity of I H M F, is in the line H F, biſecting it, and the common centre of gravity may be found by making N O parallel to H K or H L, in the ſame ratio to the diſtance of the centre of gravity of L H M from H, that L H M bears to I F L. Now the diſtance of the centre of gravity of any triangle from the vertex is two-thirds of the line which biſects the baſe, that is, in this caſe, $\frac{2}{3}$ H K, and the area of the triangle L H M is H K . K P; therefore N O : $\frac{2}{3}$ H K :: H K : K P : L F I, $\text{N O} = \frac{\frac{2}{3}\,\text{H K}\,q.\ \text{K P}}{\text{I F L}}$; but drawing O Q vertically through O, N O : N Q :: K P : H K, and N Q = $\frac{\text{N O : H K}}{\text{K P}} = \frac{\frac{2}{3}\,\text{H K cub.}}{\text{I F L}} = \frac{\frac{1}{12}\,\text{I L cub.}}{\text{I F L}}$. If therefore the centre of gravity be in Q, the body will remain in its poſition in any ſmall inclination; ſince the reſult of the preſſure of the fluid acts in the direction O Q; if the centre of gravity be below Q, it will deſcend towards the line Q O, and the body will recover its ſituation; if above Q, the body will overſet; hence the point Q is ſometimes called the centre of preſſure, or the meta-centre. The theorem may be eaſily accommodated to bodies of other forms.

Floating-*bridge*, a bridge conſiſting of ſeveral boats covered with planks: which ought to be ſo ſolidly framed as to bear both horſes and cannon. See **Bridge.**

Floating-*iſlands*. See **Islands.**

Floating *Meadows*, in *Rural Economy*, the practice of overflowing them with water in order to the improvement of their crops. See **Meadow**, and *Watering* **Land.**

Floating *Veſſel*. See **Boat**, **Vessel**, &c.

Floating *Upwards*, an old term uſed in watering lands, where large dams for keeping up the water were had recourſe to.

FLOBY, in *Geography*, a town of Sweden, in the province of Weſt Gothland; 51 miles N. E. of Gotheborg.

FLOC, a town of Norway, in the dioceſe of Drontheim; 48 miles E. N. E. of Ramſdal.

FLOCK, a number of ſheep kept together under a ſhepherd. Flocks are ſometimes diſtinguiſhed into the paſture, and mountain kinds.

Flock, *Setting of*, the practice of calling and ſorting the different kinds of ſheep-ſtock. It is uſually had recourſe to annually for lambs, where ſheep huſbandry is extenſive.

Flock-*Paper*. See **Paper.**

FLODAY, in *Geography*, one of the ſmaller Weſtern iſlands of Scotland. N. lat. 57° 40′. W. long. 7° 13′.

FLODDAY, another of the above-mentioned iſlands. N. lat. 57° 31′. W. long. 6°.

FLODOARD, or FRODOARD, in *Biography*, an eccleſiaſtic and hiſtorian, was born at Epernai, in Champagne, in 894. He was educated at Rheims, and was appointed keeper of the archives in the cathedral, and afterwards canon. He had other preferments, and in 936 was deputed to pope Leo VII. by whom he was kindly received. At length he became an abbot of a monaſtery in the dioceſe of Rheims. An attempt was made, in 951, to place him in the ſee of Noyon, but without ſucceſs. In 963 he reſigned his abbacy, and devoted himſelf to pious exerciſes. He is known as an author by "A Collection of Hiſtories in Verſe," containing the triumphs of Jeſus Chriſt and his diſciples, and the abridged hiſtory of all the popes down to Leo VII. and of the moſt illuſtrious ſaints, &c. He wrote alſo "A Hiſtory of the church of Rheims," and "A Chronicle compriſing the Hiſtory of the Times from 919 to 966." Moreri.

FLOETZ. See FLETZ.

FLOGEL, CHARLES FREDERIC, in *Biography*, a learned Sileſian author, was born at Jauer, in December 1729. In the year 1774 he was appointed profeſſor of philoſophy in the academy of Leignitz, and died in March 1788, at the age of 59. He left behind him many able works, among which was "A Hiſtory of the Human Underſtanding," and "A Hiſtory of the preſent ſtate of Belles Lettres in Germany." He had read a great deal, and poſſeſſed an extenſive knowledge of the hiſtory of literature, as well as of philoſophy and other ſciences. He was highly eſteemed on account of his integrity and agreeable diſpoſition, and his memory has been immortalized by his excellent works. Gen. Biog.

FLOGNY, in *Geography*, a town of France, in the department of the Yonne, and chief place of a canton, in the diſtrict of Tonnerre; ſix miles S.E. of St. Florentin. The place contains 330, and the canton 8367 inhabitants, on a territory of 155 kiliometres, in 15 communes.

FLOHA, a town of Germany, in the circle of Erzgeburg; ſix miles E.N.E. of Chemnitz.

FLOHAU, a town of Bohemia, in the circle of Saatz; eight miles S. of Saatz.

FLON, a river of France, which runs into the Arly, about a mile S.W. of Flumet.

FLONE, or FLOEN, a town of France, in the department of the Ourthe; eight miles S.S.W. of Liege.

FLONHEIM, a town of France, in the department of the Rhine and Moſelle; 12 miles E.S.E. of Crantznach.

FLOOD, a deluge or inundation of waters. See DELUGE.

FLOOD is alſo uſed in ſpeaking of the tide. See TIDE.

When the water is at loweſt, it is called flood; when riſing, young, or old flood; when at higheſt, high flood; when beginning to fail, ebb-water.

FLOOD-*mark*, the mark which the ſea makes on the ſhore, at flowing water, and the higheſt tide: it is alſo called high-water mark.

FLOOD *Sand*. See SAND.

FLOOD-*gate*, among *Engineers*, ſignified a gate or ſluice which can be opened or ſhut at pleaſure to retain or give paſſage to the water of a river liable to be ſwollen by floods. Flood-gates are neceſſary in many ſituations upon rivers where the water is retained for the ſervice of mills, canals, navigations, docks, &c.; in theſe only a certain quantity of the ſtream can be employed, and the ſurplus in time of a flood muſt be ſuffered to eſcape by another paſſage. For inſtance, in the caſe of mills upon a large and rapid river, the ſtream of water is intercepted by a weir erected acroſs it, and penned up the proper height to obtain a ſufficient fall for the mill, which is ſituated by the ſide of the river, with a channel leading from above the weir, to convey the water to the mill, whilſt another conducts it into the river below the weir. In ordinary times this arrangement is ſufficient, for whenever the mill is not in action, the water which would otherwiſe paſs through it, flows over the weir, and eſcapes into the river below. Now if the ſudden falling of rain, or melting of ſnow, cauſes a flood in the river, it often happens that the length of the weir is inſufficient to vent the torrent of water coming down; and without ſome contrivance anſwering the purpoſe of a flood gate, to give paſſage to the water, it becomes penned up many feet above the crown, or higheſt level of the weir, inundating the lands adjacent to the channel, above the weir. If the river is provided with a proper flood-gate, it acts, when open, in the ſame manner as removing a part of the weir, and allows the water to paſs down quietly without riſing much above the level which is common in ordinary times. From this, the uſe of a flood-gate will be comprehended; navigable rivers, which are penned up to form locks, require flood-gates, which are applied in the ſame manner as before-mentioned.

Flood-gates may be conſtructed in various forms; but it is indiſpenſable that they ſhould be capable of being opened or ſhut during the time when a preſſure of water is acting againſt them. Small gates are always made to ſlide up and down in a groove in the manner of a ſluice; ſome very conſiderable rivers are furniſhed with a number of ſuch ſmall draw-gates, which open a great extent of water, when drawn up. In the moſt extenſive works it is neceſſary to make uſe of a different kind of gate, which can be opened or ſhut with greater eaſe than a number of ſhuttles, and which will lay open a more extenſive paſſage; for in violent floods it is not uncommon for large trees, buſhes, hay ricks, thatched roofs of low buildings, &c. to be brought away by the torrent; and if the flood-gates have any obſtruction, theſe matters accumulate before the paſſage, and, when the flood laſts long, frequently choak up the gate, and the water overflows its banks. To avoid ſuch accidents is the ſtudy of the engineer in conſtructing works of this kind; the late Mr. Smeaton deſigned ſeveral flood-gates, in which the preſſure of the water was balanced, ſo that the gate at any time could be opened or ſhut with eaſe, even while the preſſure of the water was acting againſt it on one ſide only. *Figures* 5 and 6 of *Plate* XV. *Miſcellany*, is a plan, and *fig.* 2. an elevation of this contrivance; A A B B repreſents a channel made through the weir, or, if more convenient to ſuit the local circumſtances, it is made by the ſide of the river, leading from above the weir to below it: this channel muſt be ſubſtantially built in maſonry to reſiſt the violent action of the water ruſhing through it when the gate is opened; in ſome convenient part of this paſſage a ſtout beam C is placed acroſs the bottom, and another, D, acroſs the top, both firmly bedded in maſonry; theſe ſupport the gudgeons of the vertical axis E of the gate F F. When this gate is turned ſo as to preſent its edge to the current, the water has free paſſage by it, and on the other hand, when it is placed perpendicularly acroſs the channel, the whole of the water is detained: the axis of the gate is placed ſo as to paſs very nearly through the centre of preſſure of the ſuperficies expoſed to the action of the water; and as the preſſure of the ſurfaces on each ſide of the axis act to turn the gate in contrary directions, they balance each other, and the gate may be turned with ſcarcely any other reſiſtance than the friction of its gudgeons. The gate muſt neceſſarily be framed exceedingly ſtrong to bear the great weight of the water acting againſt it, without yielding. G, H, are two ground-cills firmly bolted down upon the floor of the conduit and the piles which are beneath it; one of the arms of each of theſe cills ſupport the gate when ſhut, and the other arms ſuſtain it when open, as is clearly ſhewn by the figure; theſe muſt be very firmly fixed to avoid any danger of the gate removing them; one of the upright ſides of the gate is ſupported by falling into a receſs made in the maſonry of the conduit, and to keep the other ſide of the gate up to its cill, a lever, called a vallet, which is in the form of a triangle I K, and moves upon a vertical axis placed in a receſs in the maſonry ſo as to be out of the way of the gate's motion, when placed in the poſition at *fig.* 5, leaving the gate at liberty to open; in the other poſition it acts as a lever to cloſe the gate, being drawn tight by tackle, and afterwards laſhed by a ſmall line to the beam D. The gate is retained ſhut, but can be opened inſtantaneouſly by cutting the line; and as the gate is made rather larger on the ſide of the axis where the vallet is placed, that it may have a tendency to open when releaſed by the preponderating preſſure on one ſide. The gate in queſtion is 15 feet in height, and the ſame in breadth; when open, it allows two paſſages of 15 feet by 6 feet 3 inches in width; the gate is to be ſhut by the application of a capſtan and blocks, for which purpoſe eye-bolts are provided on the proper points of the gates and beam D.

This gate, though very proper for large rivers where a watchman muſt be in conſtant attendance to open and ſhut it when neceſſary, is not ſo applicable as a common ſluice to a ſmall mill-dam, where, if a ſudden flood occurs in the night, the miller muſt riſe to open the gate; and, unleſs he conſtantly attends to ſhut it when the flood ſubſides, the mill-dam may be emptied and the water loſt, which he would wiſh to reſerve for the enſuing day. Great complaints are frequently made in the country of lands being overflowed in the night when the miller is not in the way to open his flood-gate; to remedy this a ſelf-acting flood-gate would be deſirable, and we beg leave to ſuggeſt the following. Let A A, *fig.* 7. be a gate ſimilar to the one before mentioned, but of ſmaller dimenſions, and poiſed upon a horizontal axis paſſing rather above the centre of preſſure of the gate, ſo as to give it a tendency to ſhut cloſe: *a a* is a lever fixed perpendicular to the gate, and connected by an iron rod with a caſk *b* floating upon the ſurface of the water, when it riſes to the line B D, which is aſſumed as a level of the weir or mill-dam B C E F, in which the flood-gate is placed; by this arrangement it will be ſeen, that when the water riſes above the dam, it floats the caſk, opens the gate, and allowing the water to eſcape until its ſurface ſubſides at the proper level B D; the caſk now acts by its weight, when unſupported by the water, to cloſe the gate and prevent leakage; the gate ſhould be fitted into a frame of timber H K, which is ſet in the maſonry of the dam, the upper beam H of the frame being juſt level with the crown of the dam, ſo that the water runs over the top of the gate, at the ſame time that it paſſes through it; to prevent the current diſturbing the caſk it is connected by a ſmall rod *e* at each end to the upper beam H of the frame, and jointed in ſuch a manner as to admit of motion in a vertical direction.

This flood-gate would be very uſeful in mill-dams of ſmall dimenſion, which are therefore liable to be ſuddenly overflowed, for being ſelf-acting, it requires no attendance, and from its ſimplicity is not very liable to be deranged, as before mentioned; for large rivers the principal object is, to open a great extent of water-way, which will admit the paſſage of large bodies brought down by the ſtream; Mr. Smeaton's gate above mentioned, as the axis is always in the channel, would be liable to be choaked by trees, &c.; for this reaſon large ſluices or ſhuttles are very generally adopted, though the great power and expenſive machinery required to raiſe ſuch gates are an objection.

A flood-gate lately erected by Mr. Bramah is the moſt perfect in this reſpect of any that we have met with; it is raiſed (on the hydroſtatic principle which he has ſo ſucceſsfully applied to many other uſeful purpoſes) with ſuch facility, that a paſſage 19 feet wide, and 10 feet high, can be opened by one man in 15 minutes, and this when the preſſure of 10 feet of water is acting on one ſide only. *Fig.* 8. is an elevation of this gate, and *fig.* 9. an horizontal ſection; A, A, repreſent two large beams which are partly received into the maſonry of the conduit; the lower ends are framed into a ſtrong ground-cill B, and the upper ends connected by a framing; this forms a frame in which the gate riſes and falls: it is guided in its motion by two iron plates *a*, *a*, bolted to the ſides of the gate, forming a groove, as ſhewn in the plan. Two ſquare pieces of caſt iron, denoted by *b*, *b*, and the dark ſhading in the plan, are bolted againſt the inſide ſurfaces of the beams A, A, and received into the grooves of the gate, to confine it to move in a vertical direction: theſe pieces of iron have cylindrical chambers through them, as ſhewn by the ſmall white circles in the plan, to admit two poliſhed iron cylinders *d*, *d*, attached to the end of the upper rail D D of the ornamental framing on the top of the gate; a cloſe fitting is made round the cylinders *d*, *d*, by leathers confined with ſcrews to preſs againſt them at the top of the iron barrels, ſo that no fluid can paſs out of the chamber in the barrels *b*, *b*; *e*, *e*, in the plan, are two ſmall pipes communicating with the chambers at the bottom of each barrel, and theſe pipes are united at *f*, proceeding to a pump, by which water is injected into the two chambers together; and as this fluid is incompreſſible, it follows that the cylinders *d*, *d*, muſt be forced out of their reſpective chambers raiſing up the gate. As the area of the pump is much leſs than that of the cylinders, and as it ſupplies two of them, it follows that the motion of the piſton of the pump will inject ſuch a quantity of water as, when diſtributed into the two chambers, produces a very ſmall protruſion of the cylinders; it is on this principle of the differences of the two motions that the power is gained: the area of the pump in the preſent inſtance is .7854 of a ſquare inch, and the cylinders about 7.07 ſquare inches, or nine times as much; by this means a power is gained in the two cylinders equal to 18 times the force exerted upon the piſton of the pump, which being moved by a lever multiplying the power ten times, the power of a man applied to the pump is increaſed 180 times; ſo that a weight of 100lbs. applied to the lever, will raiſe 18,000 lbs. on the piſton rods.

The pump may be placed at any convenient diſtance from the gate, a ſmall copper tube only half an inch diameter conducting the water into the cylinders: in many ſituations this will be extremely convenient, as it obviates the neceſſity of an expenſive ſcaffold or framing over the gate, which is indiſpenſable in other ſluices to ſupport the labourers and the machinery for drawing up the gate; the pump is explained by *figs.* 10. and 11. on a much larger ſcale than the other parts; *h* is a ciſtern containing water, and *i* the pump-barrel fixed perpendicular in it; the plunger or piſton *g* is ſolid, and leather packed round it in a manner ſomething ſimilar to the cylinder; it is confined to a rectilinear motion by ſliding through a fixed ſocket *l* at the upper end, and in the middle it has an opening to admit of a lever *m*, by which the pump is moved; it is connected with the rod by a coupling rod within the opening, which allows its deviations from the rectilinear motion; the pump has two valves, the one is ſituated in the bottom of the barrel at *n*, and the other in the pipe beneath *o*; its action is ſimilar to the ordinary force pump, inhaling the water into the barrel when the piſton is lifted up, and expelling it through the pipe *f* when forced down; at *p* is a ſteel-yard and weight acting upon a ſmall valve, which permits the eſcape of the water if the preſſure ſhould be ſo great as to endanger the rupture of the pipes when the gate is lifted up to the top of its frame; hence it is termed the ſafety-valve: it ſhould never be loaded with a greater weight than will keep the valve ſhut againſt a ſufficient preſſure to elevate the gate. At *r* is a cock which diſcharges the water from the pipe into the ciſtern, and permits the deſcent of the gate. To reſiſt the great preſſure of the water againſt the gate, it is ſtrengthened by three truſſed frames, repreſented by *k*, *k*, *k*, in the elevation, *fig.* 8. and in the plan; each truſs is an iron rod attached to the gate at each end, and ſupported in the middle by a block, which anſwers the purpoſe of a king-poſt: the rods can be drawn tight by iron wedges paſſing through the gate; therefore it is evident that in this ſtate the gate cannot yield to the preſſure of the water, unleſs one rod is ſhortened and the other ſtretched; theſe frames render the gate ſo ſtiff that it does not ſhew any ſigns of weakneſs when the preſſure acts againſt it; the truſſes are placed nearer together at the lower part of the gate, where the greateſt ſtrength is wanted.

The limits of our plate do not allow us to do juſtice to the preciſe and more minute parts of this admirable invention, but as theſe will again come under our notice in the article Press, *Hydroſtatic*, we refer the more complete elucidation of the pump, mode of packing the cylinders, &c. to the plates belonging to that article. It ſhould be noticed, that the gate repreſented in our figure is intended to admit the paſſage of loaded barges beneath it, and is therefore much higher in the frame A A than would be neceſſary for flood-gates in all ſituations; it would form a moſt excellent ſluice for clearing out harbours from mud, as the torrent of water it lets out would be much more effective than three or four of the ſmall ſluices at preſent in uſe.

Flood-*bridge*, ſignifies a low bridge conſtructed for the towing-path of a canal, over a weir or over-fall for diſcharging ſuperfluous water. See Canal.

Flood-*lock*, ſignifies a tide lock, or that opening into the ſea, or a tidal river.

FLOODING, *Profluvium Sanguinis*, in *Surgery*, may be applied to any unnatural or profuſe diſcharge of blood, but it is uſually confined to præternatural diſcharges of blood from the uterus. The moſt common of theſe are profluvium menſium, or an increaſed diſcharge of the menſtrual flux, (ſee Menses), or thoſe diſcharges of blood from the uterus, which precede, and not unfrequently occaſion abortion. (See Abortion.) The hæmorrhage alſo, which follows a partial or total ſeparation of the placenta from the uterus, if profuſe, whether it takes place before or after the birth of the child, is called a flooding. Flooding is ſometimes, though rarely, occaſioned by falls or blows, and ſometimes by ulcers, polypi, or other diſeaſes of the uterus. In all caſes of flooding the patient ſhould be confined, as much as conveniently may be, to a recumbent poſture, the body ſhould be kept cool and open, and a few ſpoonfuls of the infuſion of red roſes ſhould be given two or three times in the day, adding to the portion given at night from five to ten drops of the tincture of opium.

Flooding *Land*, in *Agriculture*, is the practice of flooding, or covering graſs lands with the water of rivers, &c. at particular ſeaſons. In this mode the water is ſuffered to remain upon the ground for a conſiderable length of time, which is quite different to that of irrigation, in which it conſtantly runs off as faſt as it is brought upon the land. This method has probably been introduced in conſequence of obſerving the fertilizing effects that take place after paſture lands have been overflowed with water for ſome time in the winter ſeaſon. This plan of watering is of vaſt importance in moſſy meadows, even where the water is perfectly clear and free from any material that is capable of being depoſited.

In preparing lands for being flooded, there are two circumſtances that muſt be particularly regarded, namely, firſt to lay them as level as poſſible, either by dividing them into different levels, or any other means; and ſecondly, to convey the water upon them in the moſt ſafe and convenient manner for the cultivation of the ſurrounding grounds. In ſandy or moſſy lands, this is often not accompliſhed without conſiderable difficulty. See *Watering* Land.

FLOOK *of an Anchor*. See Anchor.

FLOOKING, in *Mining*, a term uſed to expreſs a peculiarity in the load of a mine. The load or quantity of ore is frequently intercepted in its courſe by the croſſing of a vein of earth or ſtone, or ſome different metallic ſubſtance; in which caſe the load is moved to one ſide, and this tranſient part of the load is called a flooking. See Fault.

FLOOR, in *Building*, the under-ſide of a room, or that part on which we walk, or perform different operations, ſuch as threſhing, dreſſing, and meaſuring grain, &c.

Floors are of divers ſorts; ſome of earth, ſome of brick, others of ſtone, others of boards, &c.

Carpenters, by the word floor, underſtand as well the frame-work of timber, as the boarding over it. The ſupporting timbers are called *naked flooring*, which ſee. The boarding is alſo of different kinds, as batten floors, common boarded floors, dowelled floors, and ſtraight-jointed floors.

For brick and *ſtone-floors*, ſee Pavement.

For boarded floors, it is obſervable, that the carpenters never floor their rooms with boards, till the carcaſe is ſet up, and alſo incloſed with walls, leſt the weather ſhould injure the flooring. Yet they generally rough-plane their boards for the flooring, before they begin any thing elſe about the building, that they may ſet them to dry and ſeaſon, which is done in the moſt careful manner. This operation ſhould be performed for at leaſt one year, ſo that the natural ſap may be thoroughly expelled. The beſt wood for flooring is the fine yellow deal well ſeaſoned, which, when well laid, will keep its colour for a long while; whereas the white ſort becomes black by often waſhing, and looks very bad. The battens uſed for flooring are of three kinds: the beſt is that free of knots, ſhakes, ſap, and croſs grained fibres, well matched. The ſecond beſt is that in which only ſmall, but ſound knots are permitted, and free of ſhakes and ſap. The third and common kind is that which remains after taking away the beſt and ſecond beſt.

With reſpect to the joints of flooring boards, they are either quite ſquare, or plowed and tongued, or rebated, or dowelled. In fixing them, they are either nailed upon one or both edges. They are always neceſſarily nailed upon both edges when ſquare jointed, without dowels.

When they are dowelled, they may be nailed on one or both edges, though one edge only is neceſſary; and in the beſt dowelled work there are no brads or nails ſeen whatever, the outer edge being faſtened by driving the nail obliquely through the wood, without piercing the upper ſurface; ſo that the floor, when planed off, appears without blemiſh.

In laying boarded floors, the boards are ſometimes laid one after the other; or otherwiſe one is firſt laid down, then the fourth, leaving an interval ſomewhat leſs than the breadth of the ſecond and third together. The intermediate boards are next laid in their places, with an edge of the one upon the edge of the firſt board, and an edge of the third upon the inner edge of the fourth, and the two middle edges together, which will form a ridge; to level which, two or more workmen jump upon it, till they have made the under ſurface coincident with the joiſts, then they are nailed down in their places. The operation is called folding floors, and the boards are ſaid to be folded. This mode is only taken when the boards are not ſufficiently ſeaſoned, or ſuſpected to be ſo. In order to make cloſe work, it is obvious that the two edges forming the joint of the ſecond and third boards muſt make angles, with the faces, together leſs than two right angles, or each one of each board leſs than a right angle. The ſeventh board is fixed as the fourth, and the fifth and ſixth inſerted as the ſecond and third, and ſo on till completed. In this kind of flooring the headings are generally ſquare or ſplayed.

When floors are dowelled, the regulating line for the centre of the dowels ſhould be drawn from the lower ſide, which, as has been obſerved, ought to be ſtraightened on purpoſe. The diſtances to which the dowels are ſet, are from ſix to eight inches, generally one over each joiſt, and one over each inter-joiſt.

When it is neceſſary to have a heading joint in the length of the floor, it ſhould always be upon a joiſt; one heading joint ſhould never meet another. In dowelled floors the heading points are always plowed and tongued.

In common floors the boards are adzed on the lower ſide, in order to bring them to a thickneſs between rebated edges. In doing this, great care ſhould be taken ſo as not to make them too thin, which is frequently the caſe; they muſt then be raiſed with chips, which is a very unſtable reſiſtance to a preſſure upon the floor. The manner of meaſuring floors is by ſquares of ten feet on each ſide, ſo that taking the length and breadth, and multiplying them together, and cutting off two decimals, the content of a floor in ſquares will be given. Thus 18 by 16 gives 288 of 2 ſquares and 88 decimal parts.

Floors, *Earthen*, are commonly made of loam, and ſometimes, eſpecially to make malt on, of lime, and brook-ſand, and gun-duſt, or anvil-duſt from the forge; the whole being well wrought up and blended together with blood. The ſiftings of lime-ſtone have alſo been found highly uſeful when formed into floors in this way.

Ox-blood and fine clay, tempered together, ſir Hugh Plat ſays, make the fineſt floor in the world. The principal object in conſtructing floors of this nature is that of blending and incorporating the different ſubſtances in a full and perfect manner for ſome time before they are laid; and when that is done they ſhould be repeatedly beaten down and rendered perfectly ſmooth and even.

The manner of making earthen floors for plain country habitations is as follows. Take two-thirds of lime, and one of coal aſhes well ſifted, with a ſmall quantity of loam clay; mix the whole together, and temper it well with water, making it up into a heap: let it lie a week or ten days, and then temper it over again. After this, heap it up for three or four days, and repeat the tempering very high, till it become ſmooth, yielding, tough, and gluey. The ground being then levelled, lay the floor therewith about 2½ or 3 inches thick, making it ſmooth with a trowel: the hotter the ſeaſon is the better; and when it is thoroughly dried, it will make the beſt floor for houſes, eſpecially malt-houſes.

If any one would have their floors look better, let them take lime made of rag-ſtones, well tempered with whites of eggs, covering the floor about half an inch thick with it, before the under flooring is too dry. If this be well done, and thoroughly dried, it will look, when rubbed with a little oil, as tranſparent as metal or glaſs. In elegant houſes, floors of this nature are made of ſtucco or of plaiſter of Paris beaten and ſifted, and mixed with other ingredients. Well wrought coarſe plaſter likewiſe makes excellent ſafe upper-floors, for cottages, out-houſes, &c. when neatly ſpread out upon good ſtrong laths or reed. See Plaster-*Floor*.

Floor *of a ſhip*, ſtrictly taken, is only ſo much of her bottom which ſhe reſts on, when aground.

Such ſhips as have long, and withal broad floors, lie on the ground with moſt ſecurity, and are not apt to feel, or tilt on one ſide; whereas others, which are narrow in the floor, or, in the ſea-phraſe, *cranked by the ground*, cannot be grounded without danger of being over-turned.

Floor *timbers*, in a *Ship*, are thoſe parts of a ſhip's timbers which are placed immediately acroſs the keel, and upon which the bottom of the ſhip is framed; to theſe the upper parts of the timbers are united, being only a continuation of floor-timbers upwards.

Floor, in *Mining*, or ſole, thill, or pound ſtone, ſignifies the bottom of the work in a mine, or in coal-mining, the ſtratum immediately under the coal-ſeam; which if ſoft, the upper part of it for ſix or eight inches in height generally is "holed in," as the colliers call it, that is, the ſame is picked out in order to undermine or looſen the coal, but if the floor be hard, as clunch is, the holeing or picking is then made in the bottom or ſome inferior bed of the coal itſelf, in order to under-go or give room for wedging down the blocks or webs of coal. In examining and comparing the ſinkings of the numerous coal-pits in Derbyſhire and Nottinghamſhire, Mr. Farey lately diſcovered, what ſeems likely to prove a general and important geological fact, *viz.* that the floor of every coal is a fire-clay, more or leſs thick, more or leſs perfect in its infuſible property, and more or leſs indurated; ſometimes being in a ſoft or ductile ſtate, when it is called ſloam, ſpavin, fire-clay, pipe-clay, (if white,) potter's-clay, brick-clay, &c., at others, in an indurated or almoſt ſtony ſtate, but which it quickly loſes and falls to clay, on expoſure to the atmoſphere, in which caſe it is called clunch, which is the name that the floor of coal moſt generally bears. This new fact appears to throw a great degree of light on the new theory of the formation of coal, near the end of our article Colliery, by rendering it probable that the growth of the ſubaqueous beds of vegetables there ſpoken of were produced by this peculiar ſubſtance as their ſoil or pabulum.

Floor, a ſuperficial meaſure of 400 ſquare feet or docking, is a ſquare whoſe ſide is 20 feet, and occurs in the facing of the fen-banks, and in other works on the fens of Cambridgeſhire and Norfolk, &c.

Floor, a ſolid meaſure of 400 cubit feet, or a ſuperficial floor, one foot thick, uſed in meaſuring the pits dug to obtain earth for forming the banks againſt the tide or rivers in the fens on the eaſtern coaſt. (Smeaton's Reports, vol. i. p. 330.)

Flook is a term applied to the pits, which are dug in the fens, to furniſh ſtuff for making their banks, by the cubic meaſurement of which the bankers are paid.

FLOQUET, Stephen Joseph, in *Biography*, a French muſical compoſer, whoſe firſt production for the lyric theatre was ſo ſucceſsful as to merit a record, having ſupported an hundred repreſentations always with the ſame applauſe, and crowded audience; this piece, which is called a ballet, written by Monſ. le Monnier, is entitled "The Union of Love and the Arts," (l'Union de l'Amour et des Arts), was performed in 1773, when the muſic of the old ſchool began to fade. This was the year preceding the arrival of Gluck, and a year before Piccini was invited to Paris, which divided the nation into two furious muſical factions, as hoſtile to each other as thoſe in England enliſted under the banners of Bononcini and Handel. Sacchini's tender and graceful ſtrains had not yet been heard; it ſeems therefore as if there muſt have been merit of ſome kind or other to captivate, without cabal, a whole nation. Floquet was born at Aix in Provence, 1750; and was the firſt muſical author that was called for by the audience to be crowned, and to receive on the ſtage their approbation in perſon. A maſs of his compoſition was performed in the cathedral at Aix before he was eleven years old. In 1774 he ſet another opera, which not having the ſame ſucceſs as the firſt, he determined to travel into Italy to receive inſtructions from the moſt able maſters of that country, and obtained them for ſome time at Naples, under the celebrated Sala, the worthy ſucceſſor of Durante, and maſter of the Conſervatorio of la Pietà, which had furniſhed the muſical art, and all Europe, with ſo many great maſters. On quitting Naples he went to Bologna, and had the further advantage of receiving inſtructions from the profound father Martini, the greateſt theoriſt that Italy has ever produced. A Te Deum, a due Cori, of his compoſition, was performed at Naples with great ſucceſs; and he was admitted of the Philharmonic Society at Bologna; it is however known, that to be received into that academy, it is neceſſary for a candidate to give proofs of his abilities three ſeveral nights; but M. Floquet performed all the ſeveral exerciſes the ſame evening, and compoſed in two hours and a half, on canto fermo, a fugue in five parts, and the verſe crucifixus of the credo; ſo that he was immediately received unanimouſly. On his return to France, he compoſed the opera of Hellé, performed in 1778, but which had no ſucceſs; not but that the muſic manifeſted the progreſs which the young Floquet had made in his art; but from the badneſs of the words enſued a total want of intereſt in the ſubject. This compoſer was ill adviſed by friends to attempt giving meaning to a drama ſo deteſtably dull. We adviſe him to be more cautious in future in the choice of his words, and will venture to anſwer for his ſucceſs. Laborde, 1780.

FLORA, in *Mythology*. See Florales *Ludi*.

Flora, in *Botany*, is very generally applied as a title to books whoſe profeſſed object is to enumerate, define, or fully deſcribe the wild plants of any particular country or diſtrict. Publications of this kind, with which the botanical library at the preſent day abounds, are not leſs various in their ſcope than in their merits. Some are mere catalogues, diſpoſed either in alphabetical or ſyſtematic order, while others are compleat hiſtories of the plants they enumerate, reſpecting not only their botanical characters and diſtinctions, but alſo their ſcientific hiſtory, and even that of animals connected with them, as well as their actual or probable uſes and qualities. Of this laſt kind, the *Flora Lapponica* of Linnæus, publiſhed at Amſterdam in 1737, in one volume 8vo. with 12 plates, and republiſhed at London in 1792, is a tranſcendent, and hitherto unrivalled example. Of the former ſort it would be invidious to cite inſtances, nor ought even the moſt humble attempts of this nature to be diſcouraged, however they may have been affectedly deſpiſed by pedantic, but leſs practical, writers. The moſt eſſential difference in the real merits of ſuch works conſiſts in their degree of originality and authenticity. A ſmall catalogue, the firſt attempt of its kind, ſuch as How's *Phytologia Britannica*, printed in 1650, or Franckenius's *Speculum Botanicum*, firſt publiſhed at Upſal in 1638, however imperfect or incorrect, ought to rank far above compilations which only purſue a plain, well-trodden track, without affording any additional diſcoveries or illuſtrations, ſuch as the moſt beaten path will yield to a real obſerver. Of this no more ſtriking example can be given, in a purely botanical work, than the *Flora Germanica* of Prof. Schrader, the firſt volume of which, compriſing the firſt three of the Linnæan claſſes, though publiſhed at Gottingen in 1806, has only juſt reached our country. This book, as far as we have been able to ſtudy it, is unrivalled for original and accurate deſcriptions, faithful well-ſtudied ſynonyms, and acute as well as candid criticiſm. Decandolle's new edition of Lamarck's *Flore Francaiſe* is a work of ſimilar merit. Haller's *Hiſtoria Stirpium Helveticarum*, publiſhed in three vols. folio, in 1768, with ſome exquiſite engravings, is one of the moſt celebrated Floras, in which the ſubject is treated with that enthuſiaſm which gains the reader's heart; but its ſynonymy and references are extremely incorrect. Of the merits of Curtis's unfiniſhed *Flora Londinenſis* we have already ſpoken; ſee Curtis. Ray's *Synopſis*, the only Britiſh Flora which ranks above it, is as far as the original author goes, a truly excellent and nearly faultleſs publication. His own labours we have moſt correct in the 2d. edition, publiſhed in 1696; the 3d, as is remarked under our biographical article Dillenius, being extremely faulty, though commonly uſed, and even the plates added by its editor, quoted as the work of Ray.

We beg leave here, being not unuſed to the peruſal, nor indeed the compoſition of ſuch works, to offer a few remarks of a practical tendency.

It is in the firſt place eſſential that the author of a local *Flora* ſhould be reſponſible for the identity of the plants he enumerates, and the places in which they are ſaid to grow, either on his own authority, or that of ſome perſon or author named. If any obſcurity attends the determination of a ſpecies, it is his indiſpenſible duty, either by a figure or minute deſcription, to place his own plant at leaſt out of all doubt, if he has not acceſs to opinions or authorities which may decide his ſynonyms in other writers. In this particular, Relhan's *Flora Cantabrigienſis*, Sibthorp's *Flora Oxonienſis*, and Abbot's *Flora Bedfordienſis*, have their appropriate value. Nor is Lightfoot's *Flora Scotica* at all inferior as to the enumeration or determination of ſpecies, for which its author was favoured with peculiar advantages. The great fault of the laſt work, which ought ever to be reprobated, is the compiling deſcriptions from various authors, without mention of the quarters whence they are derived, which do not certainly belong to the ſame plant, though thoſe authors happen to have called it by the ſame name. This is the fault of Withering's Botanical Arrangement of Britiſh Plants, where widely diſcordant deſcriptions, from foreign writers, are often brought together to determine a Britiſh ſpecies; but in this excellent writer there is no deception, all his authorities being properly acknowledged. Another very blameable practice, which we wiſh to expoſe to juſt cenſure, is copying ſynonyms from Linnæus or ſome other author, ſuppoſed of authority, without ever turning to the books cited to ſee whether their figures or deſcriptions anſwer to the plant intended to be illuſtrated by them. This has been but too common, as a matter of courſe, nor are ſome of our beſt Engliſh writers exempt from it. The practice is detected by occaſional errors of the preſs which, exiſting in the original, are transferred to the copy. Thus, there is hardly an error of the preſs in Ray's or Linnæus's citations of former authors, that is not exactly copied in the *Flora Anglica* of Hudſon, who was otherwiſe a practical and accurate botaniſt. For inſtance, under *Aliſma Damaſonium* the quotation of Bauhin's *Hiſtoria* ſhould be *p.* 779, but Dillenius in Ray has it 789, and ſo has Hudſon; under *Arenaria rubra marina* the ſame author is erroneouſly cited, after Dillenius, 772, but it ought to be 720; under *Sedum rupeſtre* Hudſon, copying Dillenius in Ray's *Synopſis*, refers to Petiver's tab. 41, whereas it ought to be 42; for *Spergula arvenſis* Linnæus refers to Dodonæus *p.* 527, ſo does Hudſon after him, but the right page is 537; under *Aſarum europæum* Hudſon quotes Gerarde as calling it *Aſarum vulgare*, an error taken from Dillenius, for Gerarde calls it only *Aſarum*. Even the *Flora Londinenſis* is not exempt from this fault, of which one inſtance will ſuffice. Under *Lobelia urens*, faſc. 6. t. 63, Moriſon *p.* 407 is cited, though the proper page is 467, the error being obviouſly copied from Hudſon, who took it from Linnæus's *Species Plantarum*, in both editions of which, and in the Vienna copy of the ſecond, the ſame error exiſts, as well as in Willdenow's *Sp. Pl.* v. 1. 947, no ſuch miſtakes being ever corrected in the laſt-mentioned publication. In like manner, even the great Gærtner, ſo profeſſedly critical of Linnæus, under *Ægilops ovata* quotes, after the *Species Plantarum*, Dodon. Pempt. 73, whereas the proper page is 539.—The detection of only a ſingle fault of this ſort in an author, overturns our confidence in his whole ſyſtem of ſynonymy; for how are we to know whether he has judged of a ſynonym for himſelf or not? except indeed by ſearching out the paſſages which no other writer cites.

To avoid the fault we have juſt been expoſing is in every body's power. There is another leſs eaſy to avoid, and more common, though more excuſable, that of copying generic or ſpecific definitions, or deſcriptions, without acknowledgment. Since the prevalence of the ſyſtem of Linnæus, and the great popularity of his works, thoſe who have written Floras, or Catalogues of Gardens, have generally implicitly adopted his definitions, at leaſt his generic ones, ſcarcely preſuming to ſuppoſe they could be incorrect. Some miſtakes having thence ariſen, which the introduction of the Linnæan herbarium into this country firſt led us to correct, the author of the *Flora Britannica* judged it neceſſary to bring every definition to the teſt of examination, ſuch being one of the few means left him, after the labours of ſo many able preceding botaniſts, to render his work importantly uſeful. With regard to ſpecies indeed, Mr. Hudſon, when he found the Linnæan ſpecific characters not accord with his own plants, very properly, and often advantageouſly, reformed them, but he by no means detected every error of this kind. On the other hand, too great a propenſity to correct and reform ſhould not lead us, in caſes where one idea or expreſſion is as good as another, and certainly preferable, from being already adopted, to make alterations merely for the ſake of ſhewing our zeal; for it is very probable we may alter for the worſe, though our ſelf-love will make us the laſt to perceive it.

This leads me to conſider the ſubject of ſyſtem, or methodical arrangement, which the writer of a *Flora* ſhould well conſider before he aims at diſtinction by any reformations in that department. He would be wiſe, in the firſt place, to adopt the moſt popular and eaſy ſyſtem, and hence moſt perſons have followed that of Linnæus. Some excellent and original writers in this line have choſen methods of their own, which, from their ſtrangeneſs or imperfection, have depreciated their works, and rendered them far leſs popular than they deſerved; as Villars in his Flora of Dauphiny, Allioni in his *Flora Pedemontana*, Gerard in his *Flora Galloprovincialis*, and *Scopoli* in the firſt edition of his *Flora Carniolica*, though in the ſecond he wiſely adopted the Linnæan arrangement. Whether the ſyſtems of theſe writers poſſeſs any merit or not, nobody thinks it worth while to enquire. The reader revolts at them as a perpetual inconvenience. A *Flora* is too limited a theatre for the diſplay of a new botanic ſyſtem, and we expect a different kind of information from it, which it is the writer's duty to give us in the eaſieſt moſt intelligible form, without troubling us to learn a new language on purpoſe. In early times indeed, before any ſyſtem was regularly eſtabliſhed, it became leading botaniſts, like Ray, to attempt to teach the world ſome ſcientific principles; but even this great man condeſcended, in his firſt catalogue of Britiſh plants, to uſe an alphabetical arrangement, as did a ſcarcely leſs excellent writer in this department, Magnol in his *Botanicon Monſpelienſe*. An alphabetical arrangement is, at any rate, unexceptionable, not proving a hindrance, if it affords no ſcientific aid.

Some *Floras*, beſides ſcientific definitions, deſcriptions, or ſynonyms, are illuſtrated with figures, a very uſeful though ſometimes expenſive addition; as the *Flora Londinenſis* above-mentioned, the *Engliſh Botany*, Jacquin's ſplendid *Flora Auſtriaca*, to which the *Plantæ Rariores Hungariæ* by Waldſtein and Kitaibel are a ſort of ſequel, as is alſo the ſtill more ſplendid *Flora Græca*, publiſhed according to the will of the late profeſſor, John Sibthorp of Oxford. The *Flora Danica* conſiſts of little elſe than plates, which may be had either coloured or plain. The *Flora Roſſica* of Pallas, intended, by its original patroneſs the empreſs Catharine, to outſhine every work of the kind, and to be beſtowed gratuitouſly on every perſon worthy to poſſeſs it throughout Europe, very ſoon proved abortive, and became a job in the hands of thoſe entruſted with its publication; nor is the execution of the plates to be commended, they having often been coloured from dried ſpecimens. Of extra-european *Floras* illuſtrated with plates, though uncoloured, the *Hortus Malabaricus* of Rheede, *Herbarium Amboynenſe* of Rumphius, and the recent *Flora Peruviana* by Ruiz and Pavon, are the moſt magnificent. The performances of the Burmanns in this line are but indifferent, though much quoted by Linnæus. The *Flora Japonica* of the celebrated Thunberg is valuable for the novelty of its materials, but nothing can be more rude than his *Icones* ſubſequently publiſhed to illuſtrate it. In point of novelty nothing can exceed the *Novæ Hollandiæ Plantarum Specimen* by Labillardiere, full of uſeful, though not oſtentatious, plates, nor is its ſcientific merit inferior to any. The elegant *Flora Atlantica* of his countryman Desfontaines, with more beautiful plates, though leſs ſingularity of materials, deſerves no leſs commendation. France at preſent teems with ſuperb works of a ſimilar nature.

We cannot attempt in the compaſs of this article to mention, ſtill leſs to do juſtice to the merits of, every *Flora* that has appeared. We refer the reader to the article Figures *of Plants* for ſome remarks connected with the ſubject. More particular notice of ſeveral of the publications alluded to, as well as an account of many ſimilar ones here altogether omitted, may come under the Biographical articles relating to their ſeveral authors. S.

FLORAC, in *Geography*, a town of France, in the department of the Lozere, and chief place of a diſtrict, near the Tarn; 13 miles S. of Mende. N. lat. 44° 19′. E. long. 3° 40′. The place contains 1,905, and the canton 7,985 inhabitants, on an extent of territory of 305 kiliometres, in 9 communes.

FLORAL Leaf, in *Botany*. See Bractea.

FLORALES Ludi, or Floral *games*, in *Antiquity*, were games held in honour of Flora, the goddeſs of flowers. They were celebrated with ſhameful debaucheries. The moſt licentious diſcourſes were not enough, but the courtezans were called together by the ſound of a trumpet, and made their appearance naked, and entertained the people with indecent ſhews and poſtures: the comedians appeared after the ſame manner on the ſtage. Val. Maximus relates that Cato being once preſent in the theatre on this occaſion, the people were aſhamed to aſk for ſuch immodeſt repreſentations in his preſence; till Cato, appriſed of the reſervedneſs and reſpect with which he inſpired them, withdrew, that the people might not be diſappointed of their accuſtomed diverſion.

There were divers other ſorts of ſhews exhibited on this occaſion; and, if we may believe Suetonius in Galba, c. vi. and Vopiſcus in Carinus, theſe princes preſented elephants dancing on ropes on theſe occaſions.

The ludi Florales, according to Pliny, lib. xviii. cap. 29. were inſtituted by order of an oracle of the ſibyls, on the 28th of April; not in the year of Rome IↃXVI. as we commonly read it in the ancient edition of that author; nor in IↃXIV. as F. Hardouin has corrected it, but as Voſſius reads it, in 513; though they were not regularly held every year till after 580. The occaſion is ſaid to have been this: a famine had laſted three years, which had been introduced by cold and rainy ſprings; upon which the ſenate, to appeaſe Flora, and obtain better crops, paſſed an act that year, appointing the annual celebration of theſe games at the end of April, in honour of that goddeſs; which was regularly executed for the future. They were chiefly held in the night time, in the Patrician-ſtreets; ſome will have it there was a circus for the purpoſe, on the hill called Hortulorum.

The goddeſs Flora is by ſome held to be the ſame with the Chloris of the Greeks. (Ovid. Faſt. l. iv.) Others maintain, (as Lactantius, Minutius Felix, Arnobius, and St. Auguſtin, among the fathers of the church; and Plutarch and Macrobius, among profane authors,) that this Flora was a famous courtezan at Rome, who, having enriched herſelf by proſtitution, made the people of Rome her heirs, on condition that they ſhould celebrate the anniverſary of her birth-day by the games and feaſts above mentioned. Some time afterwards the ſenate, judging ſuch a foundation unworthy the majeſty of the Roman people, to ennoble the ceremony, converted Flora into a goddeſs, whom they ſuppoſed to preſide over flowers; and ſo made it a part of religion to render her propitious, that it might be well with their gardens, vineyards, &c. This is the common account: but Voſſius (de Idolol. lib. i. cap. 12,) can by no means allow the goddeſs Flora to have been the courtezan above mentioned: he will rather have her a Sabine deity, and thinks her worſhip might have commenced under Romulus. His reaſon is, that Varro, (in his fourth book of the Latin tongue,) ranks Flora among the deities, to whom Tatius, king of the Sabines, offered up vows, before he joined battle with the Romans. Add, that from another paſſage in Varro it appears, that there were prieſts of Flora with ſacrifices, &c. as early as the times of Romulus and Numa. To which we may add that Pliny (l. xxxiv. c. 4.) ſpeaks of a ſtatue of this goddeſs by the hand of Praxiteles, which proves that her worſhip was famous in Greece, whence it was propagated to Italy, long before Romulus, who adopted it, when he entered into an aſſociation with Tatius and the Sabines. Moreover, we learn from Juſtin, that the Phocæans, who built Marſeilles, worſhipped the ſame goddeſs.

FLORAL Games. There is alſo a kind of floral games obſerved at this day in France; firſt inſtituted in 1324.

The deſign and eſtabliſhment were owing to ſeven perſons of condition, lovers of poetry, who, about All-ſaints-day, in 1323, ſent a circular letter to all the Provençal poets, called Troubadours, to meet at Thoulouſe on May-day following, there to rehearſe their poems; promiſing a prize of a violet of gold to the perſon whoſe piece ſhould be judged the beſt.

The capitouls found the deſign ſo good, that it was afterwards reſolved at a council of the city, to continue it at the city-charge; and this was done in a manner that did honour to the place.

In 1325, a chancellor and ſecretary of the new academy were choſen: and the ſeven inſtitutors took the quality of maintainers thereof. Two other prizes were afterwards added to the violet; *viz.* an eglantine for the ſecond prize, and a panſy for the third. It was alſo decreed, that the perſon who bore away the firſt prize, might demand to be made bachelor: and that whoever bore away all three, ſhould be created doctor in the *gay ſcience*, that is, in poetry.

There is a regiſter of theſe games kept at Thoulouſe, which gives this account of their origin; though others repreſent the matter differently. It was an ancient cuſtom they ſay, for the poets of Provence to meet yearly at Thoulouſe, to confer together, rehearſe their verſes, and receive a prize allotted to the beſt performance. This held till about the year 1540, when a lady of quality left the beſt part of her fortune to eternize the cuſtom, and bear the expence of prizes; the number of which ſhe increaſed, ordering an eglantine, a panſy, a violet, and a pink: the three firſt, a cubit high; and worth fifteen piſtoles a piece.

The ceremony began on May-day, with a ſolemn maſs, muſic, &c. The corporation attended; and poems were rehearſed every day: the third day a magnificent treat was given by the magiſtracy, &c. and that day the prizes were adjudged. The three prizes were the reward of three different kinds of compoſitions; *viz.* a poem, an eclogue, and an ode.

FLORALIA, in *Antiquity*, a general name for the feaſts, games, and other ceremonies, held in honour of the goddeſs Flora.

FLORENCE, in *Geography*, the capital city of *Etruria*, (which ſee), and regarded as the Athens of modern Italy, is ſituated on the river Arno, at the foot of the Apennines. The Arno divides it into two unequal parts, over which there are no fewer than four bridges in ſight of each other. That called the Ponta della Trinita, is uncommonly elegant, being built entirely of white marble, and ornamented with four beautiful ſtatues, repreſenting the four ſeaſons. The quays, the buildings on each ſide, and the bridges, render that part of Florence, through which the river runs, by far the fineſt. Florence was firſt founded by the ſoldiers of Sylla, embelliſhed and enlarged by the triumvirs, deſtroyed by Totila, and rebuilt by Charlemagne. The environs of this city are beautiful, rich, and populous; containing, as it has been ſaid, 6000 villas or country-houſes. The habitations of the peaſants likewiſe ſeem to be peculiarly neat and commodious; the country all round is divided into ſmall farms, with a neat farm-houſe on each. The circumference of the city is about two leagues; the fortifications conſiſt only of a wall and ditch, with two or three forts which defend it, and command a part of the town. This city vies, as to beauty, with Rome itſelf. The buildings are magnificent, moſt of the ſtreets clean, paved with ſquare ſtones, ſo as to have the appearance of a rock made level; they are generally winding, and many of them too narrow for carriages to paſs each other. They reckon 17 public places, or ſquares; ſeven fountains conſtantly playing, ſix pillars or columns, two pyramids, 160 beautiful ſtatues, placed either in the public ſquares, or in the ſtreets, or in the front of ſome palaces; one metropolitan church; 12 collegiate, and 44 parochial; 35 convents for men, 60 for women, 37 hoſpitals, and about 9000 houſes. The number of inhabitants is eſtimated at eighty thouſand. Florence has been equally diſtinguiſhed by a ſpirit of commerce, and for the fine arts: ſome of the Florentine merchants were formerly men of great wealth, and lived in a moſt magnificent manner. One of them, about the middle of the 15th century, built that noble fabric, which, from the name of its founder, is ſtill called the Palazzo Pitti. The builder was ruined by the expence; but the palace continued to be the reſidence of the ſovereigns. The gardens belonging to this palace are on the declivity of an eminence. On the ſummit there is a kind of fort, called Belvidere; from which, as well as from ſome of the higher walks, you have a complete view of the city, and the beautiful vale of Arno, in the middle of which it ſtands. The proſpect is bounded on every ſide by an amphitheatre of fertile hills, adorned with country-houſes and gardens. In this palace is a library containing about 35,000 volumes, with a great number of pictures by Raphael, Rubens, Titian, Andrea-del-Sarto, Tintoret, Guercino, &c. The Palazzo Vecchio, or old palace, contains a room 172 feet long, and 70 wide, for public entertainments, in which the moſt celebrated actions of the republic are painted by Vaſari in freſco; and in the corners are four capital hiſtorical pictures by Cigoli Ligozzi and Paſſignani. Theſe two palaces are connected by a gallery, which preſents an inexhauſtible fund of improving amuſement in ſculpture and painting, to which the public have daily acceſs. In this place was inſtituted a celebrated ſociety for the improvement of the Italian language, called "Academia della Cruſca," (ſee ACADEMY); and yet the Florentines are noted for bad enunciation of their language, accompanied with a guttural accent, though they write it with great elegance; whence has ariſen the proverb, "Lingua Toſcana, in bocca Romana." In Florence there are ſeveral theatres, all open during the carnival, which begins on the day after Chriſtmas day, and laſts till Aſh-wedneſday. At other times one of them only is open, except in Lent and Advent. The two principal are the Pergola, finiſhed in 1755, and the new Opera-houſe, firſt opened in the year 1779. The manufactures of Florence are chiefly ſilks and ſatins of excellent fabric. The woollen manufacture, to which it was indebted for its ſplendour and opulence, has ſo much declined as ſcarcely to ſuffice for the ſupply of the common people. At Doccia, three leagues from the city, is a manufacture of porcelain. The Florentines have been long famous for their Moſaic work, which is formed of the finer marbles, agates, jaſpers, and other hard ſtones, ſome thin, and inlaid in form of birds, flowers, &c. The wine of the adjacent country is excellent, and furniſhes a conſiderable trade in Italy and other countries. Society is maintained with eaſe and freedom in this city; beſides their converſaziones, many of the nobility meet every day at a houſe called the "Caſino;" and theſe meetings bear ſome reſemblance to the clubs of London. They alſo pay and receive viſits at the opera, where the dancing engages a much greater degree of attention than the muſic. The country ſurrounding Florence, or the Florentin, is one of the moſt fertile countries in Italy. Florence is ſituated 129 miles N.N.W. of Rome. N. lat. 43° 50′. E. long. 11° 14′.

FLORENCE-COURT, a ſmall poſt-town of Ireland, in the county of Fermanagh, adjoining which the earl of Enniſkillen has a beautiful ſeat, with very extenſive plantations. It is in the weſtern part of the county, about 74 miles N.W. from Dublin, and 6 from Enniſkillen.

FLORENNES, a town of France, in the department of the Sombre and Meuſe, and chief place of a canton, in the diſtrict of Dinant; 16 miles S.W. of Namur. The place contains 1,101, and the canton 6,711 inhabitants, in 22 communes, on a territory of 240 kiliometres.

FLORENSAC, a town of France, in the department of the Hérault, and chief place of a canton, in the diſtrict of Beziers; 10 miles S. of Beziers. The place contains 2,740, and the canton 4,990 inhabitants, in 4 communes, on a territory of 157½ kiliometres.

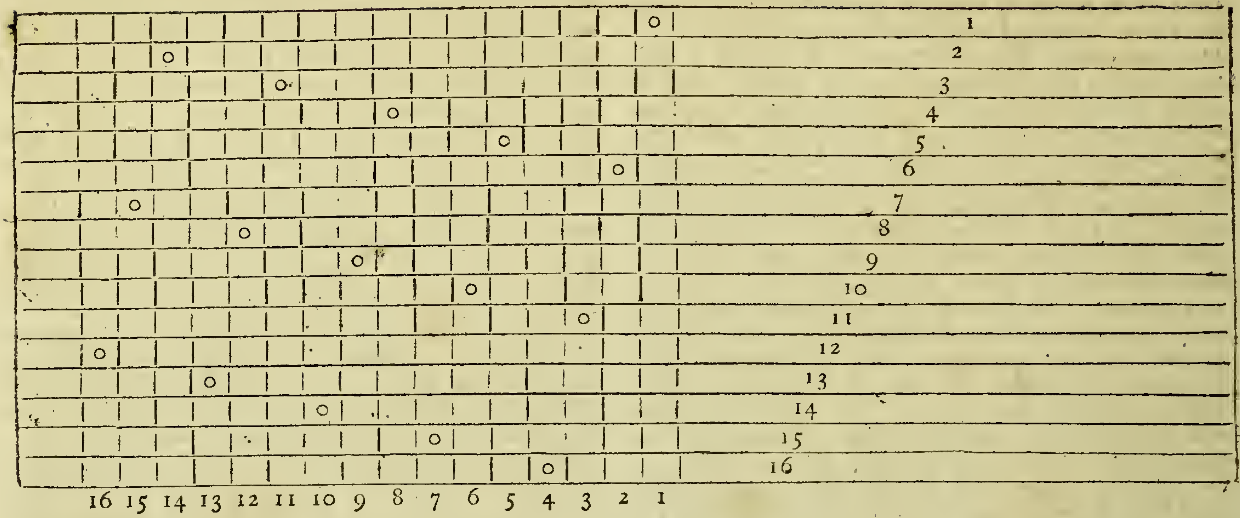
FLORENT, ST., a town of the department of Golo, in the iſland of Corſica, and in the diſtrict of Baſtia; containing in its cantons 1,487 inhabitants.—Alſo, a town of France, in the department of the Maine and Loire, and chief place of a canton, in the diſtrict of Beaupré; 19 miles W.S.W. of Angers. The place contains 1,433, and the canton 10,101 inhabitants, on a territorial extent of 190 kiliometres, in 10 communes.—Alſo, a town of France, in the department of the Cher, ſeated on the Cher; 7 miles S.W. of Bourges.

FLORENTIN, ST., a town of France, in the department of the Yonne, and principal place of a canton, in the diſtrict of Auxerre; 13 miles N.N.E. of Auxerre. The place contains 3,010, and the canton 9,740 inhabitants, on a territory of 162½ kiliometres, in 12 communes.

FLORENTINE WORK. See FLORENCE and MOSAIC *Work*.

FLORENTINE, in the *Manufacture of Cloth*, is the term uſed for a ſpecies of ſatin or tweeled ſilk, which has evidently been either originally or extenſively proſecuted at Florence. As from its very nature it muſt always prove an expenſive article of dreſs, acceſſible only to the rich parts of any country or community, it muſt be deemed of ſmall, or at leaſt ſecondary importance in one, where the extenſion and ſucceſs of every article of manufacture depend almoſt excluſively on the lowneſs of the price at which it can be furniſhed to the conſumer, after frequently paying the profits of many intermediate agents. It may, however, be proper to preſerve and record the manner of executing it; although it is by no means probable that it is likely to be introduced as a matter of traffic in Britain. This deſcription of ſatin or tweeled ſilk is generally very fine and cloſe in the fabric. It is woven with ſixteen leaves of heddles, and two or three reeds placed parallel to, and at a ſmall diſtance from, each other. It is the moſt comprehenſive kind of what is called broken or alternate tweeling. Its only variety from other tweels conſiſts in the ſuperior richneſs of appearance, which this extenſive apparatus gives it. Below is a plan of the draught and cording, by which it is effected.

FLORENTINE DRAUGHT.



From the cloſeneſs of the fabric, it would prove very inconvenient, if not abſolutely impracticable, to weave goods of this kind in a ſingle reed: for ſo many threads muſt be crowded together in every interval, that, in riſing and ſinking, they muſt impede each other ſo much, that the ſhuttle could ſeldom, if ever, find a clear paſſage between the raiſed and ſunk warp. To obviate this inconvenience, the additional reeds are uſed; the threads which paſs through the ſame interval in the firſt reed being divided in the ſecond, and again in the third, by which means both the friction and tendency to obſtruction are ſo much leſſened as to render the operation comparatively eaſy; although in fabrics ſo cloſe, it will require the moſt cloſe and unremitting attention in the weaver to keep his warp in proper order, and his *ſhed* or paſſage for the ſhuttle thoroughly open. The mode of placing the reeds ſeems very ſimilar in plan and effect to the mode adopted by practical geometricians, of dividing ſmall diſtances with accuracy by means of the diagonal ſcale.

FLORENVILLE, in *Geography*, a town of France, in the department of Feréto, and chief place of a canton, in the diſtrict of Neufchateau. The place contains 1,268, and the canton 9,072 inhabitants, in 15 communes, on a territory of 287½ kiliometres.

FLORES Triſtes, in *Botany*. See Flower.

Flores, in *Geography*, one of the Azores iſlands, which takes its name from the variety of beautiful flowers with which it is covered, is about 30 miles long and 9 broad; and contains from 1,300 to 1,400 inhabitants, who ſubſiſt upon their grain, cattle, and fruits. On this iſland, which is clothed with wood, grain, and paſture, and other neceſſary productions, are two towns and ſome hamlets. The capital is Santa Cruz, but Lagens is the moſt populous. N. lat. 39° 34′. W. long. 35°.

Flores, or *Floris*, an iſland in the Eaſt Indian ſea, about 180 miles in length from eaſt to weſt, and 45 in breadth. S. lat. 7° 54′ to 9° 2′. E. long. 120° to 123° 5′.

Flores, an iſland in the N. Pacific ocean, near the coaſt of the iſland of Quadra and Vancouver, 19 miles in length from N.W. to S.E., and from 2 to 6 in breadth. N. lat. 49° 20′. E. long. 234° 3′.

Flores *Argenti*, in *Natural Hiſtory*, a name given by ſome to the earth called by the generality of authors lac lunæ. It has both theſe names from its being ſuppoſed to partake of the nature of ſilver.

Flores *Martiales*, a name given to a preparation of the nature of what was formerly called ens veneris. Theſe flowers are thus prepared: take of waſhed colcothar, or green vitriol, or of iron filings, one pound; of ſal ammoniac, two pounds: mix them, and ſublime them in a retort, and mixing the bottom again with the flowers, renew the ſublimation till the flowers acquire a beautiful yellow colour. To the reſidue may be added half a pound of freſh ſal ammoniac, and the ſublimation repeated; and the ſame proceſs may be continued as long as the flowers remain duly coloured. Pemberton's Lond. Diſp. p. 215. See Iron.

FLORESZTI, in *Geography*, a town of European Turkey, in Moldavia; 60 miles E. of Stephanowze.

FLORET, in *Botany*, *floſculus*, (the diminutive of *flos*, a flower,) is applied to the individuals which all together compoſe either a compound or aggregate flower, but more eſpecially the former. Florets of compound flowers are invariably monopetalous and ſuperior. They are of two kinds, ligulate or ſtrap-ſhaped, as in the radiant margin of a daiſy, ſun-flower or marigold; or tubular, as in the diſk, or central part, of the ſame flowers. Ligulate florets are toothed at their extremity, more or leſs equally, the number of their teeth being uſually five, more rarely but three. Tubular florets have a regular border, cut into equal ſpreading ſegments, almoſt univerſally five in number; in *Eclipta*, however, they are but four, and in one ſpecies of *Siegeſbeckia*, the *floſculoſa*, no more than three. The ſtamens, whoſe filaments are inſerted into the tube, always agree in number with the ſegments of the floret. The generality of florets, whether ligulate or tubular, have a perfect or fertile piſtil as well as ſtamens. In the diminutive marginal florets of the *Gnaphalium* and *Artemiſia*, whoſe corolla is ligulate indeed, but ſo rolled up, or connected by its edges, as to form a capillary tube, the piſtil is very perfect, though the ſtamens are wanting.

Some compound flowers conſiſt entirely of ligulate florets, which in that caſe are all perfect, furniſhed with ſtamens and piſtil, and fertile. Theſe are the *ſemifloſculoſi* of Tournefort, and make the firſt ſection in Linnæus's *Syngeneſia Polygamia æqualis*, as the Dandelion, Sowthiſtle, Hawkweed, &c. Such flowers are generally yellow, ſometimes blue, very rarely reddiſh. They expand in a morning, and cloſe towards noon, or in cloudy weather. Other compound flowers are formed of tubular florets only, as the Thiſtle, and *Bidens*. The greater number conſiſt partly of tubular, and partly of ligulate ones, and the latter are always marginal, or external with reſpect to the former. Very frequently the marginal ligulate florets, though furniſhed with an apparent piſtil, are abortive, and ſometimes they have merely ſo much of the rudiment of a germen, as is neceſſary to form a baſis for the petal. It appears that ſome of the tubular florets, from circumſtances are capable of becoming ligulate, which is analogous to the doubling, or change of the organs of impregnation into petals, in ſimple flowers. Witneſs the Chamomile. Another change happens in the *Chryſanthemum*, and *Tagetes* or African Marigold, whoſe ligulate florets become tubular, or, as the gardeners term it, quilled. Such quilled florets are abortive of courſe, being owing to preternatural luxuriance. Compound flowers entirely compoſed of tubular florets, all prolific, occaſionally acquire neuter or abortive ones in their margin, which are likewiſe tubular, but greatly dilated. This happens in ſome ſpecies of *Carduus* and *Serratula*, and according to the Linnæan ſyſtem they thus become *Centaureæ*, for no ſyſtem can provide againſt ſuch anomalies. In like manner ſome ſpecies of *Bidens* acquire a ligulate radius, and conſtitute the genus *Coreopſis*. Hence have ariſen many ſpurious genera of botanical authors. In the Order *Polygamia neceſſaria* of Linnæus, the florets of the diſk have ſtamens only, or at leaſt a mere rudiment of a germen; thoſe of the radius being furniſhed with perfect piſtils without ſtamens. Thus they are both neceſſary to the perfection of the ſeeds. Linnæus, conſidering umbelliferous flowers as aggregate ones, uſes the term *floſculus* for what we preſume to call *flos*, or a ſimple flower. S.

FLORID STYLE, is that enriched and heightened with figures and flowers of rhetoric, in an exceſſive degree; or, when the ornaments, applied to ſtyle, are too rich and gaudy in proportion to the ſubject; when they return upon us too faſt, and ſtrike us either with a dazzling luſtre, or a falſe brilliancy. In a young compoſer this is very pardonable: perhaps, indeed, it is a promiſing ſymptom in young people, that their ſtyle ſhould incline to the florid and luxuriant. "Volo ſe efferat in adoleſcente fæcunditas, &c." ſays Quinctilian; *i. e.* "In youth, I wiſh to ſee luxuriancy of fancy appear. Much of it will be diminiſhed by years; much will be corrected by ripening judgment; ſome of it, by the mere practice of compoſition, will be worn away. Let there be only ſufficient matter at firſt, that can bear ſome pruning and lopping off. At this time of life, let genius be bold and inventive, and pride itſelf in its efforts, though theſe ſhould not, as yet, be correct. Luxuriancy can be eaſily cured; but for barrenneſs there is no remedy." But a ſimilar apology cannot be pleaded for perſons of maturer years, which is admitted for young compoſers in their firſt eſſays. Judgment, as it ripens, ſhould chaſten imagination, and reject, as juvenile, all ſuch ornaments as are redundant, unſuitable to the ſubject, or not conducive to illuſtrate it. Nothing can be more contemptible than that tinſel ſplendour of language, which ſome writers perpetually affect. This cannot always be aſcribed to the real overflowing of a rich imagination. If this were the caſe, it might be in ſome meaſure excuſed; and we might accept amuſement where we ſought inſtruction. But with theſe frothy writers, it is a luxuriancy of words, not of fancy. We ſee a laboured attempt to riſe to a ſplendour of compoſition, of which they have formed to themſelves ſome looſe idea; but having no ſtrength of genius for attaining it, they endeavour to ſupply the defect by poetical words, by cold exclamations, by common-place figures, and every thing that has the appearance of pomp and magnificence. It has eſcaped theſe writers, that ſobriety in ornament is one great ſecret for rendering it pleaſing; and that, without a foundation of good ſenſe and ſolid thought, the moſt florid ſtyle is but a childiſh impoſition upon the public. The public, however, are too apt to be ſo impoſed on; at leaſt, the mob of readers, who are very ready to be caught at firſt with whatever is dazzling and gaudy. Dr. Blair, after paying a deſerved tribute of reſpect to the good qualities of Mr. Hervey, cloſes with obſerving that the perpetual glitter of expreſſion, the ſwoln imagery, and ſtrained deſcription, which abound in his writings, are ornaments of a falſe kind. "I would, therefore, adviſe ſtudents of oratory to imitate Mr. Hervey's piety rather than his ſtyle; and in all compoſitions of a ſerious kind to turn their attention, as Mr. Pope ſays, from ſounds to things, from fancy to the heart." Blair's Lectures, lect. 18.

Longinus uſes the terms florid and affected ſtyle indifferently, and lays them down as quite contrary to the true ſublime.

FLORIDA, in *Geography*, a country of North America, bounded on the North by Georgia, on the E. by the Atlantic, on the S. by the gulf of Mexico, and on the W. by the Miſſiſſippi. This country is ſaid to have been diſcovered by Sebaſtian Cabot in the year 1496, 18 years before it was known to the Spaniards; but received its name from John Ponce, who, ſailing from Porto Rico in 1513, landed here in April, when the country appeared in full verdure and bloom. Florida has frequently changed its maſters; in 1564 the French took poſſeſſion of ſome part of it, but they were driven from their ſettlements in the following year by the Spaniards, who then began to form eſtabliſhments for themſelves. In the year 1763 Florida was ceded to Great Britain in exchange for the Havanna, which had been taken from the Spaniards. Whilſt the Engliſh were in poſſeſſion of it they divided it into two governments, *viz.* Eaſt and Weſt Florida, ſeparated by the Appalachicola. During the American war, both the Floridas were reduced by the Spaniards, and guaranteed to the crown of Spain by the definitive treaty of 1783.

Although this country was of little utility to Great Britain, the poſſeſſion of it would be valuable to the United States, more eſpecially ſince they have obtained the province of Louiſiana. On the part of Spain, the ceſſion of it would be politic, as it might ſerve to divert the attention of the States from the riches of the weſt, and as a means of amity. Weſt Florida in particular, is chiefly uſeful as preſenting avenues of commerce. Eaſt Florida extends much farther ſouth than Weſt Florida; the gulf of Mexico waſhing the weſtern coaſt from N. lat. 25° to 30°; whereas the moſt ſouthern part of Weſt Florida is in N. lat. 29° 30′. The form of Eaſt Florida is triangular, the baſe towards the N. being 160 miles in breadth from E. to W. near the ſouthern extremity about 40, and about 350 from N. to S. Along the coaſts the bays of ſmall iſlands are numerous. The ſoil near the ſea-coaſt is ſandy and barren, but further inland it improves. The productions are chiefly rice and indigo. Weſt Florida is about 320 miles from E. to W., and from 40 to 80 in width from N. to S.; on the W. it is bounded by the river Miſſiſſippi, and on the E. by Appalachicola. The country is pleaſant, and the ſoil is exceedingly fertile, ſo that the inhabitants have ſometimes two or three harveſts of maize in the ſame year. Towards the coaſt it is flat, but riſes gradually into hills, which are covered with verdure and large trees, ſuch as white and red oak, crab oak, mulberry, magnolia, pine, hickery, cypreſs, red and white cedar, &c. Orange and lemon trees grow here without cultivation, and produce better fruit than in Spain and Portugal. They have alſo vines, which yield grapes equal in ſize and flavour to the beſt muſcadine; and they have abundance of other fruits of excellent flavour. The cabbage tree furniſhes a food that is pleaſant and wholeſome. Cotton is produced in great plenty; as well as flax and hemp. Among the richer productions of the country we may reckon cochineal and indigo. The coaſts furniſh oyſters and amber. The rivers abound in fiſh, but are moleſted by alligators. In the weſtern parts are numerous herds of cattle and flocks of ſheep: hogs alſo, whoſe fleſh acquires an excellent flavour from the acorns and cheſnuts on which they feed, are numerous. In the foreſts and deſarts are found ſeveral ſpecies of wild beaſts, and alſo a variety of birds. In ſummer the air is very hot, but in ſeveral places it is pure and wholeſome; the winter is commonly temperate, though the cold ſometimes deſtroys the orange trees. The rivers are covered with ice. The principal town in W. Florida is Penſacola, and in E. Florida St. Auguſtine. The population of W. Florida is very inconſiderable; Mobile and Penſacola together not containing above 1500 ſouls. The interior of E. Florida is little known, and only inhabited by a few Creeks or Seminols. The town of St. Auguſtine in E. Florida is leſs healthy than ſome have ſuppoſed it to be; but the climate, and alſo the general appearance of the country, would be much improved, if induſtry and labour were beſtowed upon it, and the inland marſhes were properly drained.

Florida, a poſt-town of America, in Orange county, New York; 50 miles N.W. of New York city.—Alſo, a town of Montgomery county, New York, on the S. ſide of Mohawk river, at the mouth of Schoharie creek. It has 1218 inhabitants.

Florida, *La*, one of the Solomon iſlands, in the Pacific ocean, diſcovered by Mendana, in 1567. S. lat. 9° 30′.

Florida, *Cape*, the moſt ſouth-eaſterly point of land of Eaſt Florida. N. lat. 25° 24′. W. long. 81° 30′.

Florida, *Gulf of*, or *Bahama ſtraits*, the narrow channel that ſeparates the peninſula of Florida from the Bahama iſlands.

Florida *Stream*, or *Gulf ſtream*, a channel which ſeparates the iſland of Cuba from the coaſt of Florida, between the gulf of Florida and the gulf of Mexico.

FLORILEGIUM, Florilege, a name the Latins have given to what the Greeks called ανθολογιον, *anthology*; *viz.* a collection of choice pieces, containing the fineſt and brighteſt things in their kind.

Florilege, is alſo particuarly uſed as a kind of breviary, in the Eaſtern church, compiled by Arcadius, for the conveniency of the Greek prieſts and monks, who cannot carry with them, in their travels and pilgrimages, all the volumes wherein their office is diſperſed.

The florilegium contains the general rubrics, pſalter, canticles, the horologium, and the office of the feriæ, &c.

FLORIN is ſometimes uſed for a coin, or real money; and ſometimes for any imaginary money, or money of account.

Florin, as a *coin*, is of different values, according to the different metals, and different countries where it is ſtruck. Pieces under this denomination were anciently very frequent in commerce; at preſent they are leſs common, though there were abundance of them ſtruck in Holland, of Engliſh ſilver, during the war, which was terminated by the treaty of Ryſwick. In all appearance they took their name from the place where they were firſt ſtruck, *viz.* the city of Florence. The era is about the year 1251; though others aſcribe the name to a fleur-de-lis, which was ſtruck on one ſide.

Villani obſerves, that there were gold florins in the year 1067, from which time the names frank or florin became applied to the gold coins, which till that time had been called *ſolidi*, *ſhillings*. See Coin and Exchange.

Florin, as a *money of account*, is uſed by the Italian, Dutch, and German merchants and bankers, in keeping their books, and making up their accounts. But this florin is very various, and admits of different diviſions. See Coin and Exchange.

Florin, or *Florence*, was alſo a gold coin, ſtruck in England in the eighteenth year of Edward III. of the value of ſix ſhillings.

Camden ſays, it was ſo called, becauſe made by Florentines. Fabian obſerves, the florins were not of ſo fine gold as the nobles and half-nobles of that prince.

But what is moſt obſervable is, that Fabian calls the florin a penny, value 6*s.* 8*d.* the half-florin, a halfpenny, value 3*s.* 4*d.* the quarter-florin, a farthing, value 1*s.* 8*d.* Theſe words were often met with in old hiſtories and accounts, applied to ſeveral coins, as royals, angels, &c. where we are therefore only to underſtand by *penny* or *denarius* the whole, by *obolus* the half, and by *quadrans* the fourth part, or farthing.

By indenture of the mint, in 18 Edw. III. every pound weight of old ſtandard gold was to be coined into fifty florences or florins, to be current at ſix ſhillings a-piece; all which made in tale fifteen pounds; or into a proportionable number of half and quarter florins.

Florin, in *Geography*, a town of the iſland of Sardinia, eight miles S. E. of Saſſari.

FLORINIANI, or Floriani, in *Eccleſiaſtical Hiſtory*, a ſect of heretics, of the ſecond century, denominated from its author Florinus, or Florianus, a prieſt of the Roman church, depoſed along with Blaſtus, for his errors.

Florinus had been a diſciple of St. Polycarp, along with Irenæus. He made God the author of evil; or rather aſſerted, that things forbidden by God are not evil, but of his own appointing. In which he followed the errors of Valentinus, and joined himſelf with the Carpocratians. He ſeems to have maintained the doctrine of two principles, with other Gnoſtic errors.

They had alſo other names given them. Philaſtrius ſays, they were the ſame with the Carpophorians. He adds, that they were alſo called ſoldiers, milites, quia de militaribus fuerunt. St. Irenæus calls them Gnoſtics; St. Epiphanius, Phibionites; and Theodoret, Barborites, on account of the impurities of their lives. Others call them Zaccheans; others Caddians, &c. though for what particular reaſons it is not eaſy to ſay, nor perhaps would it be worth while to enquire.

FLORIS, Francis, in *Biography*, a painter of hiſtory, born at Antwerp in 1520. Having practiſed the art of ſculpture till he was 20 years of age, he then indulged his partiality for painting, and changing his profeſſion, ſtudied the latter under the tuition of Lambert Lombard. He afterwards went to Rome, there copying the works of the ancients; but he appears to have felt with more fervour the works of Michael Angelo Buonaroti; which he imitated with great zeal, particularly his Laſt Judgment; unhappily, however, attending more to the parts than the whole.

The taſte which he imbibed by theſe ſtudies not a little ſurpriſed his countrymen on his return to his native city; and it acquired for him the honourable appellation of the "Raphael of Flanders," though not very juſtly, for his ſtyle of deſign is more in imitation of M. Angelo than of Raphael.

He painted for the Contrafeſtivity Hall of St. Michael at Antwerp a large picture, which now graces the walls of the Louvre at Paris. The ſubject is "The fall of Lucifer and his Angels." It is highly celebrated for the goodneſs of the compoſition and handling, for the variety of attitudes in the fallen angels, and for the ſtrong expreſſion of the muſcles in the naked figures. In fact it is a very curious picture, painted with great capacity, and exhibits a powerful, though eccentric, imagination. The fiends in M. Angelo's Laſt Judgment are not more horrible, or nearly ſo groteſque. The power of colour alſo is admirable, and in ſome parts has been rarely ſurpaſſed.

He had a ſtrong and bold manner, and, like his great model Buonaroti, marked the muſcular parts too full for a juſt imitation of nature. He invented and compoſed with eaſe, but in a dry and gothic manner; and though ſometimes his figures have an agreeable air, yet in general they poſſeſs a reprehenſible degree of the ſtiffneſs and formality peculiar to the age and country he lived in. He died in 1570, aged 50.

FLORIST, in *Gardening*, a name applied to ſuch perſons as are curious in, or have much ſkill in the knowledge and nature of flowers. A good floriſt ſhould be perfectly acquainted with the names, characters, and kinds, or ſorts of flowers; and at the ſame time have a thorough knowledge of their nature, habits, and methods of cultivation and management.

FLORUS, L. ANNÆUS, in *Biography*, a Latin hiſtorian, who wrote about 200 years after the reign of Auguſtus. This is his own account, though from what he ſays elſewhere, *viz.* that he lived under Trajan; it has been conjectured that his hiſtory was written about 150 years after Auguſtus. His work is "A Compendium of the Roman Hiſtory," from the foundation of the city to the reign of the emperor Auguſtus, in four books. It is to be regarded rather as a panegyric on many of the great actions of the Romans, than a faithful and correct recital of their hiſtory. Throughout the narrative there are, unqueſtionably, pleaſing reflections which diſplay great animation, and ſtrong powers of ſenſibility. It has obtained a ſufficient ſhare of popularity to be recommended very generally as a proper book for the learners of the Latin language; and it has employed the erudition of ſeveral critical authors. Florus was a writer of poetry as well as an hiſtorian, and has been thought to have entered the liſts againſt the emperor Adrian. The beſt editions are, that by Duker, in 2 vols. 8vo. Lug. Bat. 1722, 1744; the Delphin edition; and thoſe of Grævius. Rom. Hiſt. Lempriere.

FLORUS, DREPANIUS, who was ſurnamed "the Maſter," a deacon of the church of Lyons, flouriſhed in the ninth century. He obtained ſo high a reputation for learning and acuteneſs, that he was choſen by the church of Lyons to anſwer the treatiſe of John Scotus Erigena, on the ſubject of predeſtination. This was publiſhed in the year 852, and entitled "Liber de prædeſtinatione, contra Johannis Scoti erroneas definitiones." It is to be found in the 8th vol. of the "Bibliotheca Patrum." It is not aſcertained how long the author lived after the production of this work. Florus was the author of "Commentarius in omnes S. Pauli Epiſtolas," which has been falſely aſcribed to the venerable Bede, and admitted into the collection of his works, and ſeveral other theological pieces. Moreri.

FLORUS, in *Ornithology*, a name by which Aldrovand and ſome other authors have called the bird commonly known with us by the name of whinchat, a kind of the oenanthe or fallow-finch. See MOTACILLA *Rubetra*. See alſo LOXIA *Chloris*.

FLORY, FLOWRY, *Fleury*, *Floretté*, *Fleur-de-liſſé*, &c. terms in *Heraldry*, uſed when the outlines of any ordinary are drawn as if trimmed with, or in the form of flowers, lilies, fleur-de-lis, &c. Thus, he bears a croſs flory, &c.

FLOS, in *Botany*. See FLOWER.

FLOS *Æris*. See ÆS.

FLOS *Ambervalis*, in *Botany*, a name given by ſome to the polygala or milkwort. See POLYGALA.

FLOS *Argenti*. See FLORES *argenti*.

FLOS *Aſiæ*, in *Natural Hiſtory*, a name given by Swenkfield and ſome other writers, to that ſalt which is found on the ſurface of the earth in ſome part of Aſia, in form of an efflorefcence, and is called the Smyrna ſoap earth.

This ſalt is evidently the ſame with the nitre of the ancients. It will ferment with any acid in the manner of our pot-aſh, or other fixed ſalts, made by fire: and with oil or any fatty ſubſtance, boils into a ſoap. Euelius gives us a great many different places for its production, from which he diſtinguiſhes it into ſeveral kinds; all theſe lie in the eaſtern parts of the world; but to theſe Wormius adds, that it is found in New Spain. It is always eaſy to be known, however, in whatſoever place it is found, being a native alkali ſalt, perforated like a ſponge, and of a lixivial taſte. Its principles ſeem to be a marine and a urinous ſalt.

That it contains a marine ſalt ſeems manifeſt from this, that it has the ſame taſte in ſolution, or nearly ſo, with marine ſalt; that the particles of it, when coagulating in the evaporated water in which they were diſſolved, firſt riſe to the top of the ſurface, as thoſe of common ſalt do, and that it is always of a ſpongy texture, or full of holes, which is always the caſe with thoſe things in which the common ſalt makes a part, its natural concretions being hollow pyramids. Its containing an urinous ſalt is plain, from its producing with ſalt of tartar the ſame ſort of ſpirit that ſal ammoniac does when mixed with that fixed ſalt.

FLOS *Cæli*, the *flower of the heavens*, a name given by the alchemiſts to the noſtoch, which often appearing after rain, was ſuppoſed to fall from heaven. See FLOS *terræ*.

FLOS *Martialis*. See FLORES *martiales*, and IRON.

FLOS *Salis*. The flower of ſalt flows down with the Nile, and is alſo found on the ſurface of ſome lakes. It is to be choſen of the colour of ſaffron, ſomewhat of a rank ſmell like garum, of a biting taſte, and of a fattiſh ſubſtance. What is coloured with minium, or is grumous, is to be rejected: beſide, what is pure and genuine is not to be diſſolved but in oil; whereas what is adulterated is partly diſſoluble in water.

It is effectual againſt malignant and phagedenic ulcers; nomæ in the pudenda, and purulencies in the ears; it alſo cures dimneſs of ſight, and removes ſpecks and albugos from the eyes. It is mixed with plaſters and ointments, as alſo with oil of roſes, for the ſake of the colour it communicates to them. Taken inwardly, in wine or water, it provokes ſweat; diſturbs the belly, and incommodes the ſtomach. It is alſo an ingredient in acopa and ſmegmata, for extenuating the hair. In general, it is of an acrimonious and pyrotic quality, as are all ſalts themſelves. Dioſcor. lib. v. cap. 129.

Flos *Terræ*, *flower of the earth*, a name given by ſome of the chemical authors to the noſtoch, a remarkable plant, which reſembles the common green oyſter-weed, but that it is thicker and more like a jelly. It ſuddenly appears on gravel walks and gardens after rain; and the alchemiſts, who knew not what to think of its origin, ſuppoſed it to contain an univerſal ſpirit, capable of turning metals into gold. See Nostoch.

Flos *Tinctorius*, in *Botany*, a name given by Fuchſius, and many others, to the geniſtella tinctoria, or dyer's-weed, called alſo lutea herba, and lutum by the Latins, and alcomenium, cymene, and thapſos, by the Greeks. See Genista.

FLOSCOPA, from *flos*, a flower, and *ſcopa*, a broom, in alluſion to the faſciculated form of the ſpikes. Lour. Cochinch. 192. Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Enſatæ*, Linn. *Junci*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, funnel-ſhaped, hairy, coloured, permanent; its border in three ovate, curved, ſpreading ſegments. *Cor.* Petals three, ovate, erect, as long as the ſegments of the calyx. *Stam.* Filaments ſix, awl-ſhaped, longer than the corolla; anthers roundiſh, with two lobes. *Piſt.* Germen ſuperior, ovate, compreſſed, two-lobed; ſtyle awl-ſhaped, inflexed, longer than the ſtamens; ſtigma rather thick. *Peric.* Capſule nearly ovate, two-lobed, two-celled. *Seeds* ſolitary, ovate, compreſſed, horny, with many concentric radiating furrows.

Eſſ. Ch. Calyx inferior, three-cleft. Petals three, ovate. Capſule of two cells. Seeds ſolitary.

1. F. *ſcandens*. Deei hoa choi of the Cochin-chineſe. Native of hills in Cochin-china. *Stem* ſhrubby, climbing, without tendrils or ſpines, unbranched, long, round. *Leaves* alternate, lanceolate, entire, ſheathing, many-nerved; fringed at the baſe; rough on the upper ſide; ſmooth beneath. *Flowers* ſmall, pale violet, on very ſhort partial ſtalks, in ſlender, rigid, cluſtered, level topped ſpikes reſembling a broom. *Loureiro*.

By the above deſcription of Loureiro, this plant is evidently very nearly akin to *Tradeſcantia* and *Commelina*, but its ſimple filaments, and two-celled capſule, ſeem to authorize its being kept diſtinct. We have from Sierra Leone a plant which, in the character laſt-mentioned and the infloreſcence, how far elſe we cannot ſay, agrees with it, and is ſurely of the ſame genus, if not the very identical ſpecies.

It ſeems to us that *Tradeſcantia paniculata*, Roxb. Corom. v. 2. 6. t. 109, muſt be the ſame genus, if not the very ſame ſpecies, as the above. The ſimple filaments evidently ſhew it not to be a *Tradeſcantia*, which the infloreſcence confirms. Perhaps *Floſcopa* is not generically different from the *Calliſia* of Jacquin and Linnæus. See Callisia.

FLOSCULOUS, a term uſed by Mr. Tournefort, and others, to expreſs ſuch flowers of plants, as are compoſed each of a great number of other ſmall flowers placed cloſe to one another, and incloſed in the ſame common cup; each of theſe ſmaller flowers conſiſts of one petal, which is ſlender and hollow, and wider than the bottom, and uſually divided into many ſegments, which ſometimes are diſpoſed in the form of a ſtar. Each of theſe flowers ſtand upon an embryo, or young fruit, from which there grows a capillament, which reaches beyond the flowers. Theſe embryos are lodged in the bottom of the cup, which is called by authors the thalamus of the flower, and finally become ſeeds winged with down, or ſometimes without that, and ſometimes are armed with prickles. Of this ſort are the flowers of thiſtles, knapweed, &c.

FLOSCULUS. See Floret.

FLOSS, in *Geography*, a town of Bavaria; five miles E. N. E. of Weiden.—Alſo, a river of Sileſia, which runs into the Oder, ſix miles N. W. of Breſlau.

FLOT Horn, a cape on the N. coaſt of Iceland. N. lat. 66° 6'.

FLOTA, a ſmall weſtern iſland of Scotland, near the N. W. coaſt of Lewis.—Alſo, one of the ſmall Orkney iſlands, between South Ronaldſha and Hoy. N. lat. 58° 42'. W. long. 2° 59'.—Alſo, one of the ſmaller Hebrides, on the S. E. coaſt of North Uiſt. N. lat. 57° 28'. W. long. 7° 8'.

Flota, or *Flotta*, *Fleet*; a name the Spaniards give particularly to the ſhips which they ſend annually from Cadiz, to the port of Vera Cruz, to fetch thence the merchandizes gathered in Mexico for Spain. It conſiſts of the captains, admiral, and patach, or pinnace, which go on the king's account; and about ſixteen ſhips, from four hundred to a thouſand tons, belonging to particular perſons. They ſet out from Cadiz, about the month of Auguſt, and are eighteen or twenty months before they return.

Thoſe ſent to fetch the commodities prepared in Peru, are called galeons. See Galeon.

The name flotilla is given to a number of ſhips, which get before the reſt in their return, and give information of the departure and cargo of the flota and galeons.

FLOTAGES, all ſuch things as are floating on the top of the ſea, or great rivers, a word chiefly uſed in the commiſſions of water-bailiffs.

FLOTE-Fescue *Graſs*, a kind of natural graſs which is found in watery ſituations, and ſaid to be an excellent cattle graſs, affording much fodder. See Festuca.

FLOTSON, Flotzam, or *Flotſam*, a term ſignifying any goods loſt by ſhipwreck, and ſwimming on the top of the water; which, with *jetſon* or *jetſam*, and *lagon* or *ligan*, and *ſhares*, belong to the king, if no owner appears to claim them; but if any owner appears, he is entitled to recover the poſſeſſion. For even if they be caſt overboard, without any mark or buoy, in order to lighten the ſhip, the owner is not by this act of neceſſity conſtrued to have renounced his property (Inſt. 2, 1. § 48); much leſs can things *ligan* be ſuppoſed to be abandoned, ſince the owner has done all in his power to aſſert and regain his property. Things *jetſam*, *flotſam*, and *ligan*, are accounted ſo far diſtinct from *wreck* (which ſee), that by the king's grant to a man of wrecks, the others will not paſs. Over thoſe the admiralty courts have juriſdiction, as they are in and upon the ſea. (5 Rep. 108.)

Jetſon is what is caſt out of a ſhip, being in danger of a wreck, into the ſea, and there ſink and remain under water. *Lagon* or *ligan*, is that which lies in the bottom of the ſea; but tied to a cork or buoy, in order to be found again (5 Rep. 106.) *Shares* are goods due to ſeveral perſons by proportion.

FLOTTE, Le, in *Geography*, a town of France, on the N. coaſt of the iſland of Ré.

FLOTZ, a town of Germany, in the principality of Anhalt Zerbſt; ſix miles N. W. of Zerbſt.

FLOUNDER, in *Ichthyology*, the Engliſh name of the fiſh called by the generality of authors paſſer fluviatilis, and fleſus. It is a ſpecies of the *pleuronectes*, which ſee.

The flounder inhabits every part of the Britiſh ſea, and even frequents our rivers at a great diſtance from the ſalt-waters. It never grows large in our rivers, but is reckoned ſweeter than thoſe that live in the ſea.

FLOUR, the meal of any grain, but more particularly of wheat, ground and ſifted for the purpoſe of food.

The grain itſelf is not only ſubject to be eaten by inſects in that ſtate, but when ground into flour, it gives birth to another race of deſtroyers, who eat it unmercifully and increaſe ſo faſt in it, that it is not long before they wholly deſtroy the ſubſtance. The fineſt flour is moſt liable to breed them, eſpecially when ſtale or ill prepared; in this caſe, if it be examined in a good light, it will be perceived to be in a continual motion; and on a nicer inſpection, there will be found in it a great number of little animals of the colour of the flour, and very nimble. If a little of this flour be laid on the plate of the double microſcope, the inſects are very diſtinctly ſeen in great numbers, very briſk and lively, continually crawling over one another's backs, and playing a thouſand antic tricks together; whether for diverſion or ſearch of food, it is not eaſy to be determined. Theſe animals are of an oblong ſlender form, their heads are furniſhed with a kind of trunk, or oblong hollow tube, by means of which they take in their food, and their body is compoſed of ſeveral rings. They do vaſt miſchief among the magazines of flour, laid up for armies and other public uſes; when they have once taken poſſeſſion of a parcel of this valuable commodity, it is impoſſible to drive them out, and they increaſe ſo faſt, that the only method of preventing the total loſs of the parcel, is to make it up into bread as ſoon as can be. The way to prevent their breeding in the flour is, to preſerve it from damp; nothing gets more injury by being put up damp than flour, and yet nothing is ſo often put up ſo. It ſhould be always carefully and thoroughly dried before it is put up, and the barrels alſo dried into which it is to be put; then if they are kept in a room tolerably warm and dry, they will preſerve it well. Too dry a place never does any hurt, though one too moiſt always ſpoils it. See MEAL.

FLOUR, *St.* in *Geography*, a town of France, in the department of the Cantal; before the revolution, the capital of Upper Auvergne and the ſee of a biſhop; containing in its north and ſouth diviſions 5000 inhabitants; in the canton of the former 10,538, and in that of the latter 15,121, on a territory of 585 kiliometres, in 27 communes. The inhabitants carry on a conſiderable trade in corn, with manufactures of cloth, carpets, and cutlery. N. lat. 45° 2′. E. long. 3° 10′.

FLOWER, in *Phyſiological* and *Syſtematical Botany*, comprehends all thoſe organs of a plant which are preparatory and neceſſary to the impregnation and perfection of the fruit or ſeed. (See FECUNDATION and FRUCTIFICATION.) Of the ſeven parts of fructification diſtinguiſhed by Linnæus, five conſtitute the flower. Theſe are, firſt, the calyx or flower-cup; ſecond, the corolla or petals; neither of theſe is indiſpenſable, one, and ſometimes both of them being occaſionally wanting; (ſee CALYX and COROLLA;) third, the ſtamen or ſtamens, generally filamentous bodies, ranged internally with reſpect to the two former; theſe are eſſential, being the male organs; fourth, the piſtil or piſtils, in the centre of the flower, which conſiſt of the rudiments of the fruit, and the female organs of impregnation, being therefore eſſential, though not always ſituated in the ſame individual flower, nor even on the ſame plant, with the ſtamens; fifth, the receptacle, or common point of connection, which muſt be preſent in ſome ſhape or other, and in compound flowers is very important; ſee COMPOUND.

Flowers are uſually the moſt ornamental part of vegetables, but the moſt fleeting and tranſitory. After their production, the vegetation of the plant, however rapid and luxuriant before, is checked, at leaſt for a time, even in perennial plants and trees; and annual ones ſurvive flowering only till they can ripen their ſeed. The ſame ſpecies, which will endure for ſeveral winters without bloſſoming, after this event loſes its vigour, and yields to the firſt attacks of froſt. Pliny obſerves that "bloſſoms are the joy of trees, in bearing which they aſſume a new aſpect, vyeing with each other in the luxuriance and variety of their colours." Linnæus has adopted and exemplified this idea, ſo congenial with his own theory of vegetable propagation, and with the importance which he gives the flower in his principles of claſſification, as the ſure guide to a true diſcrimination of the kinds of vegetables. The various modes in which flowers are ſituated upon, or connected with, the plant that bears them, will be explained under the article of INFLORESCENCE, an important ſubject in ſyſtematic botany. In poſition they greatly differ in different genera or ſpecies. Moſt generally they expand, and preſent themſelves to the light, in a remarkable manner, cloſing or drooping when its ſtimulus is withdrawn; but ſome flowers always droop, ſhading their internal organs, and protecting them from rain, as long as their own delicate ſubſtance endures. Flowers are eminently diſtinguiſhed from the other parts of a plant by their general beauty and vivacity of colour, chiefly ſeated in the corolla, and likewiſe, in many inſtances, by their peculiar fragrance, the theme of poets and the admiration of all whoſe nerves, which is not always the caſe, can endure it. This fragrance is proved by experiment to depend on a volatile, eſſential oil, in many caſes obtainable by diſtillation, in others by infuſion in ſpirits, or in expreſſed oil, either of which imbibe or diſſolve it. Flowers do not give it out alike at all times; ſome have no ſcent during the day, but become highly fragrant in the evening. Theſe enhance the luxury of the bright moonlight nights of India, nor is our own country deſtitute of many ſuch flowers. They are elegantly termed by Linnæus *flores triſtes*, ſad or melancholy flowers. Their colour is very frequently pale and ſickly, inclining to greeniſh or browniſh yellow, agreeing remarkably in plants of very different claſſes and characters, which moreover have uſually the ſame luſcious evening ſcent. Among theſe are *Heſperis triſtis*, *Pelargonium triſte*, *Meſembryanthemum noctiflorum*, *Nyctanthes Arbor-triſtis*, and others. Many oriental flowers have a fine lemon-like odour in an evening, which are, for that reaſon, aſſiduouſly cultivated by the Chineſe; as the *Chloranthus inconſpicuus*, whoſe merit in this reſpect was not diſcovered in England till it had long been cultivated, nor was the ſweet and powerful ſcent, obſervable on firſt opening the hot-houſe in a morning, ſuſpected to proceed from ſo minute and inconſpicuous a bloſſom, till the late Mr. Aiton of Kew, whom no natural phenomenon could eſcape, firſt made the diſcovery. There ſeems to be an analogy between the ſmell and colour of flowers in other inſtances. The yellow variety of *Chryſanthemum indicum* differs altogether in ſcent from the dark-purple one, agreeing rather with the yellow wall-flower, which it alſo reſembles in colour. The deep crimſon Carnation, called the Clove Carnation, and the Clove Pink now nearly extinct, have a clove-like fragrance, richer than the paler or whitiſh kinds.

Ever ſince Botany has been cultivated on ſcientific principles, the flower and fruit have univerſally been reſorted to for the leading diſtinctive characters of plants. (See CLASSIFICATION.) On theſe conjointly all natural characters of Genera, Orders and Claſſes are founded. The herbage of the plant is, according to the Linnæan idea, a ſort of maſk, which conceals its true characters till they become manifeſt in the flower. Artificial ſyſtems of arrangement

ment have been conſtructed by ſome authors on the fruit, by others on the flower. The former are uſually conſidered as moſt according with natural affinities, the latter as the moſt convenient. The principal of theſe laſt are thoſe of Rivinus and Tournefort, in which the corolla takes the lead; and the ſexual ſyſtem of Linnæus, founded chiefly on the ſtamens and piſtils.

The medical properties and ſenſible qualities of flowers, their peculiar odours excepted, agree much more with the herbage, than with the fruit to which they are ſo intimately attached. Thus in the claſs *Icoſandria*, as far at leaſt as that claſs is a natural one, the flowers, as in the peach and cherry for inſtance, partake of the acrid, noxious, eſſential, oil of the leaves and bark, not at all of the ſweet, acid, or aromatic qualities of the pulpy fruit. S.

Flowers, *Colours of.* It has been aſſerted by ſome chemiſts, that all colours ariſe from ſulphurs, and that they differ according to the different admixtures of ſalts with theſe ſulphurs. Perhaps on theſe principles, it may be poſſible to form ſome rational conjectures in regard to the origin of colours in the flowers of plants. We know very well that the flowers of all plants abound in an eſſential oil or ſulphur, to which, according to this doctrine, their colours may be rationally ſuppoſed to be owing; and though this oil ſhould be proved to be the very ſame ſubſtance in all, yet their variety of colours may be accounted for from it, ſince we find that one and the ſame oil, the eſſential oil of thyme, according to Mr. Geoffroy's experiments, may be turned to all the colours that we find in the different flowers of plants, from white to deep black, with all the ſhades of red, yellow, purple, blue, and green, by mixing it with different ſubſtances; and by the ſame laws, the eſſential oil of plants, while contained in their flowers, may by the different mixtures they meet with, give them all their beautiful variety of colours. See *Eſſential* Oils.

We know that the infuſions of flowers, and of other parts of plants, become red on being mixed with acids, and green on being mixed with alkalies; and there is no reaſon to doubt, but that it is the ſulphureous part of the vegetable in theſe infuſions which thus changes colours on theſe mixtures. This, however, ought to be proved poſſible, before it is allowed in argument.

This proof is given in the change of colours before mentioned, which are produced in oils merely by the admixture of different ſalts; and as all the colours in theſe are the regular reſult of certain combinations, there is great reaſon to believe, that in thoſe plants whoſe flowers give the ſame colours, there may be the ſame combinations.

The principal colours of plants, and their ſeveral parts, are green, yellow, red, purple, blue, white, black, and tranſparent whitiſhneſs; all the others are produced by different combinations of theſe. The green, which is the common colour of the leaves of plants, is probably the effect of an oil rarefied in that part of the plant, and there mixed with the fixed and volatile ſalts of the ſap, which remain entangled by the earthy particles after moſt of the aqueous humidity is evaporated, and by that means become in a ſtate to act upon the oil. A clear proof of this is, that if the leaves are covered up in ſuch a manner that the aqueous humidity of the ſap cannot evaporate itſelf, the oil and ſalts cannot act upon one another as they naturally would, but becoming diffuſed among ſo great a quantity of water, loſe the colour they would otherwiſe have obtained together, and become whitiſh or tranſparent. This is ſeen in the obvious inſtance of ſuccory and celery, the leaves of both which plants, though naturally green, become white by being covered up with earth by the gardener.

The leaves of both plants and trees uſually turn red in autumn, or on the attack of the firſt froſt; the reaſon of which is, that the ſeveral canals of the ſap being conſtringed by the cold, the juices are detained in the veſſels of the leaves, or at leaſt its circulation is greatly interrupted; and being detained there, it naturally grows ſour, the acidity of this altered juice deſtroying the green colour, produced by the alkaline ſalts. The ſap brings on a red colour, in the very ſame manner that the eſſential oil made green by a mixture of oil of tartar is again changed to red, by adding to it a proper quantity of diſtilled vinegar. Where we find in our common experiments the acids of the mineral kingdom turning the infuſions of flowers red, it ſeems by the analogy of theſe experiments to be only owing to their deſtroying the blue, brown, or other colour, which the alkaline ſalts of the plant had made with its eſſential oil.

All the ſhades and degrees of yellow and ſaffron colour in the flowers of plants, ſeem wholly owing to a mixture of an acid in their juices, with their eſſential oil; as the oil of thyme, which itſelf has very little colour, is made to paſs through all theſe ſhades of colours, only by digeſting it with diſtilled vinegar. From the digeſting the volatile alkalies, ſuch as ſpirit of ſal ammoniac and urine, with the ſame oil, it appears that all the ſhades of red, from the paleſt fleſh-colour, to purple, and even to the violet blue, are only owing to the different admixtures of an alkaline volatile ſalt of the urinous kind, mixed in different manners with their eſſential oil.

Black, which is a very uncommon colour in flowers, and which in them ought to be regarded only as a very deep violet, ſeems the effect of an addition of an acid juice to their oil, already turning purple to violet colour by a volatile alkali.

All the ſhades of blue and purple ſeem alſo, by the analogy of the ſame experiments, to be only the effects of mixtures of alkalies of the fixed and volatile kind, with the oils of plants; ſince theſe colours are all produced in thoſe experiments, by mixing the ſpirit of ſal ammoniac, and the oil of tartar with oil of thyme.

The bright green of ſome flowers ſeems alſo to be produced by the ſame ſalts, only acting on oils more rarefied. For the oil of thyme of a purple violet-colour diluted with rectified ſpirit of wine, being diluted with oil of tartar, becomes green. Mem. Acad. Par. 1707.

Boccone is of opinion, that in many plants the colour of the flowers is wholly owing to the colour of the juices of the root. This he inſtances in the greater celandine, whoſe roots and flowers are of the ſame yellow colour. The barberry in like manner, he obſerves, has both its roots and flowers yellow. The dentillaria has its roots and flowers both of a pale red, and the acacia Indica Aldini, and many other plants, he ſays, are inſtances of this. The reaſon that he aſſigns for this is, that the more fixed parts, wherein this colour conſiſts, preſerve the ſame tincture, without being at all altered by ſo long a circulation as that from the root to the flower; and he adds another very remarkable obſervation, which is, that in all theſe plants and trees, whoſe roots and flowers are of the ſame colour, the juices are more fixed; and therefore, that theſe are more fit for dyeing than any other coloured wood of plants. Vide Boccone, Muſ. de Plant.

Dr. Lewis, in his notes on Neumann's Chemiſtry, has many curious obſervations on the colours of flowers.

There are few of them which are durable in themſelves, or that can be made durable by art. The only permanent colour is yellow. The red, the blue, and the intermediate ſhades of purple, crimſon, violet, &c. are very periſhable. Many flowers loſe their colours on being dried, and eſpecially if they are dried in a ſhady and not warm place. The colours of all of them periſh by keeping even in the cloſeſt veſſels; the more haſtily they are dried, and the more perfectly they are ſecured from air, ſo much the longer do they retain their beauty. The colouring matter of flowers extracted and applied to other bodies is ſtill more periſhable.

The colour of many blue flowers is extracted by infuſion in water; but from others, water acquires only a purpliſh hue. Of thoſe which have been tried, not one gives a blue colour to ſpirit of wine; ſome give no colour, and ſome give a reddiſh colour. The expreſſed juice of theſe flowers is generally blue. The blue juices and infuſions are rendered red by acids; and the moſt florid red is given to them by marine acids. The flowers alſo, by maceration, impart a red colour to acid liquors. Alkalies fixed and volatile, and lime-water, change theſe blue colours to green. And thoſe infuſions or juices which have nothing of the colour of the flower, ſuffer the ſame changes from the addition of acid and alkaline liquors. Even when the flowers have been kept till their colours are loſt, their infuſions acquire a red colour from acids, and a green colour from alkalies, but in a leſs degree than when the flowers were freſh. The red colour produced by acids is ſcarcely more durable than the original blue; applied upon other bodies, and expoſed to air, it gradually degenerates into a faint purple, and at laſt diſappears, without leaving a ſtain behind. The green produced by alkalies changes to a yellow, which does not fade ſo ſoon. The green made by lime-water is more permanent and beautiful. Green lakes, prepared from blue flowers by means of lime-water, have been uſed by painters. The flowers of cyanus have been much commended for affording elegant and blue pigments. But Dr. Lewis has not been able to extract from them any blue colour. They retain their colour, when haſtily dried, longer than other blue flowers, but do not communicate their original colour to any menſtruum.

Red flowers readily communicate their colour to water; and thoſe of a full red colour give to a rectified ſpirit alſo a deep red tincture, brighter, though ſomewhat paler, than the watery infuſion. But the light red flowers, and thoſe which are purpliſh, impart little colour to pure ſpirit. The colours of infuſions of theſe flowers are ſuppoſed to be heightened by acids, and to be rendered green by alkalies. But this is not univerſal. For amongſt thoſe examined by Dr. Lewis, the roſe colours and purpliſh red were changed by acids nearly as blue flowers are; but the full deep reds were not. The deep infuſion of red poppies was turned by alkalies not to a green, but to a duſky purple.

Yellow flowers communicate to water and to ſpirit of wine durable yellow colours, not alterable but in degree by acids or by alkalies: the former only rendering them paler; and the latter, as alſo alum, rendering them deeper. Wool, or ſilk, impregnated with a ſolution of alum or tartar, receives, on being boiled with the watery infuſion or decoction, a durable yellow dye. A durable yellow lake is prepared by precipitating with alum an infuſion of yellow flowers made in an alkaline ley. In ſome of the orange-coloured flowers the yellow matter ſeems to be of the ſame kind as that of the pure yellow flowers; but the red matter ſeems to be different from that of the pure red flowers. The yellow matter is extracted from theſe flowers by water; and the remaining red matter is extracted by ſpirit of wine, or by a weak ſolution of fixed alkali in water. Such are the ſaffron coloured flowers of carthamus. Theſe flowers, after the yellow matter has been extracted by water, are ſaid to give a red tincture to ley, from which a deep red fecula ſubſides, called ſafflower, Spaniſh red, and China-lake. This pigment gives a beautiful red colour to ſpirit of wine, but none to water. The yellow farina or fine duſt, reſting on the tips of the ſtamina of flowers, gives a fine bright yellow colour to ſpirit of wine, and a duller yellow colour to water. The colours of both the watery and ſpirituous tinctures were heightened by alkalies, rendered red by acids, and again reſtored to a yellow by adding an alkali. This is the only known inſtance of the yellow colour of a vegetable being rendered red by acids. White flowers, or their expreſſed juices, impart a green colour to alkaline leys, but have not been obſerved by Dr. Lewis to give a red colour to acids. The white flowers of the common wild convolvulus give a deep yellow or orange colour to water, which is affected by acids, by alkalies, and by alum, as the infuſions of yellow flowers are. The white flowers of xeranthemum give a beautiful yellow colour to water acidulated with ſpirit of nitre. See Neumann's Chem. by Dr. Lewis, p. 430, 432.

Flowers, in *Gardening*, are diſtinguiſhed into early, or ſpring-flowers, which flouriſh in the months of March, April, and May. Of this claſs are the anemonies, daffodils, hyacinths, tulips, jonquils, cowſlips, primroſes, &c. Summer-flowers, which open in June, July, and Auguſt, as pinks, gilly-flowers, lilies, daiſies, campanulas, poppies, ſun-flowers, &c. Autumnal, or late flowers, denote thoſe of September and October; as the oculus Chriſti, Indian pink and roſes, panſy, flower-gentle, &c. Of theſe flowers, thoſe which ſubſiſt all the year, we mean in the ſtem, or root at leaſt, are called *perennials*. And thoſe which are to be planted or ſowed afreſh every year, according to the ſeaſon, are called *annual*.

Flowers, *Preſervation of*. The method of preſerving flowers in their beauty through the whole year has been diligently ſought after by many people; ſome have attempted it, by gathering them when dry, and not too much opened, and burying them in dry ſand; but this, though it preſerves their figure well, yet takes off from the livelineſs of their colour.

The primroſe and cowſlip kind are very eminent inſtances of the change of colours in the flowers of dried ſpecimens; for thoſe of this claſs of plants eaſily dry in their natural ſhape, but they not only loſe their yellow, which might be expected naturally enough, but they acquire a fine deep green, much ſuperior to that of the leaves in their moſt perfect ſtate. The flowers of all the violet kind loſe their noble blue, and become of a dead white, ſo that in dried ſpecimens there is no difference between the blue-flowered violet and the white-flowered kinds.

Muntingius gives a method, which he ſays is preferable to all others; this is as follows: gather roſes or other flowers when they are not yet thoroughly open, in the middle of a dry day; put them into a good earthen veſſel, glazed within; fill the veſſel up to the top with them; and when full, ſprinkle them over with ſome good French wine, with a little ſalt in it; then ſet them by in a cellar, tying the mouth of the pot carefully down. After this, they may be taken out at pleaſure, and on ſetting them in the ſun, or within the reach of the fire, they will open as if on the tree, and not only the colour, but the ſmell, will be preſerved.

Sir Robert Southwell has communicated to the world a method of drying plants, by which all flowers are preſerved in their natural ſhape, and many in their proper colours. To this purpoſe two plates of iron are to be prepared to the ſize of a large half ſheet of paper, or larger for particular occaſions; theſe plates muſt be made ſo thick as not to have any power of bending, and there muſt be a hole made near every corner for the receiving a ſcrew to faſten them cloſe together.

When theſe plates are prepared, lay in readineſs ſeveral ſheets of paper, and then gather the plants with their flowers, when they are quite perfect; let this always be done in the middle of a dry day, and then lay the plant and its flower on one of the ſheets of paper doubled in half, ſpreading out all the leaves and petals as nicely as can be. If the ſtalk be thick, it muſt be pared or cut in half ſo that it may lie flat; and if it be woody, it may be peeled, and only the bark left; when the plant is thus expanded, lay round about it ſome looſe leaves and petals of the flowers, which may ſerve to complete any part that may prove deficient; when all is thus prepared, lay ſeveral ſheets of paper over the plant, and as many under it; then put the whole into the iron plates, laying the papers ſmoothly on one, and laying the other evenly over them; then ſcrew them cloſe, and put them into an oven after the bread is drawn, and let them lie there two hours; after this make a mixture of equal parts of aquafortis and common brandy; ſhake theſe well together; and when the flowers are taken out of the preſſure of the plates, rub them lightly over with a camel's hair pencil dipped in this liquor; then lay them upon freſh brown paper, and, covering them with ſome other ſheets, preſs them between this and other papers with a handkerchief, till the wet of theſe liquors is dried wholly away. When the plant is thus far prepared, take the quantity of a nutmeg of gum dragon, put this into a pint of fair water cold, and let it ſtand four and twenty hours; it will in this time be wholly diſſolved; then dip a fine hair pencil in this liquor, and with it daub over the backſides of the leaves, and lay them carefully down on a half ſheet of white paper fairly expanded, and preſs them with ſome more papers over theſe. When the gum-water is fixed, let the preſſure and papers be removed, and the whole work is finiſhed. The leaves retain their verdure in this caſe, and the flowers uſually keep their natural colours. Some care muſt be taken, that the heat of the oven be not too great. When the flowers are thick and bulky, ſome art may be uſed to pare off the backs, and diſpoſe the petals in a due order; and after this, if any of them are wanting, their places may be ſupplied with ſome of the ſupernumerary ones dried on purpoſe; and if any one of them be only faded, it will be prudent to take them away, and lay down others in their ſtead: the leaves may be alſo diſpoſed and mended in the ſame manner. Another way of keeping both flowers and fruit the whole year without ſpoiling, is delivered by the ſame author in the following manner: take ſalt-petre, one pound; bole-armenic, two pounds; clean common ſand, three pounds; mix all well together, then gather fruit of any kind, that is not full ripe, with the ſtalk to each; put theſe in one by one into a wide mouthed glaſs, laying them in good order; tie over the top with an oil-cloth, and carry the glaſs into a dry cellar, and ſet the whole upon a bed of this prepared matter of four inches thick in a box; fill up the remainder of the box with the ſame preparation, and let it be four inches thick over the top of the glaſs, and round all its ſides. Flowers are to be preſerved in the ſame ſort of glaſſes in the ſame manner, and they may be taken up, after a whole year, as plump and as fair as when buried.

FLOWER *Garden*, the place where flowers are chiefly grown, cultivated and preſerved. It ſhould have a ſheltered ſouthern aſpect, but which is not by any means cloſe.

FLOWERS, in *Antiquity*. We find flowers in great requeſt at the entertainments of the ancients, being provided by the maſter of the feaſt, and brought in before the ſecond courſe; or, as ſome are of opinion, at the beginning of the entertainment. They not only adorned their heads, necks, and breaſts, with flowers, but often beſtrewed the beds whereon they lay, and all parts of the room with them. But the head was chiefly regarded. Potter Archæol. Græc. tom. ii. p. 383. See GARLAND.

Flowers were likewiſe uſed in the bedecking of tombs. Potter Archæol. Græc. lib. iv. cap. 7. tom. ii. p. 232, ſeq. See BURIAL.

FLOWER, in *Architecture*, according to Vitruvius, is a repreſentation of ſome imaginary flower, by way of crowning, or finiſhing, on the top of a dome, &c.

In lieu of this the moderns commonly uſe a vaſe, ball, or the like.

FLOWER-DE-LUCE, *Fleur-de-lis*, in *Heraldry*, is a bearing anciently of great dignity; being reputed the nobleſt of all flowers, and as ſuch having been in all ages the charge of the royal eſcutcheon of the kings of France; though time has made the bearing thereof more vulgar.

In ſome coats it is borne ſingle; in others triple; in others it is, ſemée, ſeeded all over the eſcutcheon. During the exiſtence of monarchy in France the arms conſiſted of three flowers-de-lis or, in a field *azure*. Theſe arms, however, were ſuperſeded in 1789 by the cap of liberty, and the three coloured flag, when the baſtile was taken and deſtroyed by the inhabitants of Paris.

FLOWER *of the Capital* is an ornament of ſculpture, in form of a roſe, in the middle of the ſweep of the Corinthian abacus.

In that of the Compoſite, it is not a roſe, nor any real, but an imaginary kind of flower.

FLOWERS, in *Chemiſtry*, are the fineſt and moſt ſubtile parts of dry bodies, raiſed by fire, into the veſſel's head, and aludels; and adhering to them in form of a fine powder, or duſt. Such are the flowers of ſulphur, benjamin, &c.

FLOWERS *of Antimony*. See ANTIMONY.

FLOWERS *Argentine*, of *regulus of antimony*, are made by putting the regulus into an unvarniſhed earthen pot, placed in a furnace, ſo that its bottom may be red-hot, while its upper part ſhall be much colder. The pot is to be covered with a lid, without luting it, and heat is to be applied for an hour or more. When the pot is cold, its internal ſurface, and the remaining part of the regulus are found covered with white flowers, in form of beautiful, tranſparent, and ſhining needles, which are to be gathered with a feather. After this, a ſecond ſublimation may be commenced, and managed in the ſame manner; and the whole regulus may be changed into flowers. Theſe flowers appear to be nothing elſe than the earth of regulus of antimony deprived of almoſt all its phlogiſton. They are neither emetic nor purgative; they are ſoluble in aqua regia.

FLOWERS *of Arſenic*, *white*, are made, as all other flowers are, by ſubliming arſenic; from which they do not differ in their nature and properties.

FLOWERS *of Benjamin*, or *Benzoin*, are made by putting a quantity of this reſin into a varniſhed earthen pan, and covering it with another inverted pan of ſtone-ware; and let the edges of theſe pans be made to fit well to each other, and to be well luted together with paper dipped in paſte. Put the earthen pan containing the benzoin on a gentle fire, and with that the ſublimation is performed; when the veſſels are cool and unluted, the flowers are to be ſwept off with a feather. For the properties and medical uſes of theſe flowers, ſee Benzoin.

Flowers *of Biſmuth.* See Bismuth.

Flowers *of Cobalt.* See Cobalt.

Flowers *of Copper* have been prepared by ſubliming ſal-ammoniacum with the caput mortuum of blue vitriol. See Copper.

Flowers, *Martial.* See Flores *Martiales.*

Flowers *of Sal Ammoniac* are nothing more than ſal ammoniac ſublimed; and the ſublimation is facilitated by generally mixing with it an equal part of decrepitated common ſalt. See *Sal* Ammoniac.

Flowers *of Sulphur,* or *Brimſtone,* are the vapours of melted brimſtone conveyed from an iron pot (in which it is kept boiling) through a proper flew, into a cloſe room or oven, where this vapour condenſes into flowers. See Sulphur.

Flowers *of Zinc.* See Cadmia and Zinc.

Flowers, in the *Animal Economy,* denote women's monthly purgations, or *menſes.*

Nicod derives the word in this ſenſe from *fluere,* q. d. *fluors.* Others will have the name occaſioned hence, that women do not conceive till they have had their flowers; ſo that theſe are a ſort of forerunners of their fruit.

Flowers, in *Rhetoric,* are figures and ornaments of diſcourſe, by the Latins called *floſculi.*

Flower-*fence, Barbadoes.* See Poinciana.

Flower-*fence, Baſtard.* See Adenanthera.

Flower *of Briſtol.* See Lychnis.

Flower *of Conſtantinople.* See Lychnis.

Flower *de luce,* in *Botany.* See Iris.

Flowers *of an Hour.* See Hibiscus.

Flower, *Eternal,* or *Everlaſting.* See Gnaphalium, Gomphræna, and Xeranthemum.

Flower, *Four o'clock.* See Mirabilis.

Flower, *Gentle.* See Amaranthus.

Flower, *Side Saddle.* See Sarracena.

Flower, *Sky.* See Cineraria.

Flower, *Sultan.* See Centaurea.

Flower, *Sun.* See Helianthus.

Flower, *Trumpet.* See Bignonia.

Flower, *Wind.* See Anemone.

Flower *of Oſteocolla,* a name given by the people employed in finding the *oſteocolla* to a ſort of white marley matter, which they uſually find on the ſurface of the ground in the places where the oſteocolla lies underneath. It ſeems very nearly allied to the nature of the oſteocolla itſelf, and uſually has under it ſome of that blackiſh matter reſembling rotten wood, which the oſteocolla itſelf is formed upon, and which fills up thoſe hollows we find in moſt of the pieces, while the whole is in the ground. This rotten vegetable matter has much the reſemblance of the roots or branches of trees, and is called by the common people the root of the oſteocolla or hammoſtei radix. Phil. Tranſ. Nº 39. See Osteocolla.

Flower-*root-worm,* in *Natural Hiſtory,* a peculiar ſpecies of fly-worm, which makes its habitation only in the bulbous roots of flowers. The roots of the narciſſus, at the time they are taken up out of the earth toward the end of autumn, very frequently are found to contain each a ſingle worm which eats and deſtroys them. Sometimes, one root is found to contain two of them; but this is but rarely the caſe. The roots which have them may eaſily be known, by having each a round hole in ſome part, at which the deſtroyer has entered while it was ſmall, and which probably ſerves it now in its large ſtate for reſpiration of the freer air. The interior part of theſe bulbs is always found rotted and deſtroyed, and the worm is found in theſe, lying in a brown ſort of dirt made by its own liquid excrements, mixed among the fragments of the coats of the root which it has deſtroyed. Reaumur's Hiſt. Inſect. vol. iv. p. 499.

Theſe worms undergo all their changes in a ſhell made of their own ſkin, which is of the ſame egg-faſhioned ſhape with that of the blue fleſh-fly, but conſiderably larger, and of a greyiſh colour. But this is not all its difference from thoſe ſhells; for on its anterior and ſuperior part it has two horns of the ſame kind with the four of the ſhells of the rat-tailed worm; and ſeeming to ſerve to the ſame purpoſes, and to convey the air neceſſary for the life of the creature, into its corcelet: the old ſtigmata, which ſerved the creature in its worm-ſtate, being now obliterated, and ſomething neceſſarily wanted in their place. After having undergone all the neceſſary changes, the ſhells are burſt open, in the month of April, and let out the fly they contained.

This has ſo much the appearance of a humble-bee, that at firſt ſight it is ſcarce to be diſtinguiſhed from it. It is covered with black, yellow, and reddiſh hairs, as the ſmaller kinds of the common humble-bees are; but its antennæ, which are of the battledore faſhion, prove plainly enough, that it is really no bee, even before one can determine with certainty that it has only two wings.

FLOWERAGE, a collection of flowers of ſeveral kinds ſet together in huſks, and hung up with ſtrings.

FLOWERED, in the *Manufactures.* A ſtuff, or cloth, is ſaid to be flowered, flouriſhed, ſprigged, or figured, when there are repreſentations of flowers, either natural, or imaginary, wrought thereon.

There are ſtuffs flowered of almoſt all kinds of matter: flowers of gold, ſilver, ſilk, wool, thread, cotton, &c. Stuffs and cloths are uſually denominated from the ground whereon the flowers are raiſed.

Thus, there are flowered velvets, taffeties, damaſks, ſattins, mohairs, dimities, &c.

Thoſe flowered with gold and ſilver are more uſually called *brocades.*

The flowers are uſually wrought at the ſame time with the cloth, or ground. The threads of the warp are raiſed and lowered by means of packthreads paſſed through them in mounting the loom; and the manufacturer ſhooting his warp, or matter of the flowers, whether gold, ſilver, ſilk, or the like, between the threads thus raiſed, forms the *flowers.*

It is very curious to ſee them mount a loom; or, as they call it, *read a deſign,* to be repreſented on a ſtuff; but it is next to impoſſible to deſcribe it; yet we have endeavoured to give ſome idea thereof under Design.

FLOWERING, *Bulbous-rooted Plants,* in *Gardening,* the art of blowing theſe ſorts of flower-plants in the houſe. This can be eaſily done by proper care, as they are capable of both growing and flowering in water without any ſort of earth. When well managed in this way, flowers of this kind have a beautiful and elegant appearance, at a ſeaſon when they cannot be found in other ſituations.

It is the uſual practice to blow ſingle roots in pots or glaſſes made for the purpoſe, nothing more being requiſite than that of ſupplying them properly with water, ſo as not to riſe much upon the bulbs of the roots, as they are very liable to rot when they are too much immerſed in water.

Other contrivances have likewiſe been had recourſe to in order to blow ſeveral roots of the ſame, or other kinds together, in which ſituations they have very pretty effects. Where glaſs or earthen-ware ſtands for this purpoſe are not at hand, the buſineſs may be eaſily and conveniently accompliſhed by means of a common garden pot, which ſhould have the hole in the bottom perfectly cloſed, and two pieces of pretty ſtrong ſheet lead cut ſo as to exactly fit the bottom and top of the pot; proper holes ſhould then be made in the upper piece for the reception of the root-bulbs, and ſmall perforations formed in it, and the lower or bottom piece, for receiving ſuitable ſticks for ſupporting the flowering ſtems of the different roots. Water muſt then be poured in ſo as to fill the pot quite up to the upper plate of lead, when the roots ſhould be placed in the large holes made for them, ſo as juſt to touch the ſurface of the water. Where different kinds are uſed, hyacinths, narciſſuſes, jonquils, tulips, &c. may be put in, in a varied manner, and placed in a rather warm ſituation in the houſe. In this way the whole will be brought into flower at an early period, and continue for ſome time to afford a fine diſplay of beautiful flowers. In this manner, by a careful regulation of the heat of the room, and an occaſional proper ſupply of freſh water, they may be kept flowering from December till the beginning of the ſpring.

When they have done flowering, the roots ſhould be removed and laid by in a dry, but not warm ſituation, until they may be wanted in the following ſeaſon.

It is found by much experience that thoſe bulbs which are kept in a dry ſtate flower by much the beſt, as they gradually take in that quantity of moiſture which is neceſſary in the proceſs, and are not ſo liable to rot or ſuſtain injury in that way.

The proper way of managing them is to let them at firſt only juſt come in contact with the ſurface of the water, that they may ſtrike forth their root-fibres in a full manner, after which it may be raiſed a little higher to promote the full flowering of the plants. During the whole time of flowering, they ſhould be kept quite ſteady by the ſupport of proper ſticks.

There is an advantage in flowering bulbous roots in glaſs ſtands, as they ſucceed equally well in them, by the progreſs of their roots being capable of being more perfectly judged of, and at the ſame time the ſupplies of water more conveniently afforded.

Such roots as have been in the ground are always improper for being employed in this way, as they never flower in any perfect manner. Before the roots are made uſe of, it is conſtantly neceſſary to lightly rub off all the looſe old coaty matters that may hang about them. And it is a good practice to change the roots every two or three years, in order to prevent their becoming weak, and of courſe flowering imperfectly.

It has been ſuggeſted that the early flowering of roots of this ſort may be greatly promoted by the uſe of weak ſolutions of nitre, and ammonia in its crude ſtate. Where either of them is tried, a ſmall portion ſhould only be poured into the pots or glaſſes containing the water at a time, and not too frequently repeated. See Root.

FLOWING, or Flown-*ſheets*, in *Sea Language*, denote the poſitions of the ſheets, or lower corners of the principal ſails when they are looſened to the wind, ſo as to receive it into their cavities in a direction more uſually perpendicular than when they are cloſe hawled, but more obliquely than when the veſſel is ſailing before the wind. This poſition of the ſheets takes place when the wind croſſes the line of her courſe nearly at right angles.

FLOX, in the *Colour Trade*, a very well cleaned wool uſed to abſorb the colours of cochineal, &c. It is prepared in this manner: infuſe a pound of the fineſt ſheerings of woollen cloth in cold water for one day; then take them up, and preſs them well together, to waſh off the unctuoſity the wool naturally has. This is the ſimple flox, which, when impregnated with a ſolution of alum, is called alumed flox. This is done in the following manner: Take four ounces of roach-alum, and two ounces of crude tartar, both in fine powder; put them into an earthen veſſel with three quarts of water, ſet it over the fire, and when it begins to boil, then put in the flox; let the liquor now boil half an hour over a gentle fire, then take it off, and when all is perfectly cooled, waſh the flox with fair water, letting them ſtand in it two hours, then preſs them in the hand, and let them dry.

FLOYD, in *Geography*, a new townſhip of America, and chief place of a diſtrict in Oneida Herkemer county, New York; containing 767 inhabitants.—Alſo, a county of Kentucky, containing 427 inhabitants, of whom 29 are ſlaves.

Floyd's *Fork*, a river of Kentucky, which runs into the river Salt. N. lat. 37° 48′. W. long. 85° 57′.

FLOYER, *Sir* John, in *Biography*, an eminent phyſician, was born at Hinters, in Staffordſhire, about the year 1649, and received his education at the univerſity of Oxford, where the degree of doctor of phyſic was conferred upon him, on the 8th of July, 1680. He ſettled himſelf in the practice of his profeſſion at Litchfield, in his native county; where his indefatigable attention to the ſick, and the conſequent practical ſkill which he attained, not only procured for him the confidence of the inhabitants, but gained him a reputation ſo extenſive, that his ſovereign honoured him with knighthood, as a reward for his talents. He was a great friend to the uſe of cold bathing, and left no means untried, by which he might diſſeminate the knowledge of its utility and ſafety, and bring the practice into general vogue: he particularly recommended it in chronic rheumatiſms, and in nervous diſorders, and he maintained that conſumptions had prevailed extenſively in England only ſince the practice of baptizing children by immerſion had been relinquiſhed. The following are the titles of his different publications. 1. "The Touchſtone of Medicines," London, 1687, 8vo. 2. "The Preternatural ſtate of the Animal Humours deſcribed by their ſenſible qualities," London, 1696, 8vo. in which he maintained the doctrine of fermentation. 3. "An Enquiry into the right uſe of Baths," London, 1697, 8vo. This work afterwards appeared under different titles, ſuch as "Ancient Pſychroluſy revived," London, 1702; and the ſubject was more amply treated in another edition; "Hiſtory of hot and cold Bathing, ancient and modern, with an Appendix by Dr. Baynard," London, 1709, and again in 1715, and 1722. 4. His next work was "A Treatiſe on the Aſthma," firſt publiſhed in 1698, and republiſhed in 1717 and 1726. He was himſelf the ſubject of aſthma from the age of puberty, yet lived to be an old man. 5. "The Phyſicians' Pulſe-watch," 1707 and 1710, in two volumes, 8vo. Sir John Floyer was one of the firſt to count the pulſations of the arteries; for although the pulſe had been the ſubject of obſervation from ancient times, the number of beats in a given time had not been attended to. 6. "Medicina Geronomica; of preſerving old men's health; with an appendix concerning the uſe of oil and unction, and a letter on the regimen of younger years, London, 1724. Several of theſe treatiſes were tranſlated into the continental languages.

FLUATES, in *Chemiſtry*, a genus of ſalts formed by the union of fluoric acid with any alkaline or ſalifiable baſe. Little is known of theſe ſalts, but the properties of the principal of them are enumerated in the article FLUOR, to which the reader is referred.

FLUCTUATION denotes, in *Surgery*, the motion communicated to any collection of purulent matter, or other kinds of fluid, by applying ſome of the fingers of each hand, at a certain diſtance from each other, to the ſurface of the tumour, and preſſing with them alternately in ſuch a manner, that the fingers of one hand are to make a little preſſure, while thoſe of the other hand remain lightly placed on another part of the ſwelling. When the ends of one ſet of fingers are thus delicately applied, and the ſurgeon taps, or makes gentle preſſure with the fingers of the other hand, the impulſe given to the fluid is immediately perceptible to thoſe fingers which are lightly laid on the tumour, and the ſenſation thus received is one of the principal ſymptoms by which practitioners are enabled to diſcover the preſence of fluid in a great variety of caſes.

When the collection of fluid is very deeply ſituated, the fluctuation is frequently exceedingly obſcure, and ſometimes not at all diſtinguiſhable. In this circumſtance, the exiſtence of the fluid is to be aſcertained by the conſideration of other ſymptoms. For example, in caſes of hydrops pectoris, and empyema, ſurgeons do not expect to feel the undulation of the fluid in the thorax with their fingers; they conſider the patient's difficulty of breathing, the uneaſineſs attending his lying on one particular ſide, the œdema of the parietes of the cheſt, the dropſical affection of other parts, the more raiſed and arched poſition of the ribs on the affected ſide of the body, the preceding rigors, fever, and ſeveral other circumſtances from which a judgment is formed, both with regard to the preſence and the peculiar nature of the fluid.

FLUDD, ROBERT, or as he ſtyled himſelf in Latin, *De Fluctibus*, in *Biography*, the ſecond ſon of ſir Thomas Fludd, treaſurer of war to queen Elizabeth, was born at Milgate, in Kent, in 1574. He was educated at St. John's college, Oxford; and after taking his degree in arts, attached himſelf to the ſtudy of phyſic, and ſpent almoſt ſix years in his travels through the principal countries in Europe. It was probably during theſe peregrinations that he imbibed a taſte for the Roſycrucian philoſophy, of which he was ever after a moſt ſtrenuous ſupporter, and indeed almoſt the only one who became eminent in it in this kingdom. He proceeded as doctor of phyſic in 1605, and about that time ſettled in London, and was made a fellow of the college of phyſicians. He was a very voluminous author in his ſect, diving into the fartheſt profundities and moſt myſterious obſcurities of the Roſie-croſs, and blending, in a moſt extraordinary manner, divinity, chemiſtry, natural philoſophy, and metaphyſics. Eloy allows him ſome credit on the ſcore of mathematical and mechanical knowledge, but characterizes his phyſic as a tiſſue of ſuperſtitious nonſenſe. Yet ſuch a vein of warm enthuſiaſm runs through his works, that we may readily ſuppoſe him to have been a believer in the myſtical jargon of his ſyſtem. He had the faculty, at all events, of impreſſing his patients with an idea of his importance, and of inſpiring them with great faith in his ſkill, by the uſe, it is ſaid, of a kind of ſublime unintelligible cant, whether ſucceſsful or not; he was therefore at leaſt very eminent in his medical capacity. He died at his houſe in Coleman-ſtreet, London, on the 8th of September, 1637, and was buried in the pariſh church of his native place. It is ſaid that Dr. Fludd was in poſſeſſion of the manuſcripts of Simon Forman, the aſtrologer. Although the ſect of Roſycrucians is now entirely extinct, a liſt of the works of Fludd, which were chiefly written in Latin, may not be unintereſting to the curious. 1. The largeſt, entitled, "Utriuſque Coſmi, majoris et minoris, Technica Hiſtoria," Oppenheim, 1617, in two volumes folio, contains ſome extremely ſingular prints, which are intelligible only to an adept. 2. "Tractatus Apologeticus integritatem ſocietatis de Roſea cruce defendens," Leyden, 1617. 3. "Monochordon mundi ſymphoniacum, ſeu Replicatio ad Apologiam Joannis Kepleri," Francfort, 1620. 4. "Anatomiæ Theatrum triplici effigie deſignatum," ibid, 1623. 5. "Philoſophia Sacra et verè Chriſtiana, ſeu Meteorologia Coſmica," ibid, 1626. 6. "Medicina Catholica, ſeu, Myſticum artis Medicandi Sacrarium," ibid, 1626. 7. "Integrum Morborum Myſterium," ibid, 1631. 8. "De Morborum Signis," ibid, 1631. Theſe two treatiſes are a part of the Medicina Catholica. 9. "Clavis Philoſophiæ et Alchymiæ Fluddanæ," ibid, 1633. 10. "Philoſophia Moſaïca," Goudæ, 1638. 11. "Pathologia Dæmoniaca," ibid, 1640. Aikin Biograph. Memoirs of Med. Eloy. Dict. Hiſt.

It is true, that as the great Kepler, his contemporary, from the high reſpect which he bore even to the prejudices and philoſophic dreams of antiquity, in his work, entitled "Harmonius Mundi," endeavours to illuſtrate and demonſtrate the Pythagorean harmony of the ſpheres, and to reconcile it to geometrical laws, and the Copernican ſyſtem; but as it was in this vain attempt that he made the great diſcovery of the elliptic orbits of the planets, his viſionary analogies between the diſtance of the planets, and the harmonic intervals in muſic, have been excuſed. Now Fludd, anxious for the honour which he thought Kepler had gained by the very attempt which moſt diſgraced him with poſterity, in his fanciful demonſtration of the muſic of the ſpheres, oppoſes him and his analogy with abuſe and ſcurrility, and ſets up a ſyſtem of his own ſtill more wild and abſurd; for in the third book of the firſt tract, entitled "De Muſica Mundana," he ſuppoſes the world to be a muſical inſtrument, reſembling a monochord, extending from the ſummit of the empyrean heaven to the baſis of the earth itſelf, dividing it into parts conſtituting conſonances; ſo that if the half part were touched or ſtruck, it would produce the conſonant diapaſon, or octave, in the ſame manner as in the inſtrumental monochord. Maſter doctor Fludd has given us a diagram of his ſyſtem, repreſenting his mundane monochord, the finger-board of which he has graduated by flats into a ſcale of diſdiapaſon, to G *ſol re ut* in the treble, and placed oppoſite to each note of this gammut, aſcending from the earth, the elements of water, air, and fire; then the celeſtial bodies from the moon to Saturn, aſſigning a place to each orb oppoſite to ſome ſound of his muſical ſcale.

After adjuſting his mundane monochord, and dividing it into ſyſtems of diateſſaron, diapente, and diapaſon, our author, chap. iv. undertakes to demonſtrate his whimſical hypotheſis by the figure of a pipe or flute. But if our readers have had perſeverance to follow us thus far, we can hardly ſuppoſe that their patience will laſt one inch farther; we ſhall therefore only obſerve, that this bewildered author, in order to enable himſelf to put together his ſyſtem of metaphorical muſic, muſt previouſly have ſtudied real practical muſic, concerning which, in his ſecond tract, he ſpeaks like other *Chriſtian folk*.

FLUDER, or *Sea*-FLUDDER, in *Ornithology*, the name of a water-fowl of the colymbus or diver-kind, deſcribed by Geſner, and ſome other authors, under the name of the colymbus maximus, or largeſt diver. See Colymbus *Glacialis*.

FLUE, St. Nicholas de, in *Biography*, a very diſtinguiſhed patriot of Switzerland, was born at Saxelen in 1417. Deſcended from an ancient family, he ſignalized himſelf in defence of his country, and particularly during the war which the Swiſs ſupported againſt Sigiſmond, archduke of Auſtria. He was no leſs remarkable for humanity than valour. To his countrymen, when they were preparing to pillage and burn the convent of St. Margaret, near Dieſſenhofen, he exclaimed, "If God grants you the victory over your enemies, uſe it with moderation, and ſpare thoſe edifices which are conſecrated to him." This remonſtrance was effectual, and preſerved the convent from deſtruction. To the moſt excellent qualities of the heart and underſtanding, to great political ſagacity, he added the exterior graces of figure, dignity of character, and the moſt winning affability. Raiſed by his countrymen to high employments in the ſtate, he repeatedly declined the office of landamman from motives of delicacy, becauſe he diſapproved the principles of the governing party. At length, hurried away by his deteſtation of evil, and a zeal for monkiſh devotion, he quitted his family in the 50th year of his age, and retiring from the world in a fit of gloomy ſuperſtition, turned hermit. The place of his retreat was Ranft, a few miles from Saxelen, where he built an hermitage and a ſmall chapel, and practiſed all the ſeverities required by that auſtere mode of life with the ſtricteſt obſervance. But though he withdrew from the world, the flame of patriotiſm was not extinct; but he was the happy inſtrument in reſcuing Switzerland from the impending horrors of civil diſcord. When a quarrel took place among the cantons, and the deputies aſſembled, in 1481, at Stantz, in order to compromiſe the difference, De Flue quitted his hermitage, and in the 64th year of his age travelled during the night, and arrived at Stantz on the very morning when the deputies, having failed to terminate their diſpute amicably, were preparing for their departure. He conjured them to remain; and, having by his mediation ſucceeded in compoſing the public diſſentions, returned to his hermitage, where he died, in 1487, in the 70th year of his age, regretted and eſteemed by all Switzerland. Such a general opinion of his extreme piety prevailed among his contemporaries, that the bigotry of theſe times aſcribed to him an exemption from the common wants of human nature. The following epitaph was inſcribed on his tomb: "Nicholas de Flue quitted his wife and children to go into the deſart: he ſerved God 19½ years without taking any ſuſtenance. He died 1487." Coxe's Travels in Switzerland, vol i.

Flue, the long tube of a chimney, from the fire-place to the top, for giving paſſage to the ſmoke. For a more particular account, ſee Chimnies.

FLUELLIN, in *Botany*. See Antirrhinum.

FLUENT, in *Analyſis*. It is not eaſy to give ſuch a definition of the term fluent as ſhall be intelligible to thoſe not previouſly acquainted with the uſe of the word. And indeed mathematicians themſelves differ in their conceptions of it according to the different points of view in which they have been accuſtomed to conſider the principles of the fluxionary or differential calculus.

As the converſe of a fluxion, a fluent is the flowing quantity, the rate of whoſe increaſe is expreſſed by the fluxion. According to other writers the fluent or integral is the ſum of an infinite number of ſmall factors increaſing or decreaſing according to ſome given law, each of which may be conſidered as the fluxion or differential of the whole integral or fluent. See Fluxion.

According to the more accurate ideas of modern analyſts, a fluent or integral is nothing more than an algebraic expreſſion, conſiſting of variable quantities with or without others that are conſtant, which expreſſion being expanded into a ſeries according to certain rules, gives for the *firſt term* the fluxion or differential of which it is the fluent. In this view of the ſubject a fluent and its fluxion, or an integral and its differential, are merely certain analytical or ſymbolical relations, not depending on any theory relating to velocity, or indeed on any diſputable hypotheſis whatever, ſince it is founded on arbitrary definition alone: and it is preſumed that this will be ſufficient for all the purpoſes to which the application of the differential or integral calculus can poſſibly be applied. But the diſcuſſion of this ſubject will be again reſumed under *Analytic* Function.

The moſt luminous and correct explanation of the real meaning of the term fluent is given by Mr. Woodhouſe in the Tranſactions for 1802, in a paper on the independence of the analytical and geometrical methods of inveſtigation. His object is to ſhew that analytical expreſſions, involved in geometrical language, are foreign to the ſubject, and tend to produce confuſed and erroneous notions. Such, for example, are the following: ſin x; coſ. x; hyp. log. x; ſin. $nx = 2$ coſ. x . ſin. $(n-1)x -$ ſin. $(n-2)x$; $\int \dot{x}(1-x^2)^{\frac{1}{2}} =$ circular arc; $\int \dot{x} \sqrt{\frac{1+n^2x^2}{1-x^2}} =$ elliptical arc, &c.

The value of $\int \dot{x}(1+x)^{-1}$ is ſaid to be a portion of the area of an hyperbola intercepted between two ordinates to its aſſymptotes; but as Mr. W. obſerves, this is a circumlocutory mode of expreſſion, ſince to find the value of the area, $\dot{x} \,.\, (1+x)^{-1}$ muſt be expanded, and the integrals of the ſeveral terms taken, which ſame operation muſt have taken place in order to approximate to the value of $\int \dot{x}(1+x)^{-1}$, if no ſuch curve as the hyperbola had ever been invented.

Mr. W. then proceeds to explain what he himſelf underſtands by an integral or fluent of an expreſſion. We ſhall uſe his own words.

Let ϕx denote a function of x; if x be increaſed by o then ϕx becomes $\phi(x+o)$ and $\phi(x+o)$, developed, according to the powers of o, becomes $\phi x + Po + \frac{Q}{1 \,.\, 2} \,.\, o^2 + \frac{R}{1 \,.\, 2 \,.\, 3} o^3$, &c. where P is derived from ϕx, Q from P, R from Q, &c. by the ſame law, ſo that the manner of deriving P being known, Q, R, &c. are known. The entire difference or increment of ϕx is $\phi(x+o) - \phi x$; but the differential or fluxion of ϕx, is only a part of this difference, or $P \,.\, o$. If inſtead of o, dx or $\dot{x}$ be put, it is $P \,.\, dx$ or $P\dot{x}$; the integral or fluent of $P\dot{x}$ is that function from which $P\dot{x}$ is derived; and in order to remount to it, we muſt obſerve the manner or the operation by which it was deduced, and by reverſing ſuch operation the *integral* or *fluent* is obtained. Now in taking the fluxion of certain functions of x, it appears that there are conditions to which the indices of x without and under the vinculum are ſubject. Hence, whether or not a propoſed fluxion can have its fluent aſſigned, we muſt ſee if the fluxion has the neceſſary conditions.

Expreſſions ſuch as $\frac{\dot{x}}{x}$, $\frac{\dot{x}}{1+x}$, $\frac{\dot{x}}{\sqrt{1-x^2}}$, &c. have not theſe conditions; and conſequently there is no function ϕx

of x, ſuch that the ſecond term of the developement of $\phi(x+\dot{x})$ is equal either to $\frac{\dot{x}}{x}$, or $\frac{\dot{x}}{1+x}$, or $\frac{\dot{x}}{\sqrt{1-x^2}}$, &c. There are, however, integral equations from which ſuch expreſſions may be derived. Thus, let $x = \varepsilon^z$, then $\frac{\dot{x}}{x} = \dot{z}$; let $1 + x = \varepsilon^z \therefore \frac{\dot{x}}{1+x} = \dot{z}$: let $x = \frac{\varepsilon^{z\sqrt{-1}} - \varepsilon^{-z\sqrt{-1}}}{2\sqrt{-1}} \therefore \frac{\dot{x}}{\sqrt{1-x^2}} = \dot{z}$.

Now from theſe equations, the differential equations $\frac{\dot{x}}{x} = \dot{z}$, $\frac{\dot{x}}{1+x} = \dot{z}$, $\frac{\dot{x}}{\sqrt{1-x^2}}$, &c. may, by expunging the exponential quantities, be derived; conſequently, if the ſymbol $\int$ is to deſignate a reverſe operation, I can only know what that reverſe operation is by attending to the manner by which the expreſſions affected with the ſymbol $\int$ were derived. Hence

$$\int \frac{\dot{x}}{x} = z, \text{ when } x = \varepsilon^z,$$

$$\int \frac{\dot{x}}{1+x} = z, \text{ when } 1 + x = \varepsilon^z$$

$$\int \frac{\dot{x}}{\sqrt{1-x^2}} = z, \text{ when } x = (2\sqrt{-1})^{-1}\left\{\varepsilon^{z\sqrt{-1}} - \varepsilon^{-z\sqrt{-1}}\right\}.$$

In like manner,

$$\int \dot{x}(1+x^2)^{-\frac{1}{2}} = z,\ x + \sqrt{1+x^2} = \varepsilon^z, \text{ or } x = \frac{\varepsilon^z - \varepsilon^{-z}}{2}$$

$$\int \dot{x}(2x+x^2)^{-\frac{1}{2}} = z,\ 1 + x + \sqrt{2x+x^2} = \varepsilon^z$$

$$\int \frac{2\dot{x}}{1-x^2} = z,\ \frac{1+x}{1-x} = \varepsilon^z, \text{ or } x = \frac{\varepsilon^z - 1}{\varepsilon^z + 1}.$$

$$\int \frac{2\dot{x}}{x\sqrt{1+x^2}} = z,\ \frac{\sqrt{1+x^2}-1}{\sqrt{1+x^2}+1} = \varepsilon^z, \text{ or } \sqrt{1+x^2} = \frac{1+\varepsilon^z}{1-\varepsilon^z}, \text{ or } x = \frac{2}{\varepsilon^{-\frac{z}{2}} - \varepsilon^{-\frac{z}{2}}}.$$

Again, ſuppoſe $x = \left\{2\sqrt{-1}\right\}^{-1}\left\{\varepsilon^{z\sqrt{-1}} - \varepsilon^{-z\sqrt{-1}}\right\}$ $\therefore \dot{x} = 2^{-1}\dot{z}\left\{\varepsilon^{z\sqrt{-1}} + \varepsilon^{z\sqrt{-1}}\right\}$; but $\sqrt{1-x^2} = 2^{-1}$, $\left\{\varepsilon^{z\sqrt{-1}} + \varepsilon^{-z\sqrt{-1}}\right\}$; conſequently $\dot{x} = \dot{z}\sqrt{1-x^2}$, or $\dot{z} = \frac{\dot{x}}{\sqrt{1-x^2}}$: hence reverſely, $\int \frac{\dot{x}}{\sqrt{1-x^2}} = z$, x being $= (2\sqrt{-1})^{-1}.\left\{\varepsilon^{z\sqrt{-1}} - \varepsilon^{-z\sqrt{-1}}\right\}$.

In like manner $\int \frac{-\dot{x}}{\sqrt{1-x^2}} = z$, $x = 2^{-1}.\left\{\varepsilon^{z\sqrt{-1}} + \varepsilon^{-z\sqrt{-1}}\right\}$. $\int \frac{\dot{x}}{\sqrt{2x-x^2}} = z$, $x = \left(1 - 2^{-1}.\left\{\varepsilon^{z\sqrt{-1}} + \varepsilon^{-z\sqrt{-1}}\right\}\right)$. $\int \frac{\dot{x}}{1-x^2} = z$, $x = \frac{\varepsilon^{z\sqrt{-1}} - \varepsilon^{-z\sqrt{-1}}}{\sqrt{-1}\left\{\varepsilon^{z\sqrt{-1}} + \varepsilon^{-z\sqrt{-1}}\right\}}$, or $\frac{\varepsilon^{2z\sqrt{-1}} - 1}{\sqrt{-1}\,(\varepsilon^{2z\sqrt{-1}} + 1)}$.

$$\int \frac{\dot{x}}{x\sqrt{\dot{x}-1}} = z,\ x = \frac{2}{\varepsilon^{z\sqrt{-1}} + \varepsilon^{-z\sqrt{-1}}}.$$

And a variety of forms may be obtained by ſubſtituting for x different functions of x, in the expreſſion $\frac{\dot{x}}{\sqrt{1-x^2}}$. Hence if the ſymbol $\int$ is made to denote a reverſe operation, the integral equations of the preceding differential equations have been rightly aſſigned. All other methods of aſſigning the integrals by the properties of logarithms, by circular arcs, by logarithmic and hyperbolic curves, are indirect, foreign, and ambiguous. Mr. Woodhouſe next proceeds, by the above method, to integrate certain differential equations which Euler and Lagrange have before treated of, and which are ſaid to admit for their compleat integration an algebraic form, although the integration of each particular term depends on the quadrature of the circle and hyperbola.

Let fx, fy, denote functions of x and y. Suppoſe the differential equation to be $\frac{\dot{x}}{x} + \frac{\dot{y}}{y} = 0$; then $fx + fy = a$ when $x = \varepsilon^{fx}$, $y = \varepsilon^{fy}$. Hence $xy = \varepsilon^{fx+fy} = \varepsilon^a =$ A, a conſtant quantity.

2dly. Let $\frac{\dot{x}}{\sqrt{1-x^2}} + \frac{\dot{y}}{\sqrt{1-y^2}} = 0$.

$\therefore fx + fy = a$, x being $= \left\{2\sqrt{-1}\right\}^{-1}.\left(\varepsilon^{fx\sqrt{-1}} - \varepsilon^{-fx\sqrt{-1}}\right)$; and $y = 2\sqrt{-1}^{-1}.\left(\varepsilon^{fy\sqrt{-1}} - \varepsilon^{-fy\sqrt{-1}}\right)$; or $\sqrt{(1-x^2)} = 2^{-1}.\left(\varepsilon^{fx\sqrt{-1}} + \varepsilon^{-fx\sqrt{-1}}\right)$, and $\sqrt{1-y^2} = 2^{-1}.\left(\varepsilon^{fy\sqrt{-1}} + \varepsilon^{-fy\sqrt{-1}}\right)$;

Hence $x.\sqrt{(1-y^2)} + y\sqrt{(1-x^2)} = (2\sqrt{-1})^{-1}.\left\{\varepsilon^{(fx+fy)\sqrt{-1}} - \varepsilon^{-(fx+fy)\sqrt{-1}}\right\} = (2\sqrt{-1})^{-1}.\left\{\varepsilon^{a\sqrt{-1}} - \varepsilon^{-a\sqrt{-1}}\right\} =$ A, a conſtant quantity.

3dly. Let $\frac{\dot{x}}{\sqrt{a+bx+cx^2}} + \frac{\dot{y}}{\sqrt{a+by+cy^2}} = 0$

$$\therefore \frac{\dot{x}}{\sqrt{c}\sqrt{x^2 + \frac{bx}{c} + \frac{a}{c}}} + \frac{\dot{y}}{\sqrt{c}\sqrt{\left(y^2 + \frac{by}{c} + \frac{a}{c}\right)}} = 0.$$

Let $\alpha + \frac{b}{2c} = v$, $y + \frac{b}{2c} = v'$, and $r^2 = \frac{\alpha}{c} - \frac{b^2}{4c^2}$

$$\therefore \frac{\dot{v}}{\sqrt{c}\sqrt{v^2+r^2}} + \frac{\dot{v}'}{\sqrt{c}\sqrt{v'^2+r^2}} = 0.$$

Taking the integrals $\varepsilon^{-\frac{1}{2}}\left\{\text{V} + \text{V}'\right\} = \alpha$, $v = \frac{\varepsilon^{\text{V}} - r^2\varepsilon^{-\text{V}}}{2}$, $v' = \frac{\varepsilon^{\text{V}'} - r^2\varepsilon^{-\text{V}'}}{2}$.

$\therefore v\sqrt{r^2+v'^2} + v'\sqrt{(r^2+v^2)} = \frac{\varepsilon^{\text{V}+\text{V}'} - r^4}{2}$ $\frac{\varepsilon^{-(\text{V}+\text{V}')}}{2} = \frac{\varepsilon^{\alpha\sqrt{c}} - r^4\varepsilon^{-\alpha\sqrt{c}}}{2} =$ A, and reſtoring the values of $\dot{x}$ and y;

$$\frac{2cx+b}{c}\sqrt{(a+by+cy^2)} + \frac{2cy+b}{c}\sqrt{(a+bx+cx^2)}$$

$+ cx^2) = A'$. By the above operation it appears that certain algebraical expreſſions, as $x\sqrt{1-y^2} + y\sqrt{1-x^2}$, $\frac{2cx+b}{c}\sqrt{a+by+cy^2}$, &c. may be deduced, which anſwer the equations $\int\frac{\dot{x}}{\sqrt{1-x^2}} + \int\frac{\dot{y}}{\sqrt{1-y^2}}$, &c. But, ſtrictly ſpeaking, ſuch algebraical expreſſions are not the integrals; they are rather expreſſions deduced from the true integral equations, from which other algebraical expreſſions, beſides thoſe put down, might be deduced. For the integration of this ſort of differential equations, ſee Mem. de Turin, vol. iv. p. 98. "Sur l'integration de quelques equations differentielles, dont les indeterminees ſont ſeparées, mais dont chaque membre en particulier n'eſt point integrable."

In this memoir are given three different methods of integrating $\dot{x}(1-x^2)^{-\frac{1}{2}} = y^2(1-y^2)^{-\frac{1}{2}}$; by circular arcs and certain trigonometrical theorems, by impoſſible logarithms, and by partial integrations. Strictly ſpeaking, all theſe methods are indirect; and the two firſt are only different but circuitous modes of expreſſing the method above deſcribed. See likewiſe Euler, Calc. integral, vol. ii. Novi Comm. Petrop. tom. vi. p. 37; tom. vii. p. 1. It is to be obſerved, that in the preſent ſtate of analytic ſcience, there is no certain and direct method of integrating differential equations, ſuch as $\dot{x}\left\{a + bx + cx^2 + dx^3 + \varepsilon x^4\right\}^{-\frac{1}{2}} + \dot{y}\left\{a + by + cy^2 + dy^3 + \varepsilon y^4\right\}^{-\frac{1}{2}} = 0$; becauſe no analytical expreſſion or equation of a finite form has hitherto been invented, from which, according to the proceſſes of the differential calculus, ſuch differential equations may be deduced. To find the algebraical expreſſions which anſwer to theſe equations, recourſe muſt be had to what are properly denominated artifices. For ſuch, ſee Mem. de Turin, vol. iv. Comm. Petr. tom. vi. vii. Lagrange. Fonct. Analyt. p. 86. La Croix Calc. diff. p. 427, &c.

FLÜGGEA, in *Botany*, ſo named by M. Louis Claude Richard, in honour of Mr. John Flügge, a very able German botaniſt of the preſent day, whoſe aſſiſtance is particularly acknowledged by profeſſor Schrader in the firſt volume of his own truly excellent *Flora Germanica*, juſt imported into this country. Richard in Schrader's New Journal, v. 2. faſc. 1. 8. (Ophiopogon; Gawler in Curt. Mag. v. 27. 1063.) Claſs and order, *Hexandria Monogynia*. Nat. Ord. *Sarmentaceæ*, Linn. *Aſparagi*, Juſſ.

Gen. Ch. *Cal.* none, except, with Richard, we take the corolla for ſuch. *Cor.* inferior, of one petal, bell-ſhaped, in ſix deep, equal, oval, ſpreading, permanent ſegments. *Stam.* Filaments ſix, very ſhort, inſerted into the baſe of the corolla; anthers oblong, vertical, erect, ſhorter than the corolla, ſomewhat arrow-ſhaped at the baſe. *Piſt.* Germen ſuperior, in the bottom of the corolla, roundiſh, of three cells, with rudiments of a double row of ſeeds in each; ſtyle ſolitary, rather longer than the ſtamens, erect, columnar, furrowed, tapering at the ſummit; ſtigma minutely bearded, acute. *Peric.* Berry ſuperior, globoſe, when ripe generally of one cell only. *Seed* ſolitary, large, orbicular, cartilaginous.

Eſſ. Ch. Corolla in ſix deep equal ſegments. Stamens inſerted into the baſe of the corolla, very ſhort. Stigma acute. Berry ſuperior. Seed ſolitary, globoſe.

1. F. *japonica.* Richard. in Schrad. N. Journ. v. 2. faſc. 1. 9. t. 1. f. A. (Ophiopogon japonicus; Gawl. in Curt. Mag. t. 1063. Convallaria japonica; Thunb. Jap. 140. β. Linn. Suppl. 204. Ait. H. Kew. v. 1. 455. Willd. Sp. Pl. v. 2. 160. Redout. Lil. v. 2. t. 80. Mondo; Kœmpf. Amœn. 823. t. 824. Adanſon, v. 2. 496.) Graſs-leaved Flüggea, or Japan Snakeſbeard. Native of ſhady places among ſhrubs, near Nagaſaki in Japan. *Thunberg.* Kept with us in greenhouſes, where it flowers in June. Thunberg made it known to the Dutch, from whoſe gardens we obtained roots in 1784, and who treat it as a hardy plant. The *root* is perennial, creeping by means of fleſhy horizontal ſhoots, which are mucilaginous and nutritive. *Stem* none. *Leaves* radical, numerous, naked, graſſy, linear, recurved, bluntiſh, flat, rough-edged, winged at the baſe with a broad thin membrane. *Stalk* central, ſolitary, much ſhorter than the leaves, compreſſed, racemoſe. *Flowers* drooping, ſmall, white, or blueiſh, with yellow anthers. *Berry* the ſize of a pea, of a rich deep blue. The leaves in our plants are from three inches to a foot long. Thunberg ſpeaks of a variety in which they exceed two feet, but of this we know nothing.

This plant appears to be properly enough ſeparated from *Convallaria*, on account of its habit, and perhaps the eſſential characters given above may ſerve to define the genus, which was publiſhed by the two writers to whom we have referred, in the ſame year, unknown to each other. We conceive the germen is proved by analogy to be truly ſuperior, and the ripe fruit is altogether ſo; nor can we account for that part of M. Richard's deſcription which repreſents it as "ſcarred at the top by the veſtige of the flower;" this, if true, would decide the fruit and germen to be inferior. Redoute's beautiful figure faithfully repreſents the parts in queſtion. Richard's plate is more minute as to the ſtructure of the flower, and ſhews the germen to be in an early ſtate attached to, and as it were imbedded in, the baſe of the corolla, but the more advanced ſtate of the fruit proves that it cannot be deemed even half-inferior, nor is it, by that mark, to be diſcriminated from *Convallaria.*

FLUIDITY, in *Phyſics*, that ſtate or affection of bodies which denominates or renders them fluid.

Fluidity ſtands in direct oppoſition to *firmneſs*, or *ſolidity*, which ſee.

Fluidity is diſtinguiſhed from liquidity or humidity, in that the idea of the firſt is abſolute, and the property contained in the thing itſelf; whereas that of the latter is relative, and implies wetting, or adhering, *i. e.* ſomewhat that gives us the ſenſation of wetneſs, or moiſture, and which would have no exiſtence but for our ſenſes.

Thus melted metals, air, or ether, and even ſmoke, and flame itſelf, are fluid bodies, but not liquid ones; their parts not leaving any ſenſe of moiſture; whereas water, milk, wine, &c. are at the ſame time both fluids and liquids.

The nature and cauſes of fluidity have been variouſly aſſigned.

The Gaſſendiſts, and ancient Corpuſcularians, require only three conditions as neceſſary to it, *viz.* a ſmallneſs and ſmoothneſs of the particles of the body; vacuities interſperſed between them; and a ſpherical figure. Thus the Epicurean poet Lucretius:

> "Illa autem debent ex lævibus atque rotundis
> Eſſe magis, fluido quæ corpore liquida conſtant."

The Carteſians, and after them Dr. Hook, Mr. Boyle, &c. beſide the circumſtances above mentioned, require a various, perpetual, inteſtine motion of the particles of the bodies, as that which principally contributes to fluidity.

Fluidity then, according to theſe philoſophers, conſiſts in this, that the parts of the body, being very fine, and ſmall, are ſo diſpoſed by motion, or figure, as that they can eaſily ſlide over one another's ſurfaces all manner of ways; and that they be in conſtant, various, ſeparate agitation to and fro; and that they only touch one another in ſome few parts of their ſurfaces. Mr. Boyle, in his "Hiſtory of Fluidity," mentions three conditions principally required to fluidity, *viz.*

1. The minuteneſs of parts: thus, in effect, we find that fire, by dividing metals into fine, ſmall parts, renders them fluid; and that acid menſtruums diſſolve and render them fluid after the like manner; and that fire turns the hard body of common ſalt almoſt wholly into a liquor, by diſtillation: not but that the figure of the particles may have a conſiderable ſhare in fluidity.

Thus mercury, whoſe parts are doubtleſs much groſſer than thoſe of oil and water, is yet more fluid than either of them: and thus oil, by the action of fire, may be converted into a conſiſtent ſubſtance like butter.

2. A number of vacuities interſperſed between the corpuſcles, to give room for the ſeveral particles to move among themſelves.

3. A motion and agitation of the corpuſcles; either from ſome principle of mobility within themſelves, or from ſome extraneous agent, penetrating and entering the pores, moving variouſly among them, and communicating to them a part of its motion.

That this laſt is the qualification chiefly required in fluidity, he argues from divers obſervations and experiments. Thus, a little dry powder of alabaſter, or plaſter of Paris, finely ſifted, being put in a veſſel over the fire, ſoon begins to boil like water; exhibiting all the motions and phenomena of a boiling liquor. It will tumble variouſly in great waves like that: it will bear ſtirring with a ſtick or ladle like that, without reſiſting; nay if ſtrongly ſtirred near the ſide of the veſſel, its waves will apparently daſh againſt them; yet it is all the while a dry parched powder.

The like is obſerved in ſand; a diſh of which being ſet on a drum-head, briſkly beaten by the ſticks, or on the upper ſtone of a mill, it in all reſpects emulates the properties of a fluid body. A heavy body, *e. gr.* will immediately ſink in it to the bottom, and a light one emerge to the top. Each grain of ſand has a conſtant vibratory and dancing motion; and if a hole be made in the ſide of the diſh, the ſand will ſpin out like water.

That the parts of fluids are in continual motion, the Carteſians evince from divers conſiderations: as, 1. The tranſmutation of ſolids into fluids, *e. gr.* ice into water, and *vice verſâ*; the chief difference between the body in theſe two ſtates, conſiſting in this, that the parts being fixed and at reſt in the one, reſiſt the touch; whereas in the other, being already in motion, they give way to the ſlighteſt impulſe.

2. The effects of fluids, which commonly proceed from motion: ſuch are the inſinuation of fluids among the pores of bodies; the ſoftening and diſſolving of hard bodies; the actions of corroſive menſtruums, &c. Add, that no ſolid can be brought to a ſtate of fluidity without the intervention of ſome moving or moveable body, as fire, air, or water.

Air the ſame gentlemen hold to be the firſt ſpring of theſe cauſes of fluidity, it being this that gives motion to fire and water, though itſelf receives its motion and action from the ether or ſubtle medium.

Boerhaave, however, pleads ſtrenuouſly for fire's being the firſt mover, and the cauſe of all fluidity in other bodies, as air, water, &c. Without this, he ſhews that the atmoſphere itſelf would fix into one ſolid maſs. To the ſame purpoſe, Dr. Black maintains that fluidity is the effect of heat. The different degrees of heat which are required to reduce different bodies into a ſtate of fluidity, he ſuppoſes, may depend on ſome particulars in the mixture and compoſition of the bodies themſelves; and this is rendered further probable from conſidering that the natural ſtate of bodies in this reſpect is changed by certain mixtures: accordingly, when two metals are compounded, the mixture is commonly more fuſible than either of them ſeparately. See Fire and Heat.

Sir I. Newton ſets aſide this theory of the cauſe of fluidity, and ſubſtitutes inſtead of it the great principle of attraction. The corpuſcular ſyſtem, with all the improvements of Deſcartes and Mr. Boyle, did not ſufficiently account for the primary condition, requiſite to conſtitute a body fluid, *viz.* the various inteſtine motion and agitation of its particles. But this motion is naturally enough accounted for, by ſuppoſing it a primary law of nature, that as all the particles of matter attract each other when within a certain diſtance; ſo at all greater diſtances they fly from, and avoid one another. For then, though their common gravity, together with the preſſure of other bodies upon them, may keep them together in a maſs, yet their continual endeavour to avoid one another ſingly, and the adventitious impulſes of heat and light, or other external cauſes, may make the particles of fluids continually move round about one another, and ſo produce this quality.

There is a difficulty, indeed, in accounting why the particles of fluids always keep at ſuch a diſtance from one another, as not to come within the ſphere of one another's attraction. The fabric and conſtitution of that fluid body, water, are amazing; that a body ſo very rare, and which has a vaſt over-proportion of pores, or interſperſed vacuity, to ſolid matter, ſhould yet be incompreſſible by the greateſt force, as philoſophers very generally, and for a long time have imagined, (ſee Compression;) and yet this fluid is eaſily reducible into that firm, tranſparent, friable body, which we call ice, by being only expoſed to a certain degree of cold.

One would think, that though the particles of water cannot come near enough to attract each other, yet the intervening frigorific matter doth, by being mingled per minima, ſtrongly attract them, and is itſelf likewiſe ſtrongly attracted by them, and ſo wedges or fixes all the maſs into a firm ſolid body; which ſolid body loſes its ſolidity again, when by heat the vinculum is ſolved, and the frigorific particles are disjoined from thoſe of the water, and are forced to fly out of it. And thus may the fumes of lead, perhaps, fix quickſilver.

When a firm ſolid body, ſuch as metal, is by heat reduced into a fluid, the particles of fire disjoin and ſeparate its conſtituent parts, which their mutual attraction cauſed before to cohere, and keep them at ſuch a diſtance from one another, as that they are out of the ſphere of each other's attraction, as long as that violent motion laſts; and when by the lightneſs and activity they are flown off, unleſs they be renewed by a continual ſupply, the component particles of the metal finally come near enough again to feel one another's attractions.

As, therefore, the cauſe of coheſion of the parts of ſolid bodies appears to be their mutual attraction, ſo the chief cauſe of fluidity ſeems to be a contrary motion, impreſſed on the particles of fluids; by which they avoid and fly one another, as ſoon as they come at, and as long as they keep at ſuch a diſtance from each other.

It is obſerved alſo in all fluids, that the direction of their preſſure againſt the veſſels which contain them is in lines, perpendicular to the ſides of ſuch veſſels; which property, being the neceſſary reſult of the particles of any fluid's being ſpherical, ſhews that the parts of all fluids are ſo, or of a figure very nearly approaching to it. See Fluids.

Fluidity *of the Earth*, in *Geology*. It has been a favourite topic with many of the writers on the theory of the earth, to enlarge on a ſuppoſed fluidity of the materials of which the ſolid matters of the globe are now compoſed, not only progreſſively at the ſucceſſive periods of their organic formation, but ſince, in conſequence of the ſudden and violent diſintegration or demolition of the ancient mountains and ſtrata, at the period when the organic remains of animals and plants were lodged in the preſent ſtrata; and which took place, according to moſt of the favourers of this hypotheſis, at the time of the Moſaic deluge: it is ſaid, however, by ſome late writers, that the relation of that event, as given in the ſacred writings, (and whence elſe can we gain any certain knowledge of ſuch an event?) gives us no ground for admitting this diſintegration or total deſtruction of the antediluvian earth, or the opinion of its having been at that time reduced to a ſtate of fluidity. In the article Ellipsoid *Figure* of the earth, the writer of that article has endeavoured to ſhew, that ſuch fluidity of the materials of which the globe is at preſent conſtituted, is not any way neceſſary towards accounting fully for the preſent form and dimenſions of the earth, as reſulting from its gravitation and rotation on its axis. Thoſe who have contended for an entire fluidity of the earth, or at leaſt of ſo much of its materials as compoſe the cruſt thereof, with which alone we are acquainted, ſurely never turned their attention to the vaſt depth and quantity of water or other fluid which would be neceſſary for its ſolution, or even ſuſpenſion, at one time, as ſeems neceſſary, or to the circumſtances under which ſo perfectly heterogeneous a fluid could be ſuppoſed to depoſit diſtinct ſubſtances, with the ſurpriſing regularity in which the ſtrata are diſpoſed, in orders totally diſtinct from that of their ſpecific gravities. See *Order of the* Strata.

FLUIDS are bodies, whoſe particles are but weakly connected, their mutual coheſion being in a great meaſure prevented by ſome interfering cauſe. In this ſenſe a fluid ſtands oppoſed to a ſolid.

Sir I. Newton defines a fluid body, to be that whoſe parts yield to the ſmalleſt force impreſſed, and by yielding are eaſily moved among each other.

That the particles whereof fluids conſiſt are of the ſame nature, and have the ſame properties, with the particles of ſolids, is evident, from the converſion of liquids and ſolids into each other, *e. gr.* of water into ice, of metals into fluors, &c. Nor can it be reaſonably doubted, that the component parts of all bodies are the ſame, *viz.* hard, ſolid, impenetrable, moveable corpuſcles.

We obſerve, therefore, with Dr. Clarke, that if the parts of a body either do not touch each other, or eaſily ſlide over one another; and are of ſuch a magnitude, as that they may be eaſily agitated by heat, and the heat be ſufficiently great to agitate them, though it may perhaps be leſs than ſuffices to prevent water from freezing, or, even, though the parts be not actually moved, yet, if they be ſmall, ſmooth, ſlippery, and of ſuch a figure and magnitude as diſpoſe them to move, and give way, that body is fluid.

And yet the particles of ſuch fluid bodies do, in ſome meaſure, cohere; as is evident hence, that mercury, when well purged of air, will be ſuſtained in the barometer to the height of 60 or 70 inches; that water will aſcend in capillary tubes even in vacuo; and that the drops of liquor in vacuo run into a ſpherical form; as adhering by ſome mutual coheſion like that between poliſhed marble planes. Add, that theſe fluid bodies, if they conſiſt of particles that are eaſily entangled within each other, as oil, or if they be capable of being ſtiffened by cold, and joined by the interpoſition of little cunei or wedges, as water; they are eaſily rendered hard: but if their particles be ſuch as can neither be entangled, as air; nor ſtiffened by cold, which was ſuppoſed to be the caſe with regard to quickſilver; then they would never grow hard and fixed. It is more probable that the primary cauſe of fluidity ſhould conſiſt in the imperfect coheſion of the conſtituent parts of fluids rather than in their figure. For if the particles of a body cohere ſtrongly together, they cannot eaſily move amongſt each other. It is alſo evident that the ſmallneſs of the particles of fluids will contribute to their imperfect coheſion, becauſe the ſurface of a body compoſed of ſmall particles muſt be more ſmooth and even, than the ſurface of a body compoſed of large particles, and two flat bodies may be conceived to conſiſt of particles ſo ſmall that their ſurfaces ſhall differ inſenſibly from perfect planes, ſo that if theſe bodies were placed upon one another, they would ſlide without the leaſt ſenſible friction. Moreover, if the particles of theſe bodies, thus placed on each other, be by any means deprived of the whole, or the greateſt part of their coheſion, the bodies will not only ſlide on each other in the fore-mentioned plane, but the parts of the maſs would alſo ſlide on each other in any other direction whatſoever. Conſequently they would readily yield to any impreſſed force, and in yielding be eaſily moved amongſt each other, and thus conſtitute, agreeably to the definition, a fluid maſs. But a perfect fluid, or that whoſe parts may be moved from each other by the leaſt force, exiſts only in the imagination: for independently of its gravity or weight, or tendency towards the centre of the earth, every non-elaſtic fluid poſſeſſes the attraction of aggregation (*viz.* of the mutual attraction of its parts) in a particular degree; of the attraction of coheſion, which is likewiſe, in a particular degree, towards other bodies; and of the attraction of affinity. Beſides, all fluids manifeſt more or leſs a ſort of obſtruction, or reſiſtance to a perfectly free motion. See Affinity, Aggregation, Attraction, Cohesion, Friction and Resistance.

Fluids are called either *natural*, as water and mercury; or *animal*, as blood, milk, bile, lymph, urine, &c., or *factitious*, as wines, ſpirits, oils, &c. See each under its proper article.

Fluids are more commonly diſtributed by the philoſopher into *elaſtic* and *non-elaſtic*. An *elaſtic* fluid is that the dimenſions of which are leſſened by augmenting the preſſure, and enlarged by diminiſhing the preſſure upon it: of which kind are the different ſorts of airs or gaſes. (See Gas.) A *non-elaſtic* fluid is that, whoſe dimenſions are not, at leaſt as to ſenſe, affected by the increaſe of preſſure, as mercury, water, &c. Theſe latter are ſaid to be *non-elaſtic*, or incompreſſible, not becauſe they are abſolutely ſo; but becauſe their compreſſibility is ſo very ſmall, as to make no ſenſible difference in our calculations relative to the preſſures, movements, and other properties of theſe fluids. See Compression.

The doctrine and laws of fluids are of the greateſt extent in philoſophy. The preſſure and gravitation of bodies in fluids, and the action of the fluids immerged in them, make the ſubject of *Hydroſtatics*, which ſee.

Fluids, *Hydroſtatical laws of.* 1. The upper parts of all fluids, as water, &c. do preſs upon the lower; or, as ſome philoſophers ſtate it, all fluids do gravitate in *proprio loco*.

The contrary of this was a principle in the ſchool-philoſophy; and two facts have been commonly urged in ſupport of it. A bucket full of water is lighter in the water than out of it, nor does it weigh more when full in the water, than when empty out of it; therefore, it has been concluded, that the water in the bucket, becauſe it is within water, its own element, does not gravitate: and divers, who deſcend to conſiderable depths, it has been ſaid, feel no ſenſible preſſure under water; though at the depth of thirty-two feet, the additional preſſure they ſuſtain is not leſs than twenty thouſand avoirdupois pounds: for, ſuppoſing the ſurface of the body to contain only ten ſquare feet, and a cubic foot of water to weigh one thouſand avoirdupois ounces, 32 × 10 feet, or 16 × 20 feet of water will weigh 16 × 20,000 avoirdupois ounces, or twenty thouſand pounds. However, in this caſe the uniformity of the preſſure, the increaſed elaſticity and reſiſtance of the compreſſed internal air, and the firm texture of the membranes, &c. may prevent their complaining of any ſenſible pain: though there have been many inſtances to the contrary, in which the difference of the preſſure has produced very injurious effects. See Diving.

As to the former fact, it is eaſily explained by the theory of *ſpecific* Gravity, (which ſee). The bucket of water weighs in water, but does not overweigh; becauſe the ſurrounding parts of water endeavour to deſcend as well as the bucket, and with equal force, and therefore do not permit it to deſcend. Thus, according to an obſervation of Dr. Deſaguliers, if two pound weights were hung at the two arms of a balance, no one will ſay, that neither weighs, becauſe it does not outweigh the other. Deſag. Exp. Phil. vol. ii. p. 96.

Beſides, it is evident, that, in any fluid, the weight of the whole is equal to the weight of all its parts; and if any part be taken from the whole, the weight of the whole will be diminiſhed by the weight of that part; and if any part be added to the whole, the weight of the whole will be increaſed by the weight of the part which was added; and, therefore, it is reaſonable to conclude, that the weight of the whole is compoſed of the weights of the ſeveral parts, and that the parts do, therefore, gravitate in the whole, or in *proprio loco*. (Cotes's Hyd. and Pneum. Lectures, p. 7.) But the certainty of ſuch preſſure is now demonſtrated by a thouſand experiments: it will be ſufficient to inſtance one or two.

Immerge a tube, open at both ends, and half filled with oil of turpentine, in a veſſel of water, the upper end of the tube being ſtopped with the finger: if now the upper ſurface of the oil lie as low as that of the water, the oil, upon removing the finger, will not run out at the lower end of the tube; nay, and if the tube be thruſt a little lower, the water will riſe up in it, and bear the oil above it: but if the upper ſurface of the oil be conſiderably higher than that of the water, the oil will drop out of the tube. Whence it follows, that the column of oil in one caſe preſſes or gravitates leſs on the plane imagined to paſs under its lower ſurface than a column of water; and in the other caſe more.

Or thus: a phial, with as much ſhot in it as will make it ſink, cloſe ſhut, being immerged in water, and ſuſpended by a horſe-hair to the beam of a balance, with a weight at the other end exactly counterpoiſing it; upon unſtopping the phial, and filling it with water, it will preponderate, and bear down the end of the balance, without having any communication with the external air. And if the phial had been firſt weighed in air, it will be found, that the weights neceſſary for reſtoring its equilibrium in water anſwer exactly to the additional weight of the phial, when it is again weighed in air with the water in it: ſo that water weighs in water juſt as much as in air.

Theſe two experiments abundantly prove the propoſition, that the upper parts of fluids do really preſs or gravitate on the lower. See *Specific* Gravity.

From this gravity it follows, that the ſurfaces of ſtagnant fluids are plain and parallel to the horizon; or rather, that they are ſegments of a ſphere or ſpheroid concentrical with the earth, becauſe they all gravitate towards the centre of the earth.

For, as the particles are ſuppoſed to yield to any force impreſſed, they will be moved by the action of gravity, till ſuch time as none of them can deſcend any lower. And in this ſituation, once attained, the fluid muſt remain at reſt, unleſs put in motion by ſome foreign cauſe; inaſmuch as none of the particles can now move without aſcending, contrary to their natural tendency.

In this caſe the centre of gravity of the fluid, contained in a veſſel open at top, will lie as low as it poſſibly can. Thus, let A B D C (*Hydraulics, Plate* V. *fig.* 1.) repreſent one ſide of a rectangular veſſel, containing water as high as E F, whoſe centre of gravity is G; it is eaſy to prove that when the ſurface of the water is flat and horizontal, as E F, then the centre of gravity of the water lies loweſt; but that if the water be elevated on any part of that ſurface, and of courſe lowered on any other part, then the centre of gravity will be removed to ſome place higher than G. Imagine that the water be diſpoſed into the ſituation D K B C, *viz.* that the portion K E H be removed to the place B H F; and in this caſe the centre of gravity L of the quantity of water K D H F C remains in its original ſituation, whilſt the centre of gravity of the quantity of water K E H has been removed higher, *viz.* from I to S. Now, ſince the common centre of gravity of two bodies is in a ſtraight line between the reſpective centres of gravity of thoſe bodies; therefore, the common centre of gravity of both the quantities of water formerly ſtood at G, in the line I S; whereas it now ſtands at O in the line L S, *viz.* evidently higher than the level of G, which is the line *z r*. This reaſoning, applied to one ſide of the veſſel, may be eaſily adapted to any ſection of the water and veſſel, as alſo to veſſels of any ſhape, and to any irregularity which the ſurface of the water may be ſuppoſed to acquire; for in any caſe the concluſion is exactly the ſame, namely, that the centre of gravity of a given quantity of ſome uniform fluid, like water, which is contained in an open veſſel of any ſhape, ſtands at the loweſt poſſible ſituation, when the whole ſurface of the fluid is in the ſame horizontal line.

2. If a body be immerged in a fluid, either wholly, or in part, its loweſt ſurface will be preſſed upwards by the water underneath it: and the preſſure of fluids upwards is equal to the preſſure downwards at the ſame depth.

The truth of this propoſition is evident from the experiment above mentioned; where the oil of turpentine was ſuſpended and made to mount up in the tube, by the preſſure of the water upwards on its lower parts. Thus alſo, if the upper end of a narrow-bored tube be dipped into quickſilver, whilſt the other end is ſtopped with the finger, and the tube be lifted up, a ſhort column of quickſilver will be ſuſpended in the lower end, which column, when dipped into water deeper than about fourteen times its own length, will be preſſed upwards, after the finger is removed from the orifice.

This upward preſſure of fluids may be evinced by cauſing a piece of lead, &c. to ſwim in water; which may be done by immerging it to a proper depth, and keeping the water from getting above it. Let C D, *Plate* V. *Hydraulics*, *fig.* 2. be a glaſs tube open at both ends, and E F G a flat piece of lead, half an inch thick, exactly fitted to the lower end of the tube, having its upper ſurface covered with wet leather, ſo as to hinder the entrance of the water contained in the outer veſſel. Let this leaden plate be held cloſe to the tube, by pulling the ſtring or wire I H L upward at I, with one hand, whilſt the tube is held in the other by the upper end C. In this ſituation, let the tube be immerſed in water in the glaſs-veſſel A B, to the depth of ſix inches below the ſurface of the water at K; and then the leaden plate E F G will be plunged to the depth of ſomewhat more than eleven times its own thickneſs: holding the tube at that depth, you may let go the wire or thread at L; and the lead will not fall from the tube, but will be kept to it by the upward preſſure of the water below it, occaſioned by the height of the water at K above the level of the lead. For, as lead is 11.33 times as heavy as its bulk of water, and in this experiment is immerſed to a depth ſomewhat more than 11.33 times its thickneſs, and no water getting into the tube between it and the lead, the column of water E a b c G, below the lead, is preſſed upwards againſt it by the water K D E G L, all round the tube; which water, being a little more than 11.33 times as high as the lead is thick, is ſufficient to balance and ſupport the lead at the depth K E. If a little water be poured into the tube upon the lead, it will increaſe the weight upon the column of water under the lead, and cauſe the lead to fall from the tube to the bottom of the glaſs veſſel, where it will lie in the ſituation b d: or if the tube be raiſed a little in the water, the lead will fall by its own weight, which will then be too great for the preſſure of the water round the tube on the column of water below it. If the plate were braſs inſtead of lead, it ought to be immerſed under water at leaſt eight times its thickneſs, in order to be ſupported by the water; becauſe braſs is about eight times ſpecifically heavier than water. A plate of pure gold would require near twenty times its thickneſs of water: and this led Mr. Boyle to propoſe one of his hydroſtatical paradoxes in theſe words, *viz.* That a ſolid body, as ponderous as any yet known, though near the top of the water it will ſink by its own weight, yet immerſed in water at a greater depth than that of twenty times its thickneſs, will not ſink, if its deſcent be not aſſiſted by the weight of the incumbent water. (Paradox 11. Statics. Boyle's Works, abr. by Shaw, vol. ii. p. 311.) As we have now ſeen that the heavieſt body may be made to ſwim in water, the lighteſt wood may be made to lie at the bottom of water or mercury. Thus, let two pieces of wood be planed quite flat, ſo that no water may get between them when they are put together; let one of them, b d, be cemented to the bottom of the veſſel A B, *fig.* 2. and the other be laid flat and cloſe upon it, and held down with a ſtick, whilſt water is poured into the veſſel, then remove the ſtick, and the upper piece of wood will not riſe from the lower one, for as the upper one is preſſed down both by its own weight and the weight of water over it, whilſt the contrary preſſure of the water is kept off by the wood under it, it will lie as ſtill as the heavieſt body: but if it be raiſed at the edge, ſo that the water may get under it, it will immediately be preſſed upwards; and as it is lighter than its bulk of water, it will riſe and float on the ſurface of the water. See Ferguſon's Lectures, 4to. p. 68. and Cotes's Hyd. Lect. 2. See HYDROSTATIC *Bellows*, and Art. 11. in the ſequel.

The law or quantity of this preſſure in this; that a body immerged in a fluid loſes juſt ſo much of the weight it would have in air, as ſo much of the fluid as is equal to it in bulk, if weighed in the air, would amount to.

This preſſure of fluids on the lower parts of an immerſed body is farther confirmed, by attending to the reaſon why bodies, ſpecifically lighter than fluids, aſcend therein. The effect is owing to this, that there is a greater preſſure or weight on every other part of the plane or ſurface of the fluid imagined to paſs under the lower ſurface of the body, than there is on that whereon the emerging body inſiſts. Conſequently, to produce an equilibrium in the fluid, the parts immediately under the riſing body being preſſed by the reſt every way, do continually force it upwards.

In effect, the emerging body is continually preſſed on by two columns of water, one bearing againſt its upper and the other againſt its lower parts: the length of both which columns being to be eſtimated from the top of the water, that which preſſes on the lower part will be the longer, by the thickneſs of the aſcending body, and conſequently will overbalance it by the weight of as much water as will fill the ſpace that body takes up.

Hence, 1. We are furniſhed with one reaſon, why very minute corpuſcles, either heavier or lighter than the liquor they are mingled with, will be ſuſtained therein a good while, without either emerging to the top, or precipitating to the bottom; the difference between the two columns of the fluid being here inconſiderable.

Hence, 2. If a body A be ſpecifically lighter, than B, an equal portion of the fluid in which it is immerged, it will riſe with a force proportionable to the exceſs of gravity of B above A: and if A be ſpecifically heavier than B, it gravitates and deſcends with the exceſs only of its weight above that of B.

Hence, 3. We have, as ſome ſay, a ſolution of the phenomenon of two poliſhed marbles or other planes adhering ſo ſtrongly together; becauſe the atmoſphere preſſes or gravitates with its whole weight on the under ſurface and ſides of the lower marble, but cannot do ſo at all on its upper ſurface, which is cloſely contiguous to the upper and ſuſpended marble. See COHESION.

3. The preſſure of the upper parts of a fluid on the lower exerts itſelf every way, and every way equally, laterally, horizontally, and obliquely, as well as perpendicularly.

For, as the parts of a fluid yield to any impreſſion, and are eaſily moved, it is impoſſible any drop ſhould remain in its place, if, while it is preſſed by the ſuperincumbent fluid, it be not equally preſſed on every ſide.

The ſame is confirmed from experiments: for ſeveral tubes of divers forms, ſtraight, curved, angular, &c. being immerſed in the ſame fluid, though the apertures through which the fluid enters be differently poſited to the ſurface or plane, ſome being perpendicular, others parallel, and others variouſly declined; yet will the fluid riſe to an equal height in them all. See SYPHON.

Hence, 1. All the particles of fluids being thus equally preſſed on all ſides, it is argued, that they muſt be at reſt, and not in continual motion, as has been uſually ſuppoſed.

Hence, 2. Alſo, a body being immerſed in a fluid, ſuſtains a lateral preſſure from the fluid; which is alſo increaſed as the body is placed deeper beneath the ſurface of the fluid.

4. In tubes that have a communication with each other, whatever their magnitude be, whether equal or unequal; and whatever their form, whether ſtraight, angular, or crooked; ſtill fluids riſe in them to the ſame height.

5. If a fluid riſe to the ſame altitude in two tubes that communicate with each other, the fluid in one tube is a balance, or equal in weight to that in the other.

If the tubes be of equal diameters, the columns of the fluid, having the ſame baſe and altitude, are equal, and conſequently their gravities equal; ſo that they preſs and gravitate againſt each other with equal force.

This is demonſtrated from mechanics. *E. gr.* Let the baſe of G I, *Plate* V. *Hydraulics*, *fig.* 3. be ſuppoſed quadruple the baſe of H K; and let the fluid deſcend in the greater tube the ſpace of an inch, as from L to O; it will then riſe in the other the ſpace of four inches, as from M to N. Wherefore the velocity with which the fluid moves in the tube H K, is to that with which it moves in G I as the baſe of the tube G I to the baſe of the other, H K. But the altitude of the fluid being ſuppoſed the ſame in both tubes, the quantity of the fluid in the tube G I will be to that in the other tube H K, as the baſe of the tube G I to the baſe of the other H K.

Conſequently, the momentum of the fluid in the tube G I is to that in the tube H K, as the product of the baſe of the tube G I into the baſe of the other H K, to the factum of the tube H K into the baſe of the other G I. Wherefore, the products being equal, the momenta muſt be equal.

The ſame is eaſily demonſtrated where one of the tubes is inclined, and the other perpendicular, &c.

Hence in tubes that communicate, the fluid will preponderate in that where its altitude is the greateſt.

6. In communicating tubes, fluids of different ſpecific gravities will equiponderate, if their altitudes be in the ratio of their ſpecific gravities.

Hence we have a way of finding the ſpecific gravities of fluids, *viz.* by pouring one fluid into one of the communicating tubes, as A B (*fig.* 4.) and another into the other tube C D; and meaſuring the altitudes G B and H D, at which they ſtand when balanced.

For the ſpecific gravity of the fluid in A B is to that in D C, as D H to B G. If the fluids employed in this experiment be apt to mix, it may be proper to fill the horizontal tube B D with mercury to prevent the mixture. Hence, ſince the denſities of fluids are as their ſpecific gravities, the denſities will likewiſe be as the altitudes of the fluids D H and B G; ſo that we have hence likewiſe a method of determining the denſities of fluids.

7. The bottoms and ſides of veſſels are preſſed in the ſame manner, and by the ſame laws, as the liquids contained in them.

And hence, as action and re-action are equal, the fluids themſelves ſuſtain an equal preſſure from the bottoms and ſides. And as the preſſure of fluids is equal every way, the bottoms and ſides are preſſed as much as the neighbouring parts of the fluids; and conſequently this action increaſes in proportion to the height of the fluid, and is equal every way at the ſame depth; as depending altogether on the height, and not at all on the quantity of the fluid.

8. In perpendicular veſſels of equal baſes, the preſſure of fluids on the bottoms is in the ratio of their altitudes. This is evident, becauſe, the veſſels being perpendicular, the bottoms are horizontal: conſequently the tendency of fluids by the action of gravity will be in lines perpendicular to the bottoms, ſo that they will preſs with all their weight; the bottoms therefore are preſſed in the ratio of the gravities. But the gravities are as the bulks, and the bulks here are as the altitudes; therefore the preſſure on the bottoms are as the altitudes.

9. In perpendicular veſſels of unequal baſes, the preſſure on the bottoms is in a ratio compounded of baſes and altitudes.

From the preceding demonſtration it appears, that the bottoms are preſſed in the ratio of the gravities: and the gravities of fluids are as their bulks, and their bulks in a ratio compounded of the baſes and altitudes. Conſequently, &c.

10. If an inclined veſſel A B C D, *fig.* 5. have the ſame baſe and altitude with a perpendicular one, B E F G, the bottoms of the one and the other will be equally preſſed.

For, in the inclined veſſel A B C D, the bottom C D is preſſed in the direction B D. But the force of gravity in the direction B D is to the abſolute gravity, as B E to B D. Conſequently, the bottom C D is preſſed in the ſame manner, as if it had been preſſed perpendicularly by the fluid under the altitude B E. Therefore, the bottoms of the perpendicular and inclined veſſels are equally preſſed.

11. Fluids preſs upon ſubject bodies, according to their perpendicular altitude, and not according to their latitude, or breadth.

Or, as others ſtate it, thus: If a veſſel be taper, or unequally big at top and bottom, yet the bottom will be preſſed after the ſame manner as if the veſſel were cylindrical, and the top and bottom equal.

Or thus: The preſſure ſuſtained by the bottom of a veſſel, whatever the figure of the veſſel be, is ever equal to the weight of a column of the fluid, whoſe baſe is the bottom itſelf, and height, the vertical diſtance of the upper ſurface of the water from the bottom.

Or, yet more explicitly, thus: If there be two tubes or veſſels, having the ſame heights, and baſes, both filled with water; but one of them made ſo tapering upwards that it ſhall contain but twenty ounces of water; whereas the other, widening upwards, holds two hundred ounces; yet the bottoms of the two tubes ſhall ſuſtain an equal preſſure of water, *viz.* each of them that of the weight of two hundred ounces.

This is a noble paradox in hydroſtatics, firſt diſcovered by M. Paſchal, and which it is well worth the clearing and inſiſting on. It is found unexceptionably true from abundant experiments; and it may even be demonſtrated and accounted for on principles of mechanics.

Suppoſe, *e. g.* the bottom of a veſſel C D (*fig.* 6.) leſs than its top A B; ſince the fluid preſſes the bottom C D, which we ſuppoſe horizontal, in a perpendicular direction E C, none but that part within the cylinder E C D F can preſs upon it, the natural tendency and preſſure of the reſt being taken off by the ſides.

Again, ſuppoſing the bottom C D (*fig.* 7.) much bigger than the top F G; or even, for the eaſier demonſtration, ſuppoſe a tube F E fixed in a cylinder A B C D; and ſuppoſe the bottom C D raiſed to L, that the fluid may be moved through the interval D L; then will it have riſen through the altitude G L, which is to D L as the baſe C D to that of G F. The velocity, therefore, of the fluid F E is to its velocity in the veſſel A D as the baſe C D to the baſe F G.

Hence we have the momentum wherewith the fluid in the tube tends downwards, by multiplying the baſe of the cylinder C D into its altitude C H.

Conſequently the bottom C D is preſſed with the ſame force, as it would be preſſed by the cylinder H C D I.

To confirm and illuſtrate this doctrine of the preſſure of fluids in the ratio of the baſe and altitude, provide a metallic veſſel A C D B (*fig.* 7.) ſo contrived, as that the bottom C D may be moveable, and to that end fitted in the cavity of the veſſel with a rim of wet leather, to ſlide freely without letting any water paſs. For this purpoſe it would be moſt adviſeable, that the moveable bottom ſhould have a groove round its edge, and that it be put into a bladder, tied cloſe round it in the groove by a ſtrong waxen thread; and the bladder may be made to come up like a purſe within the veſſel, and put over the top of it at A and B all round, and then the lid of the veſſel preſſed on it: ſo that when water is poured through a hole in the lid, it would lie upon the bottom C D, and be contained within the bladder. Then, through holes in the top A B, apply ſucceſſively ſeveral tubes of equal altitudes, but of different diameters. Laſtly, faſtening a ſtring or wire to the beam of a balance, and fixing the other end by a little ring K to the moveable bottom, put weights in the other ſcale, till they be ſufficient to raiſe the bottom C D: then will you not only find, that the ſame weight is required, what diameter or magnitude ſoever the tube be of; but even, that the weight which will raiſe the bottom when preſſed by the ſmalleſt tube, will raiſe it when preſſed by the whole cylinder H C D I.

Suppoſe the veſſel A B C D to hold about a pound of water, and that the moveable bottom, wire, and hook, are of equal weight with an empty ſcale M. When this ſcale is pulled down, the bottom C D will be drawn up within the box, and that motion will cauſe the water to riſe in the glaſs tube E L F G. If one pound be put into the ſcale, the bottom will be moved a little, and the water will juſt appear at the lower end of the tube at *a*. Another pound will cauſe it to riſe from *a* to *b*, juſt twice as high above the bottom as it was when at *a*; the preſſure on the bottom being equal to two pounds, the counterbalancing weight in the ſcale M. A third pound will raiſe it to *c*, a fourth to *d*, &c. the diſtances *a b*, *b c*, *c d*, &c. being taken equal to each other and to the depth of the veſſel. If another tube, as *f*, be put into a hole made in the top of the veſſel, and the veſſel be filled with water; and, then, if water be poured in at the top of the tube F G E L, it will riſe in the tube *f* to the ſame height as it does in the other tube: from hence it is evident, that the upward preſſure of the water, riſing in the tube *f*, is equal to the downward preſſure in the other tube F G E L: the caſe would be the ſame, whatever be the number of tubes; and the moveable bottom would ſuſtain the weight of the water in all the tubes, beſides the weight of all the water in the veſſel: and if all the holes to which theſe tubes (F G E L excepted) were fixed be ſtopped up, each part, thus ſtopped, will be preſſed upward with a force equal to the weight of water in each tube: and conſequently, the whole upward preſſure againſt the top of the veſſel, ariſing from the weight or downward preſſure of the water in the tube F G E L, will be equal to the weight of a column of water of the ſame height with that in the tube, and of the ſame thickneſs as the width of the inſide of the box or of the moveable bottom; and this upward preſſure againſt the top will reach downwards with equal force againſt the bottom.

If the diameter of the moveable bottom be three inches, therefore, and the diameter of the bore of the tube a quarter of an inch, their ſquares will be nine inches and one ſixteenth of an inch: and therefore the whole area of the bottom will be a hundred and forty-four times as great as that of the area of the bottom or top of the tube; ſo that if the moveable bottom be raiſed one inch, the water would be raiſed to the top of a tube a hundred and forty-four inches, or twelve feet in height. The veſſel muſt be open below the moveable bottom to let in the air; otherwiſe the preſſure of the atmoſphere upon it, ſuppoſing its diameter three inches, would require a counterbalance of a hundred and eight pounds in the ſcale M before the bottom would begin to move. See HYDROSTATIC *Bellows*.

12. From the preceding articles, we may eaſily deduce a method of eſtimating the quantity of preſſure of fluids on any given ſurface. Let *a b c d* (*fig.* 8.) repreſent a cubical veſſel full of water; the ſide *a c* will therefore, repreſent a ſquare; and the meaſure of the preſſure on every phyſical point of *a c* will be the altitude of the water above that point; thus, the preſſure on *l* is meaſured by *a l*, on *m* by *a m*, &c. and the preſſure on the whole line will be meaſured by the ſum of as many altitudes *a l*, *a m*, &c. as there are points in the line *a c*. Erect perpendiculars *l o*, *m p*, &c. reſpectively equal to *a l*, *a m*, &c. and the ſum of theſe perpendiculars will be the meaſure of the whole preſſure on the line *a c*: but the ſum of theſe is equal to the area of the triangle *a c d*; and this is as the ſquare of its altitude *a c*. When *a c* repreſents a ſquare, the triangle *a c d* muſt repreſent a priſm, having the ſaid triangle for its baſe, and the ſide of the ſquare for its altitude: the weight of that priſm of water is, therefore, equal to the preſſure made againſt the ſquare, or ſide of the cube; which, as the priſm is half the cube, is equal to half the weight of the whole water contained in the veſſel; and as each ſide bears the ſame degree of preſſure, all the four ſides ſuſtain four times half the weight, or twice the whole weight of the water: and becauſe the bottom ſuſtains a preſſure equal to the whole weight of the water, the bottom and ſides of a cubical veſſel taken together ſuſtain a preſſure from the water contained in it equal to thrice its weight. The ſame obſervations may be eaſily applied to planes that are oblique to the horizon; and we may conclude univerſally, that the preſſure upon any plane, of whatever figure and ſituation, is equivalent to the weight of a ſolid of water, formed by erecting perpendiculars upon every point of the plane propoſed, equal to the reſpective diſtances of thoſe points from the upper ſurface of the water: or, the preſſure on any ſurface is equal to the ſum of all the products which are made by multiplying every indefinitely ſmall part of the ſurface into its diſtance from the top of the water. To find the ſum of all theſe products, or a body of water equal to that ſum, is, in moſt caſes, a difficult problem: Stevinus has attempted the ſolution of it in few inſtances, confining himſelf to regular plain ſurfaces. Mr. Cotes has laid down the following univerſal and expeditious rule: the preſſure on any ſurface is equal to the weight of a body of water whoſe magnitude is found by multiplying the ſurface propoſed into the depth of its centre of gravity under water; and the preſſure on any number of ſurfaces of different bodies, however differently ſituated, is equal to the weight of a body of water whoſe magnitude is found by multiplying the ſum of all thoſe ſurfaces into the depth of their common centre of gravity under water. The demonſtration of this rule depends on the following theorem, *viz.* that the ſum of the products, ariſing from multiplying every indefinitely ſmall part of any ſurface, or number of ſurfaces, reſpectively, into its perpendicular diſtance from any propoſed plane, will be equal to the product of the whole ſurface or number of ſurfaces multiplied into the perpendicular diſtance of the centre

of gravity of any ſingle ſurface, or of the common centre of gravity of the whole number of ſurfaces from the ſame plane. Thus, let a, b, c, d, (*fig.* 9.) repreſent weights, hanging at their centres of gravity a, b, c, d, by the lines $a\,o$, $b\,o$, $c\,o$, $d\,o$, fixed to a horizontal plane o, o; o, o; and let z be the common centre of gravity of all the weights, and zo its perpendicular diſtance from the ſaid plane. Let x be the common centre of gravity of a and b, and to $x\,o$, drawn parallel to the reſt, let $a\,m$ and $b\,n$ be perpendicular. In the ſimilar triangles $m\,x\,a$ and $n\,x\,b$, $m\,x : n\,x :: (x\,a : x\,b ::)\ b : a$. (See Center *of Gravity*.) Therefore $a \times m\,x = b \times n\,x$, i. e. $a \times \overline{m\,o - x\,o} = b \times \overline{x\,o - n\,o}$, and, conſequently, $a \times m\,o + b \times n\,o = \overline{a + b} \times x\,o$. In the common centre of gravity of a and b ſuſpend a weight $x = a + b$, and a weight $y = x + c$ in the common centre of gravity of x and c, and a weight $z = y + d$, in the common centre of gravity of y and d. Then z is the common centre of gravity of a, b, c, d. And we have (as above) $a \times a\,o + b \times b\,o = x \times x\,o$, and $x \times x\,o + c \times c\,o = y \times y\,o$, and $y \times y\,o + d \times d\,o = z \times z\,o$: conſequently $a \times a\,o + b \times b\,o + c \times c\,o + d \times d\,o = z \times z\,o = \overline{a + b + c + d} \times z\,o$. And this will be the caſe, if the ſuſpended lines $a\,c$, &c. be perpendicular to any plane, though not parallel to the horizon. Now taking the upper ſurface of water for that plane to which we refer the indefinitely ſmall parts of the ſurface which is expoſed to the preſſure we are concerned with; ſince it has been already ſhewn, that the preſſure upon the whole is equivalent to the weight of a body of water which is equal in magnitude to the ſum of all the products, made by multiplying every little part by its diſtance from the upper plane of the water; and that this ſum of products is exactly equal to the product of the whole ſurface or number of ſurfaces multiplied into the diſtance of the centre of gravity from the upper plane of the water; it will follow, that the ſame product is the meaſure of a magnitude of water, whoſe weight is equivalent to the preſſure required. Cotes's Hydroſt. Lect. 3. See Center of *Preſſure.*

For the laws of the preſſure and gravitation in fluids ſpecifically heavier, or lighter, than the bodies immerged, ſee Gravity, *Specific.*

For the laws of the reſiſtance of fluids, or the retardation of ſolid bodies moving in fluids, ſee Resistance.

For the aſcent of fluids in capillary tubes, or between glaſs planes, ſee Ascent and Capillary *Tubes.*

The motions of fluids, and particularly water, do alſo make the ſubject of *Hydraulics*, which ſee.

Fluids, *Hydraulic Laws of.* 1. The velocity of a fluid, as water, moved by the preſſure of a ſuperincumbent fluid, as air, is equal at equal depths, and unequal at unequal ones.

For the preſſure being equal at equal depths, the velocity ariſing thence muſt be ſo too; and *vice verſâ*: yet the velocity does not follow the ſame proportion as the depth, notwithſtanding that the preſſure, whence the velocity ariſes, does increaſe in the proportion of the depth. But here the quantity of the matter is concerned: and the quantity of motion, which is compounded of the ratio of the velocity and quantity of matter, is increaſed in equal times as the ſquares of the velocities.

2. The velocity of a fluid ariſing from the preſſure of a ſuperincumbent fluid, at any depth, is the ſame as that which a body would acquire in falling from a height equal to the depth; as is demonſtrated both from mechanics and experiments. See Descent. See alſo Discharge *of Fluids.*

3. If two tubes of equal diameters, full of any fluid, be placed in any poſition, either erect, or inclined; provided they be of the ſame altitude, they will diſcharge equal quantities of the fluid in equal times.

That tubes, every way equal, ſhould, under the ſame circumſtances, empty themſelves equally, is evident; and that the bottom of a perpendicular tube is preſſed with the ſame force as that of an inclined one, when their altitudes are equal, has already been ſhewn. Whence it eaſily follows, that they muſt yield equal quantities of water, &c.

4. If two tubes of equal altitudes, but of unequal apertures, be kept conſtantly full of water, the quantities of water they yield in the ſame time will be as the diameters; and this, whether they be erect, or any way inclined.

Hence, if the apertures be circular, the quantities of water emptied in the ſame time, ought to be in a duplicate ratio of the diameters.

But this law, Mariotte obſerves, is not perfectly agreeable to experiment. If one diameter be double the other, the water flowing out of the leſs is found more than a fourth of what flows out of the greater. But this may have been owing to ſome accidental irregularities in making the experiments.

Wolfius however aſcribes it principally to this, that the column of water directly over the aperture is ſhorter than that next the ſides or parietes of the veſſel: for the water, in its efflux, forms a kind of cavity over the aperture; that part immediately over it being evacuated firſt, and the other water not running faſt enough from the ſides to ſupply it. Now, this cavity, or diminution of altitude, being greater in the greater tube than in the leſs; hence the preſſure, or endeavour to paſs out becomes proportionably leſs in the greater tube than in the leſs.

5. If the apertures E and F of two tubes A B and C D (*Hydraulics, Plate* VI. *figs.* 1 and 2.) be equal, the quantities of water diſcharged in the ſame time will be as the velocities.

6. If two tubes have equal apertures E and F, and unequal altitudes A B and C D, the quantity of water diſcharged from the greater A B, will be to that diſcharged from C D, in the ſame time, in a ſubduplicate ratio of the altitudes A B and C D.

Hence, 1. The altitudes of water, A B and C D, diſcharged through equal apertures E and F, will be in a duplicate ratio of the water diſcharged in the ſame time. And as the quantities of water are as the velocities, the velocities are likewiſe in a ſubduplicate ratio of their altitudes.

Hence, 2. The ratio of the water diſcharged by two tubes A B and C D, together with the altitude of one of them, being given, we have a method of finding the altitude of the other, *viz.* by finding a fourth proportional to the three given quantities; which proportional, multiplied by itſelf, gives the altitudes of C D, required.

Hence, alſo, 3. The ratio of the altitudes of two tubes of equal apertures being given, as alſo the quantity of water diſcharged by one of them, we have a method of determining the quantity the other ſhould diſcharge in the ſame time.

Thus, to the given altitudes, and the ſquare of the quantity of water diſcharged at one aperture, find a fourth proportional. The ſquare root of this will be the quantity of water required.

Suppoſe, *e. gr.* the height of the tubes as 9 to 25, and the quantity of water diſcharged at one of them, three inches; that diſcharged by the other will be $= \sqrt{\frac{9 \times 25}{9}} = \sqrt{25} = 5$.

7. If the altitude of two tubes A B and C D be unequal, and the apertures E and F be likewiſe unequal, the quantities of water diſcharged in the ſame time, will be in a ratio compounded of the ſimple ratio of the apertures, and the ſubduplicate one of the altitudes.

And hence, if the quantities of water diſcharged in the ſame time by two tubes, whoſe apertures and altitudes are unequal, be equal, the apertures are reciprocally as the roots of the altitudes, and the altitudes in a reciprocal ratio of the ſquares of the apertures.

8. If the altitudes of two tubes be equal, the water will flow out with equal velocity, however unequal the apertures be.

9. If the altitudes of two tubes, A B and C D, as alſo their apertures, E and F, be unequal, the velocities of the waters diſcharged are in a ſubduplicate ratio of their altitudes.

And hence, 1. As the velocities of waters flowing out at equal apertures, when the altitudes are unequal, are alſo in a ſubduplicate ratio of the altitudes, and as this ratio is equal if the altitudes be equal, it appears in the general, that the velocities of water flowing out of tubes, are in a ſubduplicate ratio of their altitudes.

Hence alſo, 2. The ſquares of the velocities are as the altitudes.

Mariotte found, from repeated experiments, that if a veſſel A B C D have a tube E G fitted to it, there will more water be evacuated through the tube, than there could have been, in the ſame time, through the aperture of the veſſel E without the tube; and that the motion of the fluid is accelerated ſo much the more, as the tube E G is the longer.

E. gr. The altitude of a veſſel A C being one foot, that of the tube E G three feet, and the diameter of the aperture three lines, no leſs than 6½ ſeptiers of water were diſcharged in the ſpace of one minute; whereas, upon taking off the tube, only four ſeptiers were diſcharged. Again, when the length of the tube E G was ſix feet, and the diameter of the aperture G an inch, the whole quantity of water run out in thirty-ſeven ſeconds; but cutting off half the tube, the veſſel was not evacuated in leſs than forty-five ſeconds; and taking it quite away in leſs than ninety-five ſeconds.

10. The altitudes and apertures of two cylinders full of water being the ſame, one of them will diſcharge double the quantity of water diſcharged in the ſame time by the other, if the firſt be kept continually full, while the other runs itſelf empty; for the velocity of the full veſſel will be equable, and that of the other will be continually retarded. Now it is demonſtrated, that, if two bodies be impelled by the ſame force, and the one proceeds equally, and the ſecond is equably retarded, by that time they have loſt all their motion, the one has moved double the ſpace of the other.

11. If two tubes have the ſame altitudes, and equal apertures, the times wherein they will empty themſelves will be in the ratio of their baſes.

12. Cylindric and priſmatic veſſels, as A B C D (*fig.* 3.) empty themſelves by this law, that the quantities of water diſcharged in equal times decreaſe, according to the uneven numbers, 1, 3, 5, 7, 9, &c. taken backwards.

For the velocity of the deſcending level F G is continually decreaſing in the ſubduplicate ratio of the decreaſing altitudes; but the velocity of a heavy body deſcending, increaſes in the ſubduplicate ratio of the increaſing altitudes. The motion, therefore, of the level F G, in its deſcent from G to B, is the ſame as if it were to deſcend in the inverſe ratio from B to G; but if it deſcend from B to G, the ſpaces, in equal times, would increaſe, according to the progreſſion of the uneven numbers; conſequently the altitudes of the level F G, in equal times, would decreaſe, according to the ſame progreſſion inverſely taken.

Hence, therefore, the level of water F G deſcends by the ſame law, as, by an equal force impreſſed, it would aſcend through an altitude equal to B G.

From this principle, many other particular laws of the motion of fluids might be demonſtrated, which, for brevity ſake, we here omit. See Discharge *of Fluids.*

To divide a cylindrical veſſel into parts, which ſhall be evacuated in certain parts or diviſions of time, ſee Clepsydra.

13. If water, deſcending through a tube H E (*fig.* 4.) ſpout up at the aperture G, whoſe direction is vertical, it will riſe to the ſame altitude G I, at which the level of the water L M, in the veſſel A B C D, does ſtand.

For ſince the water is driven through the aperture G by the force of gravity of the column E K, its velocity will be the ſame as that with which a body, by the ſame force impreſſed, would riſe to the altitude F I: wherefore, ſince the direction of the aperture is vertical, the direction of the water ſpouting through it will be ſo too; conſequently the water muſt riſe to the height of the level of the water L M in the veſſel.

Indeed, by the experiment, it appears, that the water does not riſe quite ſo high as I: beſides the aperture G ſhould be ſmaller, as the height of the level of the water is leſs; and even ſmaller when mercury is to be ſpouted than when water. But this is no objection to the truth of the theorem; it only ſhews that there are certain external impediments, which diminiſh the aſcent. Such are, the reſiſtance of air, and the friction of the tube, &c. See Jet *d'Eau.*

14. Water, deſcending through an inclined tube, or a tube bent in any manner, will ſpout up, through a perpendicular aperture, to the height at which the level of the water in the veſſel ſtands.

15. The lengths or diſtances D E and D F, or I H and I G, (*fig.* 5.) to which water will ſpout either through an inclined, or an horizontal aperture D, are in a ſubduplicate ratio of the altitudes in the veſſel or tube A B and A C.

For ſince water, ſpouted out through the aperture D, endeavours to proceed in the horizontal line D F, and, at the ſame time, by the power of gravity, tends downwards in lines perpendicular to the ſame; nor can the one power hinder the other, inaſmuch as the directions are not contrary; it follows, that the water, by the direction B A, will arrive at the line I G in the ſame time wherein it would have arrived at it, had there been no horizontal impulſe at all. Now, the right lines I H and I G are the ſpaces which the ſame water would have deſcribed in the mean time by the horizontal impetus; but the ſpaces I H and I G, inaſmuch as the motion is uniform, are as the velocities; conſequently the velocities are in a ſubduplicate ratio of the altitudes A B and A C; and therefore the lengths or diſtances, to which the water will ſpout in apertures either horizontal or inclined, are in a ſubduplicate ratio of the altitudes.

That the velocities are in the ſubduplicate ratio of the altitudes may be ſhewn by experiment: for, let two pipes, as C and g, of equal ſized bores, be fixed into the ſide of the veſſel A B, (*fig.* 6.) and let the pipe g be four times as deep below the ſurface of the water at h, in the veſſel, as the pipe C is; and whilſt theſe pipes run, let the water be conſtantly poured into the veſſel, to keep the ſurface at the ſame height. Then a veſſel, holding a pint, applied to the ſpout C, and another containing a quart at the ſpout g, will be filled at the ſame time. The horizontal diſtance, to which a fluid will ſpout from an horizontal pipe, in any part of the ſide of an upright veſſel, below the ſurface of the fluid, is equal to twice the length of a perpendicular to the ſide of the veſſel, drawn from the mouth of the pipe to a ſemicircle deſcribed upon the altitude of the fluid; and, therefore, the fluid will ſpout to the greateſt diſtance poſſible from a pipe whoſe mouth is at the centre of the ſemicircle; becauſe a perpendicular to its diameter (ſuppoſed parallel to the ſide of the veſſel) drawn from that point, is the longeſt that can poſſibly be drawn from any part of the diameter to the circumference of the ſemi-circle. Thus, if the veſſel A B, (*fig.* 6.) be full of water, the horizontal pipe D be in the middle of its ſide, and the ſemicircle N$cdcb$ be deſcribed on D as a centre, with the radius DgN, or Dfb, the perpendicular Dd to the diameter D N b is the longeſt that can be drawn from any part of the diameter to the circumference N$edcb$. And if the veſſel be kept full, the jet G will ſpout from the pipe D to the horizontal diſtance N M, which is double the length of the perpendicular Dd. If two other pipes, as C and E, be fixed into the ſide of the veſſel at equal diſtances above and below the pipe D, the perpendiculars Cc and Ee, from theſe pipes to the ſemicircle, will be equal; and the jets F and H, ſpouting from them, will each go to the horizontal diſtance N K, which is double the length of either of the equal perpendiculars Cc or Ee.

Hence, as every body, projected either horizontally or obliquely, in an unreſiſting medium, deſcribes a parabola: water projected either through a vertical or inclined ſpout, will deſcribe a parabola.

Hence we have a way of making a delightful kind of water arbours, or arches, *viz.* by placing ſeveral inclined tubes in the ſame right line.

On theſe principles are formed various hydraulic engines for the raiſing, &c. of fluids, as pumps, ſyphons, fountains, or jets d'eau, &c. which ſee deſcribed under their proper articles PUMP, SYPHON, FOUNTAIN, SPIRAL, SCREW, &c. For other particulars relating to this ſubject, and the difference between the deductions of theory and the reſult of experiments; ſee DISCHARGE *of Fluids*. See alſo CONTRACTED *Vein* and JET.

For the laws of the motion of fluids, by their own gravity, along open channels, &c. ſee RIVER and WAVE, and *Motion* of WATER.

For the laws of preſſure and motion of air, conſidered as a fluid, ſee AIR and WIND.

FLUIDS. Animalcules obſerved in fluids are of divers kinds; ſome are flat, others eel-like, but the greater part of an oval figure. Leewenhoeck gives a deſcription of a very unuſual ſhaped creature, fixed in a little ſcabbard or ſheath, which was faſtened to ſome of the ſmall green weeds found in ditches full of water. Phil. Tranſ. N° 337, p. 160.

Waters of all kinds, that have ſtood a while expoſed to the air, till they have grown a little putrid, or where putrefaction has been promoted by the admixture of other matters, abound in variety of animalcules, having each their peculiar characters, ſizes, figures, economy, and method of life, not to ſay uſes. In a ſmall drop of the diſcoloured ſurface of rain-water, which had ſtood two months in a window, Dr. Harris obſerved four ſorts of animalcules: the clear part of the drop preſented two kinds, both very ſmall; the firſt of the figure of ants-eggs: theſe were in a continual briſk motion. The ſecond more oblong, three times as long as broad, were exceedingly numerous, but their motion ſlow.

In the thick part of the drop there were alſo two ſorts of animalcules. The firſt of the eel-kind, reſembling thoſe in vinegar, but much ſmaller, and with their extremes more ſharp. Theſe would wriggle out into the clear part, and then ſuddenly betake themſelves back again, and hide in the thick and muddy part of the drop, much like common eels in the water. The ſecond ſort reſembled a large maggot, which would contract themſelves into a ſpherical figure, and then ſtretch out again. The end of the tail appeared with a forceps, like that of an ear-wig. They might be plainly perceived to open and ſhut their mouths, from whence air-bubbles were frequently diſcharged. The number of theſe was not above four or five. The ſame four kinds of animalcules he alſo found in many other drops of the ſame corrupted water. Animalcules in fluids are generally found at the top. In the lower parts of the water, Dr. Harris aſſures us he could never find any, unleſs when the liquor had been diſturbed, and the ſurface ſhaken down, and mingled with the lower parts. Dr. Harris examined ſome rain-water that had ſtood uncovered a little while, but had not contracted any thick or diſcoloured ſcum. And here, where the water was clear, he could not find any animals at all: but a little thin white ſcum, that, like greaſe, began to appear in its ſurface, he found to be a congeries of exceeding ſmall animals of different ſhapes and ſizes, much like thoſe produced by ſteeping barley in water. Viewing a ſmall drop of the green ſurface of ſome puddle water, he found it altogether compoſed of animalcules of ſeveral ſhapes and magnitudes; the moſt remarkable were thoſe which gave the water that green colour, and were oval creatures, whoſe middle part were of a graſs-green, but each end clear and tranſparent. They could contract and dilate themſelves, tumble over and over many times together, and then ſhoot away like fiſhes. Phil. Tranſ. N° 220, p. 255.

Dr. Harris looked on the ſurface of ſome mineral chalybeate water, which ſtood in a viol unſtopt for about three weeks. In it he ſaw two kinds of animals, one exceeding ſmall, and the other very large, which latter ſort had on the tail ſomething that looked like fins. There were but very few of either ſort. Phil. Tranſ. N° 220, p. 257. ſeq.

Animalcules in fluids are eaſily deſtroyed by only ſeparating them a while from their element. Naturaliſts have even found ſhorter ways. A needle-point dipped in ſpirit of vitriol, and then immerſed into a drop of pepper-water, readily kills all the animalcules, which, though before friſking about with great livelineſs and activity, no ſooner come within the influence of the acid particles, than they ſpread themſelves, and tumble down to all appearance dead. The like may be done by a ſolution of ſalt, only with this difference; that by the application of this latter, they ſeem to grow vertiginous, turning round and round till they fall down. Tincture of ſalt of tartar uſed in the ſame manner kills them ſtill more readily; yet not ſo, but there will be apparent marks of their being ſick firſt and convulſed. Inks deſtroy them as faſt as ſpirit of vitriol, and human blood, by virtue of the ſalt contained in it, produces the ſame effect. Urine, ſack, and ſugar, do all deſtroy them, though not ſo faſt; beſides, that there is ſome diverſity in their figures and appearances, as they receive their deaths from this poiſon or that. The point of a pin dipped in ſpittle preſently killed all the kinds of animalcules in puddle-water, as Dr. Harris ſuppoſes it will other animalcules of this kind. Phil. Tranſ. N° 203. p. 836, ſeq. and N° 220, p. 256.

We find in the waters of our ditches many ſpecies of ſmall animalcules, both of the cruſtaceous and teſtaceous kinds. The legs of the creatures are ſhort, they reſemble thoſe of crabs and lobſters, but are of a much more curious ſtructure; they are leſs than a ſmall flea, but they ſeem all breeders, carrying ſpawn at their tails, or in two ſmall bags, one hanging from each ſide. Theſe bags are often ſeen broken, and the ſpawn is then found to conſiſt of globules very large in proportion to the ſize of the creature. There is another ſort beſides theſe, as beautiful, but much ſmaller than they; this in ſhape more reſembles the ſhrimp, and carries its ſpawn as the ſhrimp does. Theſe kinds both ſeem only to have one eye, and that placed exactly in the middle of the fore-head, without the leaſt trace of a dividing line; and they are often ſo tranſparent, that the motion of their bowels, and pulſation of their heart, may be ſeen. Baker's Microſcope, p. 93.

All who are acquainted with the microſcope, know very well that in water, in which the beſt glaſſes can diſcover no animated particle of matter, after a few grains of pepper, or a ſmall fragment of a plant of almoſt any kind, has been ſome time in it, animals full of life and motion are produced, and thoſe ſo numerous as to equal the fluid itſelf in quantity.

A ſmall quantity of water taken from any ditch in the ſummer months, is found to be full of little worms, ſeeming in nothing ſo much as ſize to differ from theſe microſcopic animalcules. Nay, water, without theſe, expoſed in open veſſels in the ſummer months, will be always found, after a few days, to abound with multitudes of them, viſible to the naked eye, and full of life and motion.

Theſe, we know, by their future changes, are the fly-worms of the different ſpecies of gnats, tipulæ, and multitudes of the other fly-ſpecies, and we can eaſily determine, that they have owed their origin only to the eggs of the parent fly there depoſited. Nay, a cloſer obſervation will at any time give ocular proof of this; as the flies may be ſeen laying their eggs there, and thoſe eggs may be followed in all their changes to the fly again.

Why then are we to doubt but that the air abounds with other flies and animalcules, as minute as the worms in theſe fluids? and that theſe laſt are only the fly-worms of the former, which, after a proper time ſpent in that ſtate, will ſuffer changes like thoſe of the larger kinds, and become flies like thoſe to whoſe eggs they owed their origin? Vide Reaumur, Hiſt. Inſect. vol. iv. p. 431.

The differently medicated liquors, made by the infuſions of different plants, afford a proper matter for the worms of different ſpecies of theſe ſmall flies; and there is no reaſon to doubt but among theſe ſome are viviparous, others oviparous, and to this may be in a great meaſure owing the different time taken up for the production of the inſects in different fluids. Thoſe which are a proper matter for the worms of the viviparous fly, may be ſooneſt found full of them, as probably the liquor is no ſooner in a ſtate to afford them a proper nouriſhment than their parents place them there: whereas thoſe produced from the eggs of the little oviparous flies muſt, after the liquor is in a proper ſtate, and they are depoſited in it, in form of eggs, have a proper time to be hatched before they can appear alive.

It is eaſy to prove that the animals we find in theſe vegetable infuſions were brought thither from ſome other place. It is not leſs eaſy to prove that they could not be in the matter infuſed, any more than in the fluid it is infuſed in.

Notwithſtanding the fabulous accounts of ſalamanders, it it is now well known, that no animal, large or ſmall, can bear the force of fire for any conſiderable time; and by parity of reaſon we are not to believe that any inſect, or embryo inſect, in any ſtate, can bear the heat of boiling water for many minutes. To proceed to enquiries on this foundation, if ſeveral tubes filled with water with a ſmall quantity of vegetable matter, ſuch as pepper, oak-bark, truffles, &c. in which, after a time, inſects will be diſcovered by the microſcope; and other like tubes be filled with ſimple water boiled, with water and pepper boiled together, and with water with the two other ingredients, all ſeparately boiled in it; when all theſe liquors come to a proper time for the obſervation of the microſcope, all, as well thoſe which have been boiled as thoſe which have not, will be found equally to abound with inſects, and thoſe of the ſame kind in the infuſions of the ſame kind, whether boiled or not boiled.

Thoſe in the infuſions which had ſuſtained a heat capable of deſtroying animal life, muſt therefore not have ſubſiſted either in the water, or in the matters put into it, but muſt have been brought thither, after boiling, and it ſeems by no way ſo probable, as by means of ſome little winged inhabitants of the air depoſiting their eggs or worms in thoſe fluids.

It is a natural queſtion on this to aſk, why it is, that whilſt we ſee myriads of the progeny of theſe winged inſects in water, we ſeldom ſee the inſects themſelves? The anſwer is equally eaſy, *viz.* becauſe we can always place a drop of this water immediately before the focus of the microſcope, and keep it there while we at leiſure examine its contents; but that is not the caſe with regard to the air inhabited by the parent flies of theſe our worms, which is of immenſe extent in proportion to the water proper to nouriſh theſe worms, and conſequently, while the latter are cluſtered together in heaps, the former may be diſperſed and ſcattered. Nor do we want inſtances of this even in the inſects of a larger kind. In many of our gardens we frequently find veſſels of water filled with the gnat-worms, as plentifully in proportion to their ſize, as theſe our fluids with animalcules. Every cubic inch of water in theſe veſſels contains many hundreds of theſe animals; yet we ſee many cubic inches of the air in the garden not affording any one of the parent flies. Id. ibid. See ANIMALCULES, EEL, VINEGAR, and PEPPER-*water.*

FLUID, *Cauſtic.* See CAUSTIC-*fluid.*

FLUID, *Senſitive.* See SENSITIVE-*fluid.*

FLUKE, in *Ichthyology*, a word uſed in ſome parts of England as a name for the flounder.

FLUKE *of an Anchor*, that part of it which faſtens in the ground. See ANCHOR.

FLUKE-*worm*, a ſort of ſmall flat worm, often found in the livers of ſheep which have died of the rot. See ROT.

FLUMARI, in *Geography*, a town of Naples, in Principato Ultra; 9 miles S. E. of Arriano.

FLUMET, a town of France, in the department of Mont Blanc, ſeated on the Arly; 31 miles S. E. of Geneva.

FLUMMERY, a wholeſome ſort of vegetable jelly made of oatmeal.

The manner of preparing it is as follows: put in the proportion of three large handfuls of finely ground oatmeal, to ſteep for twenty-four hours or more, in two quarts of fair water; then pour off the clear water, and put two quarts of freſh water to it; ſtrain it through a fine hair-ſieve, and boil it till it is as thick as a haſty-pudding, ſtirring it continually while it is boiling that it may be very ſmooth: ſome ſweeten it with ſugar, and add roſe or orange-flower-water; and then eat it with white or Rheniſh wine, cream, or milk.

FLUMS, in *Geography*, a town of Switzerland, in the county of Sergans, ſituated on the Mat; 5 miles W. of Sergans.

FLUOR, in *Phyſics*, &c. denotes a fluid; or, more properly, the ſtate of a body, which was before hard and ſolid, but is now reduced, by fuſion of fire, into a ſtate of fluidity.

Gold and ſilver will remain a long time in fluor, maintained by the intenſeſt heat, without loſing any thing of their weight. See Gold, Fixity, &c.

The word fluor is applied to ſignify the habitual fluidity of any ſubſtance, or that property by which a ſubſtance cannot be rendered ſolid, and is employed as an epithet to diſtinguiſh ſuch ſubſtances from others of the ſame kind, but which are habitually ſolid, or which may be rendered ſolid.

Fluor, in *Mineralogy*, a ſpecies of the calcareous genus, being a combination of lime and fluoric acid, and known by the chemical appellation of *fluate of lime*. The more familiar names under which it paſſes in moſt countries are *fluſs* and *fluor*, denoting the uſe to which it is frequently applied as a flux of various ores. Beſide theſe, there are a variety of other names that have originated in the ſimilarity of its colours, (particularly thoſe of the fluor-ſpar,) to the beautiful tints of ſeveral of the ſtones called precious; ſuch are *falſe emerald*, *hyacinth*, *topazes*, *beryl*, *chryſolite*, &c. Indeed there is no mineral that may equal fluor in the varied beauty of its hues; the ſuite of its colours is almoſt ſufficiently comprehenſive to be formed into a chromatic ſcale. It is reſerved for nicer chemical obſervation to diſcover the nature of this variouſly modified colouring principle, which is more fugacious in fluor than in moſt other minerals, but probably always correſponding with the nature of the metallic ſubſtances that accompany fluor in the bowels of the earth.

Fluor has been divided by Werner into three ſub-ſpecies, namely, *earthy*, *compact*, and *ſpathoſe fluor*. The firſt, alſo known by the name of the phoſphoreſcent *earth of Marmaroſh*, was claſſed with the fluates of lime on the authority of Pelletier; but the late analytical experiments of Klaproth, who found 32 parts of phoſphoric to two of fluoric acid, ſhew the neceſſity of reſtoring it to the phoſphates of limes, to which it was firſt referred! Mr. Jameſon appears to have had his doubts reſpecting this ſubſtance; he does not deſcribe it as a ſub-ſpecies of fluor, nor does he enumerate it among the phoſphates of lime. See Phosphorite.

1. *Compact fluor.* This is rather better underſtood; but it appears that mineralogiſts are very apt to confound the terms "compact" and "maſſive" alſo in ſpeaking of fluor: whence maſſive fluor ſpar has been deſcribed as Werner's compact fluor. This latter occurs but rarely, having hitherto been found only at Stollberg and Straſsberg in the Hartz, and at Yxſiö and Norberg in Sweden, to which habitats we may perhaps add Schlackenwalde and Kriman in the Saatz circle of Bohemia, and Schwarzleogang in Salzburg. The following external characters appear the moſt important.

Its colour is generally light greyiſh-green, paſſing ſometimes into greeniſh-white, ſometimes into blueiſh-grey, approaching to verdigris green, and it is alſo found reddiſh. Not ſeldom ſeveral of theſe ſhades are mixed in ſpots in one and the ſame fragment, now and then with the addition of accidental yellowiſh and browniſh ſpots.

It occurs maſſive only. Fracture more or leſs even, approaching ſometimes to flat conchoidal, ſometimes to ſplintery, even to foliated. The fragments are indeterminately angular with pretty ſharp edges, and more or leſs tranſlucent in the ſame piece.

It is feebly glimmering, almoſt dull. Half-hard, ſcarcely ſcratched by fluor ſpar, brittle, eaſily frangible. Its ſpecific gravity, if Kirwan's compact fluor be the ſame as the one here deſcribed, is 3.120 to 3.165.

This ſub-ſpecies, to a ſuperficial obſerver, appears ſometimes like horn-ſtone, ſometimes like compact lime-ſtone; but the above external characters (to which may be added the phyſical one of its ſhewing a weak phoſphoreſcence when laid on ignited coal) keep it ſufficiently diſtinct. Its geographic ſituation has been given above. Its geognoſtic ſituation at Stollberg is in a vein, in greywacke; it is found with fluor ſpar (its conſtant companion), ſome copper pyrites and barytes. At Kriman in Bohemia it was found by Dr. Reuſs in gneiſs, in which it is ſometimes ſeen as thin laminæ between the layers of quartz and feldſpar.

It is, together with fluor ſpar, made uſe of as a flux.

2. *The ſparry fluor*, or *fluor ſpar*, which, beſides the above-mentioned general names, is alſo known under thoſe of *cubic fluor*, *glaſs fluor*, *phoſphoreſcent ſpar*, *ſpath vitreux*, *ſpath fuſible*, &c.

Its principal colours are, 1. *White*, ſuch as greyiſh, greeniſh, yellowiſh, and reddiſh-white, paſſing into 2. *Red*, particularly roſe red of various intenſity, carmine. 3. *Grey*, greeniſh, yellowiſh, ſmoke, and pearl-grey. 4. *Blue*, lavender, azure, ſmalt, ſky-blue, Pruſſian and violet-blue, the two latter appearing ſometimes nearly black. 5. *Green*, verdigris, ſeladon, mountain, emerald, graſs-apple, leek, piſtachio, and olive green. 6. *Yellow*, wine, wax, honey yellow. 7. *Brown*, yellowiſh, and clove-brown. All theſe colours will frequently paſs into each other, and even thoſe leaſt related to each other are ſometimes ſeen together in the ſame ſpecimens in ſpots and flakes, and in ſtripes that often appear like ſome kinds of alabaſter, whence Romé de l'Iſle called a variety of fluor, *albâtre vitreux*. The colouring matter of ſome of them is very fugacious, eſpecially that of the ſky-blue variety, which is often ſeen to fade merely by being expoſed to the atmoſpheric air. Of the above colours, the white and violet blue are the more common.

Fluor ſpar is found maſſive and diſſeminated, and moſt commonly cryſtallized, but it has not been obſerved, except in one inſtance to be mentioned hereafter, in thoſe imitative ſhapes, (ſuch as dentiform, branched, ſtalactitic,

&c.) in which the carbonates and ſulphates of lime, and other cryſtallizable earthy ſubſtances ſo frequently occur.

Its primitive form is the octaedron. As to the determination of the integrant molecule ſome difficulty has ariſen. The octaedron, we know, cannot be ſub-divided into ſolids of the ſame form; the laſt term of mechanical diviſion we arrive at is that into other octaedrons accompanied by tetraedrons; ſix of the former and eight of the latter being diſpoſed in ſuch a manner as to form in all directions acute rhomboids. If we imagine either all the octaedral or all the tetraedral particles removed, thoſe of the ſame kind that remain will ſtill be in exact connection by means of their edges. Of the latter circumſtance Haüy has ingeniouſly availed himſelf to reconcile this reſolution of the octaedral cryſtal into two kinds of ſolids, with that principle according to which all the integrant molecules of a cryſtal muſt be neceſſarily ſimilar. He ſuppoſes that, could we caſt a look into the primary conſtruction of the octaedral cryſtal, and ſub-divide it to the utmoſt limits, we ſhould find the whole ſubſtance pervaded either by tetraedral or octaedral vacuities; if the former, the whole would be compoſed of octaedral elementary particles, if the latter, the tetraedron would excluſively conſtitute the integrant molecule. Now as, according to Haüy's doctrine, this molecule is conſtantly either the parallelopiped, or the triangular priſm, or the tetraedron, analogy has in this caſe decided in favour of the tetraedron, which is now conſidered as the integrant molecule of fluor, inſtead of the octaedron. It was Werner who firſt obſerved the tetraedral and octaedral fragments which reſult (according to his terminology) from the fourfold cleavage preſented by the foliated fracture of fluor.

The principal forms of the cryſtals of fluor-ſpar, with their modifications, conſidered, not according to their origin, but to the manner in which they preſent themſelves to the eye, are the following:

1. The *perfect cube* (*chaux fluatée cubique*, Haüy.) It is ſometimes elongated; paſſing from the cubic form into that of a rectangular four-ſided priſm, generally with two of its lateral planes narrower. We have ſeen ſpecimens of the latter variety from Cumberland; it is alſo found at Schemnitz and Nertſhinſk.

2. Cube with all the edges truncated (*chaux fluatée cubo-dodécaèdre*, Haüy).

3. The preceding with planes of truncation ſo much increaſed that the rhomboidal or garnet-dodecaedron is formed (*chaux fluatée dodécaèdre*, Haüy.)

4. Cube with all its edges bevilled (*chaux fluatée bordée*, Haüy).

5. The preceding, with bevilling edges ſo much enlarged as to convert each plane of the cube into four triangular planes (*chaux fluatée hexatétraèdre*, Haüy). What has been deſcribed as perfect cube with convex planes, we ſuppoſe to be this modification indiſtinctly formed.

6. Cube with all its ſolid angles flatly acuminated by three planes, placed on the lateral planes of the cube.

7. Cube having its angles acuminated by ſix planes, placed on the lateral planes. We do not know where the preceding and this variety occur; Emmerling informs us, that in the latter the ſix acuminating planes ſometimes completely engroſs the planes of the cube.

8. The cube truncated at all its ſolid angles (*chaux fluatée cubo-octaèdre*, Haüy.) If the triangular truncating planes do not meet, the planes of the cubes are octagons; if they meet exactly, thoſe planes are ſquares; if all the truncating planes encroach on each other theſe become hexagons, while the planes of the cubes remain ſquares; when they encreaſe ſtill more the

9. *Octaedron*, with ſix truncated angles, is formed; in which the truncating planes are the ſix planes of the cube; in the ſame manner as the truncations at the eight angles of the cube N° 8. are the eight planes of the octaedron. When the truncating planes of the modification N° 8. enlarge ſo much as to cauſe the faces of the cube entirely to diſappear,

10. The perfect octaedron, or double four-ſided pyramid, is formed (*chaux fluatée primitive*, Haüy.)

11. Octaedron with truncated edges (*chaux fluatée emarginée*, Haüy.)

12. Octaedron with both angles and edges truncated.

13. The elongated octaedron with four broader and four narrower planes, terminating in a ridge.

No. 1. is by far the moſt common of all the modifications of cryſtallized fluor ſpar. No. 3. is very rarely met with; it was found by M. Subrin between Breuil and Charecey on the way to Chalons. Of No. 4. the moſt intereſting varieties occur in Cornwall. From the geometrical figure in plate 73, of that uſeful work "Britiſh Mineralogy," it appears, that Haüy's chaux fl. bordée occurs in Cornwall, with the eight angles truncated, parallel to the octaedron, by which a cryſtal of 38 faces is formed. Of No. 10, the perfect octaedron, the moſt beautiful variety is the roſe-coloured one, found in the neighbourhood of Mont-Blanc. It alſo occurs in beautiful cryſtals in England, on Mount St. Gothard &c. and Mr. Sowerby is, we ſuppoſe, the firſt who has noticed the ſmall violet variety of this modification found in Aberdeenſhire.

To the above may perhaps in future be added the following unuſual modifications. 1. The *tetraedron* with faintly truncated edges, mentioned by Mr. Mohs as exiſting in the collection of Mr. Vonder Null: the truncating planes are ſtated to correſpond to thoſe of the cube. 2. The rhomboid (one of the forms which fragments of fluor-ſpar frequently exhibit, and which may be conſidered as an octaedron, with two tetraedrons applied to two of its oppoſite planes) is ſaid to have been found as cryſtal. The third, mentioned by Emmerling, is the double eight-ſided pyramid, acuminated at both extremities by three planes placed on the alternate lateral edges. It is ſaid to have been found in Saxony, and is in the collection of Count Wrbna at Vienna.

The cryſtals of fluor ſpar are of various ſize: the perfect cubic is ſeen from five inches ſquare to extremely minute, and ſcarcely diſtinguiſhable. They are found diſtinct and aggregated in various directions; ſometimes globularly aggregated. Their ſurface is generally ſmooth and ſplendent; but ſometimes perfectly dull. They are not ſeldom covered by an opaque cruſt of various colours, particularly blueiſh-green; often they are druſy, and ſometimes ornamented with a beautiful golden and pavonine tarniſh: of which latter we have a fine ſpecimen before us. Internal luſtre ſplendent, ſometimes ſimply ſhining, according to the various degrees of perfection of the foliated fracture; it is vitreous, rather inclining to pearly; in ſome varieties even an adamantine luſtre has been obſerved.

Fracture more or leſs perfectly foliated, almoſt always ſtraight, ſeldom curved-foliated, ſometimes approaching to vitreous; it preſents a four-fold equiangular cleavage.

The form of the fragments has been mentioned in ſpeaking of the integrant molecules. The maſſive is generally ſeen in granular diſtinct concretions of various bigneſs; and ſometimes it appears in columnar concretions, and radiated, interſected by curved lamellar diſtinct concretions.

Degree of tranſparency according to the differences in the colour and fracture; ſome varieties, particularly the white or colourleſs, perfectly tranſparent; others entirely opaque; moſt commonly it is ſemi-tranſparent.

Its hardneſs is greater than that of calcareous ſpar; but it is ſcratched by iron; it is brittle, eaſily frangible, and not very heavy; its ſpecific gravity is,

3.092 (from Stollberg) } Gellert.
3.148 (from Freiberg) }
3.156 to 3.184. Muſchenbroeck.
3.175 (the green var.) Blumenbach.
3.200 to 3.700. Gerhard.

Other phyſical characters are its phoſphoreſcence when laid on ignited coal; the ſky and violet blue and green varieties have been obſerved to emit the moſt vivid phoſphoric light. The variety from Siberia, called chlorophane, when put on ignited coal, does not decrepitate, but emits a beautiful emerald green light, which has procured it its name. A ſlight phoſphoreſcence is likewiſe obſerved when two fragments are rubbed againſt each other in the dark.

As chemical characters of fluor-ſpar, we have to mention its decrepitation before the blow-pipe, (which, however, is not the caſe with the Siberian chlorophane,) and ſubſequent loſs of colour, and its melting, (particularly with addition of borax or phoſphoric acid,) into a greyiſh-white enamel; as alſo its emitting ſuffocating white vapours (fluoric acid) when acted upon by ſulphuric acid.

The conſtituent part of fluor-ſpar, according to Scheele, the celebrated diſcoverer of a peculiar acid in this mineral, were ſtated to be,

Lime	57
Fluoric acid	16
Water	27

After him, Wenzel, Richter, and but lately Klaproth, have analyſed this ſubſtance, and obtained the following reſults.

Fluoric acid	$32\frac{3}{6}$	
Calcar. earth	$56\frac{4}{6}$	
Iron and alum earth	$10\frac{5}{6}$	
	100	Wenzel, 1783

Fluoric acid	35	
Calcar. earth	65	
	100	Richter, 1785.

Calcar. earth	67.75	
Fluoric acid	32.25	
	100	Klaproth, 1807.

With regard to the *geognoſtic ſituation* of fluor ſpar much is left to future obſervation. We know, however, that it does not only occur in veins, but likewiſe as beds, principally in mountains of older formation. In Derbyſhire it appears to form large irregular depoſitions in fletz lime-ſtone, and alſo in Thuringia and at Zinnwald in Bohemia it occurs in beds. More frequently it is met with in veins of different relative ages, accompanied with ſeveral important metallic formations. The oldeſt, conſiſting principally of tin ſtone, occurs at Zinnwald, and in other parts of the Bohemian and Saxon Ertzgebirge: and a vein formation, equally old, is found in Switzerland, where the veins conſiſt of fluor ſpar, feldſpar, rock cryſtal, &c. The ſecond in antiquity appears to be that which, accompanied with lead and ſilver ores, and ſometimes with barytes, forms the ſubſtance of veins at Freiberg and other parts of the Saxon Erzgebirge, and alſo partly in Derbyſhire. A third vein formation, found in the lower parts of the Hartz, conſiſts chiefly of fluor ſpar with copper and iron pyrites, galena, ſpathoſe iron, &c. The different ages of the venigenous fluor ſpar have firſt been examined into by Werner. We ſhould alſo mention here that the variety of fluor called chlorophane is found in a granitic rock in Siberia; and Andrada ſpeaks of a variety he ſaw in Sweden (in the diſtrict of Norberg) mixed in large maſſes with mica ſlate.

A liſt of localities of fluor ſpar may be found in all books on mineralogy; indeed, it is met with in moſt parts of Europe, though in ſome it is found in no conſiderable quantity. England and Saxony are the principal native places of this intereſting mineral ſubſtance. In Scotland it is very ſcarce; the only localities known to Mr. Jameſon are Aberdeenſhire and the Shetland iſlands. We know of no ſpecimens from any part of America or Africa; in the northern parts of Aſia, Patrin found it in ſmall quantities in two mines, *viz.* in the ſilver mine of Zmeof, in the Altaic mountains, where it occurs mixed with the other vein materials; and in a lead mine in Dauria, near the river Amur, where, if Patrin's obſervation be correct, it coats the ſmall cavities of the vein ſtone, in the ſhape of a thick *botroidal* cruſt.

The uſes to which fluor ſpar is applied, though not manifold, are not unimportant. The coarſer kinds are uſed as fluxes to metallic ores, particularly copper, iron, and ſilver. Chemiſts obtain fluoric acid from it. The uſe made of it in this country, (particularly of the variety called blue jack by the Derbyſhire miners,) for ornamental vaſes, columns, &c. is generally known. Mr. Mawe, in his "Mineralogy of Derbyſhire," has given an account of the mode of working it. Several attempts have been made in France to manufacture the fluor ſpar of Auvergne into ſimilar articles of ornament; but it appears as if the nature of its fracture renders it leſs fit for the lathe.

Fluor ſpar is ſeldom ſeen to conſtitute the ſubſtance of organic remains. We find inſtances of this converſion mentioned in Mr. Martin's "Outlines:" the remains are chiefly thoſe of entrochitæ. Alſo Dr. Kidd, in his "Outlines, &c." deſcribes a bivalve ſhell in the Oxford collection, converted into fluor ſpar with imperfect cryſtals of nearly colourleſs fluor in the interior.

We ſhould not omit mentioning in this place thoſe corroded cubic cryſtals of fluor ſpar, of a yellowiſh-grey colour, found near the ſurface of the earth in ſome parts of Derbyſhire: their texture is more or leſs porous throughout. Haüy, who calls this variety chaux fluatée aluminifère, thinks that the ferruginous clay which it is ſaid to contain has the ſame relation to the fluor ſpar which the quartz grains have to the carbonate of lime in the cryſtallized ſandſtone of Fontainebleau. But this analogy does not appear to be founded in reality. (See Sandstone.) Dr. Kidd conjectures that the corroded appearance of theſe cryſtals may have been produced by ſome form of zinc.

Fluor ſpar ſometimes exhibits traces of decompoſition. The ſingular variety from Beeralſton, Devonſhire, in octaedral cryſtals of a pale ſeladon green colour, and caſed, as it were, in one another, is encruſted with a white earthy ſubſtance, which, if we may judge from the gradual tranſition into the perfect ſubſtance obſervable in a ſpecimen before us, can only be the reſult of a diſintegration of the conſtituent parts. Mr. Sowerby has given a good figure of this variety. It is probable that much of the ſubſtance deſcribed as earthy fluor is nothing but fluor in a decompoſed ſtate.

Fluor *Albus*, in *Medicine*, a colourleſs diſcharge from the female vagina, popularly termed *the whites*, and by the noſologiſts *leucorrhœa*, an appellation of the ſame ſignification, derived from the Greek. See Leucorrhœa.

FLUORIC Acid, in *Chemiſtry*. This acid was diſcovered by Scheele more than thirty years ago, and the ſubject ſoon after excited the diligent attention of Dr. Prieſtley, whoſe experiments and obſervations are detailed at large in the ſecond volume of his experiments methodized, p. 339, 367. For many years it was ſuppoſed to exiſt in the fluor ſpar only, but later proceſſes have ſhewn that it is a conſtituent of ſome of the topazes, and of the wavellite, a newly diſcovered foſſil. It has alſo been found in the animal kingdom, *viz.* in the enamel of the petrified teeth of an elephant: alſo in the enamel of the human teeth, and in ivory.

We have ſeen that the conſtituent parts of fluor ſpar, independently of the water in combination, are fluoric acid and lime. To obtain this acid we muſt put one part by weight of the ſpar coarſely pulverized into a leaden retort, and pour over it three parts of concentrated ſulphuric acid. An efferveſcence is immediately excited; the ſulphuric acid exerting a ſtronger attraction for the lime of the ſpar, unites with it, and the fluoric acid goes off in the form of gas, which may be collected in receivers over mercury. If water had been previouſly introduced into the receiver, the gas would have been abſorbed, and the acid would, in that caſe, be exhibited in the liquid ſtate. Hence fluoric acid can ſubſiſt in the liquid form, and likewiſe under that of gas, which gas has the common properties of the atmoſpheric air, being elaſtic and inviſible. But it is ſomewhat heavier than common air; it extinguiſhes combuſtion, and is utterly incapable of ſupporting animal life. Expoſed to the atmoſphere it combines very greedily with its moiſture, and appears in the form of vapour or white fumes. It has a penetrating pungent ſmell; reddens vegetable blues, and corrodes the ſkin. If a lighted candle be introduced into it, the flame becomes green, and then is extinguiſhed. The moſt remarkable property of the fluoric acid gas is that of corroding glaſs in conſequence of its ſtrong affinity for ſilex. This property has rendered it extremely uſeful in etching or engraving on glaſs veſſels, which operation is performed by a very ſimple and eaſy proceſs: the glaſs is covered with wax, or a ſtrong ſolution of iſinglaſs, the figures are then traced with a common graver, or ſteel point, and then the veſſel is expoſed to the action of the fluoric acid in a ſtate of gas; thoſe parts that are expoſed are ſoon corroded, and the impreſſion is more or leſs deep, according to the time employed. This art, though adopted as new at the time of Scheele's and Prieſtley's diſcoveries, was, according to the account given by Beckmann in the ſecond volume of his Hiſtory of Inventions, known and practiſed a century before.

Light and caloric have no effect on fluoric acid; its properties are not the leaſt altered by being paſſed through a red-hot porcelain tube. It will not unite with oxygen, which is the great difference that exiſts between this and the muriatic acid; nor has it any action on azote, hydrogen, carbon, phoſphorus, or ſulphur. By theſe, or by ſome of them, almoſt all the other acids have been decompoſed, and their conſtituents detected, and hence its baſe was, till very lately, wholly unknown; and it was, from analogy only, that chemiſts aſſumed that it muſt contain oxygen in combination with an unknown baſe. Mr. Davy has, however, thrown ſome light on this ſubject, by ſubjecting the fluoric acid-gas to the action of potaſſium, one of his newly diſcovered metals. In this gas potaſſium, when heated, burns, and there is a great abſorption of the gas. Either the whole, or part of the acid, according to the quantity of the potaſſium uſed, is deſtroyed or abſorbed, and the reſidual elaſtic fluid is found to be hydrogen, which is in leſs proportion as the fluoric acid gas has been more perfectly freed from water. After the combuſtion, a chocolate coloured maſs remains at the bottom of the retort, and alſo a ſublimate, partly chocolate coloured, and partly yellow, is found about the ſides, and at the top of the retort. This ſubſtance, when examined by a magnifier, appeared to conſiſt of different kinds of matter; and when thrown into water it efferveſced very violently, and the gas evolved was inflammable. When heated in contact with air it burnt ſlowly, loſt its brown colour, and became a white ſaline ſubſtance.

The water which had acted on this ſubſtance was examined, the ſolid particles ſeparated by a filtre, and the fluid was found to contain fluate of pot-aſh, and pot-aſh. The ſolid reſiduum was heated in oxygen gas, it burnt before it came to a red heat, the brown colour was changed to white; oxygen was abſorbed, and acid matter was produced. The inflammable ſubſtance thus produced from the action of potaſſium on the fluoric acid is ſuppoſed to be the baſe of the acid. Perhaps the decompoſition of the fluoric acid by potaſſium is analogous to that of the ſulphuric and phoſphoric acids; in which the pure baſes are not evolved, nor even the baſes in their common form, but new compounds formed of the baſe with potaſſium, with a ſmaller proportion of oxygen. This ſubject has engaged alſo the attention of the French chemiſts, M. M. Gay Luſſac and Thenard, who employed the agency of potaſſium, and the reſults of their inveſtigation were very ſimilar to thoſe of Mr. Davy. From which they infer that ſince little or no hydrogen gas is evolved in the combuſtion of potaſſium, the effect cannot be aſcribed to the agency of water. The acid muſt therefore be decompoſed, or it muſt combine undecompoſed with the metallic baſe, which is not even oxydated. It is probable, therefore, that the acid is decompoſed, and the product is a combination of the fluoric baſe with pot-aſh, analogous in conſtitution to a phoſphuret.

Fluoric acid combines with alkalies and earths, and the ſalts ſo formed are named fluates. They are generally deliqueſcent, and can be cryſtallized with difficulty. They are decompoſed by the ſulphuric or muriatic acid, which, as we have ſeen, diſengages the fluoric. The alkaline fluates are decompoſed alſo by lime, as is evident by the following

Table of Affinities.

Lime,
Barytes,
Strontites,
Magneſia,
Pot-aſh,
Soda,
Ammonia,
Glucina,
Alumine,
Zircon,
Silica.

The ſaturating power of this acid exceeds that of all the others, a given quantity of it ſaturating a larger quantity of any baſe. On this account, it is regarded as the moſt powerful of the acids, and its leſs energetic action muſt be aſcribed partly to the weak ſtate of concentration in which it can be obtained, and partly to its not affording oxygen in a direct way.

There are eight fluates known, *viz.* of pot-aſh, ſoda, ammonia, lime, barytes, magneſia, alumine, and ſilica. Some of theſe we ſhall briefly notice. The fluate of *pot-aſh* is obtained by fuſing, in a platina crucible, a mixture of fluor ſpar, and carbonate of pot-aſh. The maſs, digeſted in water, yields a ſolution, which, filtered and evaporated, leaves a fluate of pot-aſh. It does not cryſtallize, but forms a gelatinous maſs with ſcarcely any taſte, that attracts moiſture from the air. It readily diſſolves in water. F. of *ſoda* is formed like the laſt; if the ſolution is evaporated till a pellicle riſes on its ſurface, it yields on cooling ſmall cubical cryſtals of fluate of ſoda. Theſe are bitter and aſtringent; they do not deliqueſce in the air, and are but little ſoluble in water. They decrepitate and melt into a tranſparent globule when expoſed to the action of the blow-pipe. F. of ammonia is obtained by the application of heat to a mixture of ſulphate of ammonia and fluor ſpar. The fluate ſublimes; but if it is prepared by ſaturating the acid with ammonia, the ſolution, by evaporation, yields ſmall cryſtals of fluate of ammonia. F. of lime, is the fluor ſpar on which we have already treated, as it is found in nature; this ſalt may be artificially prepared by adding fluate of ammonia to nitrate of lime; the fluate of lime falls to the bottom, and when properly treated is very pure. It is inſoluble in water, phoſphoreſcent when laid on a hot iron, it is inſipid, unalterable by expoſure to the air, and at a heat equal to 51° of Wedgwood, it melts into a colourleſs tranſparent glaſs. Fluoric acid obtained in glaſs veſſels always contains a portion of ſilica; if this ſolution be allowed to remain a conſiderable time in a veſſel not quite cloſed, it depoſits ſmall brilliant tranſparent cryſtals, which have been aſcertained to be the fluate of ſilica. This ſalt is ſoluble in alkalies, and gives out fluoric acid by mere heat, or by the action of any of the ſtrong mineral acids. Felſpar, and all minerals that contain ſilica, are probably acted on without difficulty by the fluoric acid in a ſtate of gas, but thoſe that contain no alkali are leſs liable to its action. The following table, taken from Dr. Thomſon's chemiſtry, vol. ii. exhibits the reſults of the experiments and calculations of Richter on the ſeveral fluates.

Table of the Compoſition of the Fluates.

Fluates of	Acid.	Baſe.
Alumine	100	123
Magneſia	100	144
Ammonia	100	157
Lime	100	186
Soda	100	201
Strontian	100	311
Pot-aſh	100	376
Barytes	100	520

FLURRY-BRIDGE, in *Geography*, a ſmall poſt-town of Ireland, in the county of Louth, on the borders of Armagh.

FLUSH, ſignifies to draw off, or let go a ſtream of water from any pound.

FLUSH *Deck*. See DECK.

FLUSHER, in *Ornithology*, the common name of the leſſer butcher-bird, called by authors the lanius minor, and the lanius tertius of Aldrovand. See LANIUS *Collurio*.

FLUSHING, VLISSENGEN, or FLESSINGUE, in *Geography*, a ſea-port town of the Dutch ſtate of Zealand, in the iſle of Walcheren, on the north ſide of an arm of the Scheldt. It defends the paſſage not only of that river, but of all the iſlands of Zealand, of which it is one of the moſt important keys: and on this account Charles V. when he abdicated his crown, enjoined his ſon Philip to preſerve it ſafe; and that prince, when he left the port in 1559, in order to take poſſeſſion of the kingdom of Spain, commanded a caſtle to be built for the defence of the town; but the order was prevented from being executed by ſubſequent troubles. The port lies between two moles that break the waves of the ſea, which enters the town by means of two canals, forming two baſons, ſo that loaded veſſels may ſail into the town, to the great convenience of the merchants. It was but a ſmall place before the 15th century, when Adolphus de Bourgogne, the lord of the place, ſurrounded it with walls, ſince which time it has become a celebrated port; and has been reckoned next to Middleburg, the richeſt town in the province of Zealand. The emperor Charles V. erected it into a marquiſate in 1551, which the prince of Orange purchaſed, together with the marquiſate of Ter-Vere, for 146,000 florins. The ſtadt-houſe, built according to the model of that at Amſterdam, is a ſuperb building. The States-General ſeized this town on the 27th of April 1573, by means of ſeven boats filled with ſoldiers ſent by the prince of Orange from the Brill. When they landed, they hanged the Spaniſh commander, Francis Paciotti, one of the greateſt engineers of his time, and the friend of the duke of Alva: they pillaged the churches and cloiſters, and took alſo the town of Vere, defeating a fleet of Spaniſh ſhips commanded by the duke of Medina Celi. The duke of Alva and the prince of Parma endeavoured in vain to retake it. This town was pledged with ſome others by the ſtates to queen Elizabeth, as a ſecurity for her aſſiſtance, and ſurrendered to the earl of Leiceſter, who was made governor in October 1585, and arrived the ſame year with 6 00 ſoldiers, and more than 500 gentlemen. In 1616 it was reſtored, with the other towns, to the ſtates, by the negociation of John Olden Barnevelt, ambaſſador to James I. In January 1795, Fluſhing was taken by the French; and united by a decree of the conſervatory ſenate in 1808 to the French empire and the department of the Scheldt or Eſcaut. In 1809 it was captured by the Engliſh, and ſoon after evacuated. N. lat. 51° 26′ 37″. E. long. 3° 34′ 9″.

FLUSHING, a town of America, in Queen's county, New York, on the N.W. part of Long iſland, and on the S. ſide of Hell-gate; ſeven miles E. by N. of New York city. It contains 1818 inhabitants.

FLUSTRA, in *Zoology*, a genus of Zoophytes. The animal is a polype proceeding from porous cells; ſtem fixed, foliaceous, membranaceous, and conſiſting of numerous rows of cells united together and woven, or matted together. Ovaries bulbiform?

Two or more diſtinct genera of zoophytes have been confounded by ſome naturaliſts under the general name of fluſtra. The true fluſtra may be readily diſtinguiſhed however by the above character. It is not of a ſtony nature like the millepora, with which it has been ſometimes arranged: neither is it ſo calcareous as the madrepora, though more ſo than the gorgonia, and by this means conſtitutes an intermediate link between thoſe analogous tribes. The cells of the fluſtra are diſpoſed with regularity, and always incline to the plane of their baſe. The animals which inhabit the cells are polypes, furniſhed with from ſix to twelve tentacula of moderate length. The colour of theſe creatures is in general white, and in the night-time, or when placed in the dark, they occaſionally emit a phoſphoreſcent light.

Species.

TRUNCATA. Foliaceous, ſub-divided, with linear truncated ſub-diviſions. Müll.

Native of the European ſeas, and five inches in length; cells oblong-ſquare, and pale yellowiſh-brown.

FOLIACEA. Foliaceous, branched, with round cuneate ſub-diviſions. Fabr. Fn. Groenl. &c. *Porus cervinus Imperati*, C. Bauh.

Inhabits European and Mediterranean ſeas, ſix inches long; colour yellowiſh-brown.

PILOSA. Foliaceous, variouſly branched, with a ſetaceous denticle on the lower part of each pore. Müll.—*Millepora membranacea plana, punctis quincuncialibus*, Amoen. Acad.

Whitiſh, porous, incruſting marine plants; and inhabits European ſeas.

CARBASEA. Foliaceous, ſub-divided, with a ſingle layer of cells. Ellis.

Yellowiſh-brown. Inhabits the coaſt of Scotland.

CHARTACEA. Papyraceous, with cells on both ſides, the tops of the branches truncated, like the edge of an axe. Ellis.

Adheres to ſhells, and of a pale ſtraw colour; native of Europe.

BOMBYCINA. Frondeſcent, with obtuſe branches, divided into two or three parts, growing together in tufts, ſending forth ſmall radical tubes, and having a ſingle layer of cells. Soland.

Inhabits the Bahama iſlands.

VERTICILLATA. Paraſitical, with flattiſh linear branches, narrower at the baſe, and rows of top-ſhaped ciliated cells diſpoſed in whorls one above another. Soland.

Native of the Mediterranean.

DENTATA. Paraſitical, foliaceous, with ſhining oval cells in a ſingle layer, the mouth ſurrounded by ſharp inflected teeth. Ellis.

On fuci, and inhabits the European ſeas.

BULLATA. Paraſitical, with ovate projecting white cells, the mouths of which are round, and armed with ſmall ſpines. Ellis.

Found in the European ſeas adhering to fuci.

TOMENTOSA. Paraſitical, ſoft, woolly, with inviſible cells. Müll.

Inhabits the North and Baltic ſeas.

DENTICULATA. Paraſitical, with oval diſtinct cells, three-toothed at the oppoſite margins, and the mouth margined. Müll.

Inhabits the North ſeas, on fuci and ſhells.

TUBULOSA. Paraſitical, membranaceous, with ſingle oblong-ovate cells, and tubular erect mouths. Soland.

Deep yellowiſh, ſemi-tranſparent, and adheres to fuci: found in the ſeas of St. Domingo.

HISPIDA. Frondeſcent, ſpongy, the fronds branched and muricated on the upper ſide with very rough belts. Pallas.

About an inch long, of a pale grey colour, and extremely rare. The ſpecies inhabits the Mediterranean ſea.

FRONDICULOSA. Frondeſcent, with obtuſe crowded branches thrice divided, and a ſingle layer of cells. Seba, Pallas, &c.

Native of the Indian ocean.

PAPYRACEA. Cruſtaceous, frondeſcent, with a cuneate many-cleft ſingly lamellate frond; cells oblong-rhombic, and ringent at the top. Pallas.

Yellowiſh and rough on the ſurface. Inhabits the Mediterranean.

HIRTA. Paraſitical, flat, coriaceous, with contracted diſtant cells. *Fluſtra hiſpida*, Fabr. Fn. Groenl.

Fulvous with narrow cells, adhering to fuci, in the Greenland ſeas.

MEMBRANACEA. Paraſitical, membranaceous, with oblong-quadrangular cells pointed at the upper projecting angles. Soland.

Inhabits the Britiſh and North ſeas.

LINEATA. Paraſitical, flat, foliaceous, undivided, with oval cells in tranſverſe rows. Fabr. Fn. Groenl.

Found on fuci in the North ſeas.

The fluſtra arenoſa of Gmelin is excluded, as it cannot be conſidered of this genus; it is an eſchara of Pallas, and millepora of Ellis.

FLUT, in *Geography*, a river of Bohemia, which runs into the Egra, oppoſite to Elabogen.

FLUTA, in *Ichthyology*, a name given by Gaza and ſome authors to the common ſparus, diſtinguiſhed by Artedi by the name of the plain yellow ſparus, with a large annular black ſpot near the tail. See SPARUS *Annularis*.

FLUTA is alſo a name given by Columella to the muræna of Ariſtotle and the ancient authors in general, as well Greek as Roman. It makes only one ſpecies of the muræna, according to Artedi; but being with him a generical name which comprehends all the eel-kind, the ſerpens marinus and the like, among theſe. This, which was anciently called ſimply the muræna, is diſtinguiſhed by that author under the name of the muræna having no pectoral fins; which being peculiar to this ſpecies, evidently and obviouſly diſtinguiſhes it at firſt ſight from all the reſt. See MURÆNA.

FLUTE, an inſtrument of muſic, the ſimpleſt of all thoſe of the wind-kind; played, by blowing it with the mouth; and the tones or notes formed and changed by ſtopping or opening holes diſpoſed for that purpoſe all along it. Thoſe in common uſe are either the *flute abec*, i. e. a beaked or common Engliſh flute, and the traverſe, Helvetian, or German flute, the invention of which is aſcribed by Galileo and Merſenne to the Helvetians; but the antique ſtatue of the piping faun, and a teſſelated pavement of Fortuna Virilis, erected by Sylla at Rome, in which is a repreſentation of a young man playing on a traverſe pipe, with an aperture to receive his breath, ſhew that it is of more ancient original.

The Latins call it *fiſtula*, and ſometimes *tibia*, pipe; from the former of which ſome derive the word flute; though Borel will have it derived from *fluta*, a lamprey, thus called *a fluitando in fluviis*, in regard the flute is long, like the lamprey, and has ſeven holes all along it, like that fiſh. Graſſineau.

The ancient fiſtulæ, or flutes, were made of reeds; afterwards they were of wood; and at length of metal. But how they were blown, whether as our flutes, or hautboys, does not appear.

Monſ. Caſtillon apprehends that they were founded by means of a reed; and that there were two ſorts of them, in one of which the reed was viſible, as in our hautboy, but concealed in the other. (Berlin Mem. 1774. vol. v.) It is plain ſome had holes, which at firſt were but few; but afterwards were increaſed to a greater number; and ſome had none. Some were ſingle pipes, and ſome a combination of ſeveral, particularly Pan's ſyringa, which conſiſted of ſeven reeds, joined together ſideways.

Theſe ſeven reeds had no holes, each giving but one note, in all ſeven diſtinct notes; but at what intervals is not known; perhaps they were the notes of the natural, or diatonic ſcale.

The German flute is different from the common one; it is not put into the mouth, by the end, as the ordinary ones are; the end is ſtopped up with a plug or tampion, but the lower lip is applied to a hole a little way diſtant from it.

It is made equally big every where, and perforated with ſix holes, beſides that of the mouth, and that opened by the key.

The flute was of ſuch importance in antiquity, that among the Dii majorum gentium, ſome of the female divinities laid claim to a ſhare in muſical diſcoveries. Of this number was Minerva, or Pallas, the daughter of Jupiter, who is ſometimes called Muſica, or the muſician, a name ſhe acquired from a ſtatue made by Demetrius, in which, when the ſerpents of the Gorgon were ſtruck, they reſounded like a lute. She is alſo honoured with the invention of chariots, together with having firſt uſed trumpets, and invented the flute. The vouchers for her muſical talents are Pauſanias, Plutarch, and Fulgentius, among the proſe writers; and Pindar, Nonnus, Ovid, Hyginus, Propertius, and Claudian, among the poets. The flute that ſhe invented is ſaid by Ovid to have been made of box, and by Hyginus of bone. Foramina rara, with few holes, it is natural to ſuppoſe.

Indeed the Syrinx, ſee plate IV. N° 6, ſaid to have been invented by Pan, was found inconvenient. It conſiſted of a number of pipes of different lengths, tied together, or faſtened by wax, which were played on, according to Lucretius, by blowing in them one after the other, moving the inſtrument ſideways, for the admiſſion of wind into the ſeveral tubes; and it was by the ſagacity and penetration of Minerva, that it was found practicable to produce the ſame variety of tones with a ſingle pipe, by means of ventiges or holes, which had the effect of lengthening or ſhortening the tube, by a quick alteration of the column of air which was forced through it.

Two other circumſtances are related of Minerva with reſpect to the flute; ſhe is ſaid by Hyginus to have found herſelf laughed at by her mother and ſiſter, Juno and Venus, whenever ſhe played the flute in their preſence: this ſuggeſted to her the thought of examining herſelf in a fountain, which ſerving as a mirror, convinced her that ſhe had been juſtly derided for the diſtortion of her countenance, occaſioned by ſwelling her cheeks in the act of blowing the flute. This is one reaſon given for her throwing aſide that inſtrument, and adopting the lyre. However, a better cauſe, and one more worthy of her wiſdom, is aſſigned for her throwing aſide the flute, upon ſeeing Apollo perform on the lyre; for by having his mouth at liberty, ſhe found that it enabled him to ſing at the ſame time as he played, which afforded an opportunity of joining inſtruction to pleaſure.

The invention of the flute having been given by the poets to Apollo, Mercury, Minerva, and Pan, is a proof of its high antiquity as well as importance. There are nominal flutes repreſented in ſculpture of all forms: curved, ſtraight, ſmall, middle-ſized, ſingle, double, right, left, equal, unequal, &c.; theſe inſtruments were made of all kinds of wood and metal. They had different names aſſigned them, according to the country where they were invented, or were chiefly in uſe: as the curved flute was called Phrygian, or Tyrian, its name in Magna Grecia, or the Pheution of the Egyptians, which was termed Monaulos. The flute had, indeed, ſo many different names in the Claſſics, and is applied to ſo many different purpoſes, that M. le Fevre, who had undertaken their explanation, ended his fruitleſs labours by a copy of Latin verſes in praiſe of Minerva, for throwing the flute into the ſea, and anathematizing thoſe who ſhould take it out. But far from imitating M. le Fevre, and without having the fear of Minerva before our eyes, we ſhall try if we cannot give ſome ſatisfactory explanation of the terms equal and unequal flutes, right and left flutes, Sarrana flutes, Phrygian, Lydian, or Tibiæ pares, Tibiæ impares, Tibiæ ſarranæ, Phrygiæ, Lydiæ, &c., of which mention is often made in comedies performed at Rome; we ſhall give what has been ſaid, which ſeems moſt probable and ingenious on this curious ſubject of antiquity.

In the comedies of Terence the flute-players played on double flutes, or two flutes at the ſame time; that which they held in the right hand was called the *right* flute, and that with the left, for the ſame reaſon, the *left*. The firſt had but few holes, and produced the grave or loweſt ſounds; the left had many holes, and produced the acute or high notes. When the muſician played the two flutes of different ſounds, it was ſaid that the piece was accompanied tibiis imparibus, with unequal flutes; or tibiis dextris et ſiniſtris, with right and left flutes; and when they played on two flutes of equal ſound (or in uniſon) either right or left, as often happened, it was ſaid that the piece was played tibiis paribus dextris, with right-hand equal flutes, producing two ſounds; or tibiis paribus ſiniſtris, equal left-handed flutes, producing acute or high notes.

Donat pretends, that when the ſubject of a piece was grave and ſerious, the right-hand or baſe flutes only were uſed, which were called Lydian; that when the drama was gay and playful, the left-hand or high flutes were uſed, which were called Tyrian or Sarranæ, which having high ſounds were more proper for joy; and finally, when the ſubject was mixed, or as we ſhould ſay, tragi-comedy, unequal flutes were employed, that is to ſay, right and left, which were called Phrygian.

At the Panathenæan games, inſtituted at Athens in honour of Minerva, the patroneſs of that city, premiums were given to players on the flute, an inſtrument then in the higheſt eſtimation throughout all Greece, but in particular requeſt at Athens; perhaps from the legendary account of its invention by Minerva, the protectreſs of that city.

Ariſtotle tells us, (de Laud. Sui.) that the flute, after its firſt invention, was uſed by mean people, and thought an ignoble inſtrument, unworthy of a freeman, till after the invaſion and defeat of the Perſians, when eaſe, affluence, and luxury, ſoon rendered its uſe ſo common, that it was a diſgrace to a perſon of birth not to know how to play upon it. Callias and Critias, celebrated Athenians, Archytas of Tarentum, Philolaus and Epaminondas, were able performers on the flute.

The Thebans in general piqued themſelves much on being great performers on the flute. This is manifeſt from a paſſage in Dion Chryſoſtom. "The pre-eminence," ſays he, "which all Greece unanimouſly allows to the Thebans, in this particular, has been conſtantly regarded by them as a point of great importance, of which I ſhall give an inſtance. After the total ruin of their city, which has never yet been rebuilt, no part of it being now inhabited but the ſmall quarter, called Cadmea, they gave themſelves but little trouble in reſtoring any of the public monuments that had been thrown down or deſtroyed, one ſtatue only of Mercury excepted, which they took great pains to dig out from among the rubbiſh, and to erect again, on account of the following inſcription; Ἑλλας μεν Θηβας νικαν προυκρινεν αυλοις.—"Greece has declared that Thebes wins the prize upon the flute." So that this ſtatue is ſtill ſtanding in the old public ſquare, among the ruins."

Pronomus, a Theban, according to Pauſanias, invented a flute, upon which he could play in three different modes. Before his time, there was a particular flute for every mode or key: and ſo *out of tune* are the generality of modern flutes, it were almoſt to be wiſhed that the cuſtom had ſtill continued. The words and muſic of a hymn, compoſed by Pronomus for the inhabitants of Chalcis, when they went to Delos, were ſubſiſting in the time of Pauſanias, as was likewiſe the ſtatue of this muſician, erected by the citizens of Thebes, near that of Epaminondas.

Pericles, who had invited Antigenides to Athens, and who had undertaken the ſuperintendance of the education of Alcibiades, his nephew, appointed Antigenides for his flute maſter. But Aulus Gellius relates, from the Hiſtory of Muſic, in thirty books by Pamphila, that his ſcholar Alcibiades, ſetting up for a fine gentleman, and taking the utmoſt care of his perſon, was ſoon diſguſted with his inſtrument, as Minerva herſelf had been before; for happening to ſee himſelf in a mirror, while he was playing, he was ſo ſhocked at the diſtortion of his ſweet countenance, that he broke his flute in a tranſport of paſſion, and threw it away, which brought this inſtrument into great diſgrace among the young people of rank at Athens. However, this diſguſt did not extend to the ſound of the flute itſelf, ſince we find by Plutarch, that the great performers upon it continued long after to be much followed and admired.

Horace ſpeaks of bands of female flute players, which he calls "Ambubaiarum Collegia," and of whom there were ſtill colleges in his time. But the followers of this profeſſion became ſo numerous and licentious, that we find their occupation prohibited in the Theodoſian code; however, with little ſucceſs: for Procopius tells us that in the time of Juſtinian, the ſiſter of the empreſs Theodora, who was a Tibicina, appeared on the ſtage without any other dreſs than a ſlight ſcarf thrown looſely over her. And theſe performers were become ſo common in all private entertainments, as well as at public feaſts, obtruding their company, and placing themſelves at the table, frequently unaſked, that, at the latter end of this reign, their profeſſion was regarded as infamous, and utterly aboliſhed.

Dorion is mentioned by Plutarch as a flute player who had made ſeveral changes in the muſic of his time, and who was head of a ſect of performers, opponents to another ſect of practical muſicians, of which Antigenides was the chief; a proof that theſe two maſters were cotemporaries and rivals. Dorion, though much celebrated as a great muſician and poet, by Athenæus, is better known to poſterity as a voluptuary. Both his muſic and poetry are loſt; however, many of his pleaſantries are preſerved. Being at Milo, a city of Egypt, and not able to procure a lodging, he enquired of a prieſt who was ſacrificing in a chapel, to what divinity it was dedicated, who anſwered, to Jupiter and to Neptune. How ſhould I be able, ſays Dorion, to get a lodging in a place where the gods are forced to lie double? Supping one night with Nicocreon, in the iſland of Cyprus, and admiring a rich gold cup that was placed on the ſide-board, the gold-ſmith will make you juſt ſuch another, ſays the prince, whenever you pleaſe; "he'll obey your orders much better than mine, ſir, ſays Dorion; ſo let me have that, and do you beſpeak another." The remark of Athenæus upon this reply is, that Dorion acted againſt the proverb, which ſays, that

> "To flute-players, nature gave brains there is no doubt,
> But alas! 'tis in vain, for they ſoon blow them out."

Upon hearing the deſcription of a tempeſt, in the Nauplius of Timotheus, Dorion ſaid, he had ſeen a better in a boiling cauldron.

Having loſt a large ſhoe at a banquet, which he wore on account of his foot being violently ſwelled by the gout, "the only harm I wiſh the thief, ſaid he, is, that my ſhoe may fit him."

His wit and talents made amends for his gluttony, and he was a welcome gueſt wherever he went. Philip of Macedon, in order to enliven his parties of pleaſure, uſed frequently to invite him with Ariſtonicus the citharœdiſt.

The importance of the flute is manifeſted in innumerable paſſages in ancient authors; among which there is one in Pliny that is diverting and curious. In ſpeaking of comets, he ſays that there were ſome in the ſhape of flutes, which were imagined to forebode ſome ill to muſic and muſicians: (Tibiarum ſpecie, muſicæ arti portendere), and Montfaucon proves by ſeveral inſcriptions from ancient marbles, that the ſacrificial Tibicen at Athens was always choſen, and his name recorded with the officers of ſtate, (Supple. tom. ii. cap. 25.)

After ſpeaking of ſo many flute players of the male ſex, it is but juſtice to ſay that they did not monopolize the whole glory ariſing from the cultivation of that inſtrument; as the performing upon it was ranked, in high antiquity, among female accompliſhments. Its invention was aſcribed by the poets to a goddeſs; it was the ſymbol of one of the Muſes; and it was never omitted in the repreſentation of the Sirens. However, the ſame reaſon which provoked Minerva to throw it aſide, has luckily inclined modern ladies to cultivate inſtruments, in performing upon which, their natural charms, inſtead of being diminiſhed, are but rendered ſtill more irreſiſtible.

The moſt celebrated female flute-player in antiquity was Lamia; her beauty, wit, and abilities in her profeſſion, made her regarded as a prodigy. The honours ſhe received, which are recorded by ſeveral authors, particularly by Plutarch and Athenæus, are ſufficient teſtimonies of her great power over the paſſions of her hearers. Her claim to admiration from her perſonal allurements does not entirely depend, at preſent, upon the fidelity of hiſtorians; ſince an exquiſite engraving of her head, upon an amethyſt, with the veil and bandage of her profeſſion, is preſerved in the king of France's collection, which, in ſome meaſure, authenticates the accounts of her beauty.

As ſhe was a great traveller, her reputation ſoon became very extenſive. Her firſt journey from Athens, the place of her birth, was into Egypt, whither ſhe was drawn by the fame of the flute-players of that country. Her perſon and performance were not long unnoticed at the court of Alexandria; however, in the conflict between Ptolemy Soter, and Demetrius, for the iſland of Cyprus, about 312 years B. C. Ptolemy being defeated in a ſea engagement, his wives, domeſtics, and military ſtores fell into the hands of Demetrius.

Plutarch, in his life of this prince, tells us, that "the celebrated Lamia was among the female captives taken in this victory. She had been univerſally admired, at firſt, on account of her talents, for ſhe was a wonderful performer on the flute; but afterwards her fortune became more ſplendid by the charms of her perſon, which procured her many admirers of great rank." The prince, whoſe captive ſhe became, and who, though a ſucceſsful warrior, was ſaid to have vanquiſhed as many hearts as cities, conceived ſo violent a paſſion for Lamia, that, from a ſovereign and a conqueror, he was inſtantly transformed into a ſlave; though her beauty was now on the decline, and Demetrius, the handſomeſt prince of his time, was much younger than herſelf.

At her inſtigation, he conferred ſuch extraordinary benefits upon the Athenians, that they rendered him divine honours; and as an acknowledgment of the influence which ſhe had exerciſed in their favour, they dedicated a temple to her, under the name of "Venus Lamia."

The flutes of the ancients alone have furniſhed Bartholinus with materials for a very learned and inſtructive work (De Tibiis Veterum), in which he has collected all the claſſic deſcriptions of the different inſtruments included in the claſs of flutes, and pointed out all the alluſions to them in Greek and Roman authors, furniſhing ſubſequent modern writers with a body of information on the ſubject, which has enabled them to appear very learned with very little trouble. So many different kinds of ancient wind inſtruments under the denomination of flutes are repreſented in ſculpture, ſome plain without holes, ſome with two, ſome with three, and ſome with five holes, others with plugs, ſtopples, or, as Merſennus calls them, *tetines* (nipples) at the ſides, ſome double, and ſome ſo large, that they muſt have been an octave below the others. Horace ſpeaks of flutes with few holes, as well as lyres with few ſtrings:

> "Tibia non ut nunc orichales vincta tubæque
> Æmula, ſed tenuis, ſimplexque foramine pauco."

Ovid has the ſame remark:

> "Prima terebrato per rara foramina buxo,
> Ut daret effici, tibia longa ſonos."

Sidonius gives the flute ſeven holes; but Avienus gives it a thouſand.

> "Foraminibus tibia mille ſonat."

The learned are very diſcordant in their opinions and explanations of the flutes uſed in the comedies of Terence, nor does any one diſcover the leaſt knowledge of modern practical muſic, ſufficient to lead them to intelligible diſcoveries on the ſubject. Bianchini "De tribus generibus inſtrumentorum muſicæ veterum organicæ," and Bonanni, in his "Gabinetto Armonico," have copied the antique repreſentations of ancient muſical inſtruments, but we have long ſeen that there is no dependance to be placed on their fidelity. Sometimes ignorance, and ſometimes pictureſque convenience, have occaſioned blunders and deviations from truth in the original ſculptors. In the ſupplement to the folio edit. of the Fr. Encyclopédie, it is ſuppoſed that all the ancient flutes had reeds; but of two kinds: one viſible and the other inviſible, like thoſe in childrens' trumpets; the oblique flute, or flauto traverſiere, commonly called the German flute, was unknown to the ancients. According to the author of this article, the ancients had no real flute à bec, or traverſiere; but all were played with reeds, like the modern hautbois. The plugs, or ſtopples at the ſides of ancient flutes, which ſerved inſtead of keys, are imagined to have been uſed occaſionally to ſtop certain holes which, in changing the mode, would not be wanted.

In this long article concerning flutes, or rather the hautbois, not a word is ſaid of double flutes. Our belief however is, that the tibiæ pares were two tubes in uniſon with each other; and that the tibiæ impares were tuned all'ottava. We can conceive no other harmonical uſe that could be made of them, as it is now generally believed that the ancients had never cultivated counterpoint, or figurative harmony. But ſomething muſt ſtill be ſaid in this article, long as it is already, concerning modern flutes.

The common flute, or flute à bec, from the upper end, or mouth-piece, reſembling the beak of a bird, at the beginning of the laſt century, till the works of Corelli came over, was in far more general uſe as a concert inſtrument than the violin. Sonatas for two flutes, and a thorough baſe, violone or theorbo, were innumerable; with ſolos, duets, and concertos for the ſame inſtrument; nor was there a ballad then printed which was not tranſpoſed for the flute at the bottom of the page; as in the middle of the ſame century, almoſt every ſong and tune was ſet for the guitar. The concert flutes for which this muſic was compoſed were generally F and C. There is an imitative ſtop in the organ, called the flute, compoſed of open wooden pipes in uniſon with the principal; but much more ſoft and tender. This ſtop is always in the choir organ. The flute is ſhewn by Mr. Maxwell, in his "Eſſay on Tune," p. 17. to belong to the claſs of imperfect inſtruments, ſee PERFECT *inſtruments*.

FLUTE *Traverſiere*, Fr. *Flauto traverſiere*, Ital. horizontal.

FLUTE *Allemande*, or *German flute*, a wind inſtrument of wood or ivory, conſiſting of four pieces, or joints, inſerted one in the other. In the Fr. Encyclopédie ſo minute a deſcription is given of the ſeveral parts of this inſtrument, its joints, holes, or perforations, keys, tampion, or bung at the top of the mouth-piece, that an ingenious turner who never ſaw a German flute would find little difficulty in making one; but we ſhall ſay no more on the mechaniſm of the inſtrument, but confine our inſtructions to its uſe.

To become a good performer on this inſtrument, the ſtudent muſt begin by acquiring a good emboucheure, or by procuring a clear, full, and ſweet tone; a taſk far more difficult than is generally imagined. Every one can produce a tone on a common flute, but few are able, without teaching, to make the German flute ſpeak. The inſtrument being blown at the ſide, whence it has its name of traverſiere, muſt be held parallel to the ſhape of the mouth, that the ſtream of air iſſuing from the breath of the performer may enter in part at the ſingle orifice in the upper piece. Whoever can whiſtle in the pipe of a key, will ſoon produce a tone in the German flute, which will be harſh at firſt, but muſt be ſmoothed and refined by degrees, never forgetting in every day's practice to make that a principal conſideration. Whether ſitting or ſtanding, the performer muſt be erect in his carriage, the head rather above than below its uſual poſition, and a little inclining to the left ſhoulder; the hands high, without raiſing the elbows or the ſhoulders; the left hand bent out, and the ſame arm near the body. If the player is ſtanding, the attitude ſhould be firm, the left foot advanced, the body reſting on the right hip, and the whole perſon free from conſtraint. The greateſt care ſhould be taken not to move the head or body, as many do, in order to mark the time. The attitude ſhould have no ſingularities, nothing aukward or affected to attract the attention, or prejudice the audience againſt the performer. With regard to the poſition of the hands, the left is to be at the top of the flute, which is held between the thumb of that hand, and the fore finger, which ought to ſtop the upper hole, marked 1 in the figure, the ſecond hole with the middle finger, and the third by the ring finger. The right hand is to hold the lower part of the inſtrument; the thumb of this hand, which muſt be a little bent inwards, ſupports the flute below, and the three fingers of this hand, the fore finger, the middle finger, and ring finger, ſtop the holes marked 4, 5, 6; the little finger ſerves to preſs down the key at the tail piece, or loweſt joint, which key opens a hole out of the reach of the fingers. The flute muſt be held horizontally. No inſtructions for the lips in blowing the flute can ſuit the form of all mouths; but when the ſtudent can make the inſtrument ſpeak eaſily and freely, he muſt turn it in and out, by ſmall degrees, till he gets the beſt tone poſſible; and then, beginning with the cheſt well filled with wind, as ſoft as poſſible to ſwell by minute degrees any note to its utmoſt power, and then to diminiſh it by the ſame degrees to a thread. We ſhall give among the plates a complete ſcale of every ſound that can be produced on the inſtrument. Having worked upon one and the ſame note till a full and clear tone can be produced on a ſhort notice, begin on the loweſt ſound D, to ſwell and diminiſh each note in the ſame manner as the firſt, and let alone rapid paſſages and execution, till certain of the tone of the inſtrument: as fingers are obliged to *ſolfeggiar*, going no further than a hexachord for a long time; ſwelling each note to the utmoſt power of the breath and lungs, aſcending and deſcending, to acquire ſteadineſs in ſuſtaining a note perfectly in tune, and free from all tremulous uncertainty during the moſt crude and violent accompaniment. See *Muſical Plate.*

The tablature contains ſeven ranges of black and white indications of the ſeven holes that are to be occaſionally ſtopped and opened on the flute. The black repreſent the fingers, and the white or open circles the holes unſtopped. The compaſs of the German flute at preſent extends to three octaves, from the loweſt D in the treble, to the octave above what uſed to be the higheſt D. [A C ※ or D ♭ below the D natural, has lately been acquired by blowing very ſoftly and turning the inſtrument inward.] It is to be obſerved that the higher the notes on this inſtrument are, the wind muſt be encreaſed, and the orifice of the lips ſomewhat more cloſed. Moſt of the notes are broken into octaves by a little additional force in blowing. The B, C, D, of the third octave cannot be produced upon all flutes; with middle pieces which lower the tone of the whole inſtrument, they are eaſier to be produced; the lower the better. There are ſometimes ſeven middle pieces in uſe for flattening the pitch. Theſe amount to about a tone; ſo that by their aſſiſtance a flute may accommodate itſelf to any pitch. Not only all the ſemitones are given in the general ſcale on the firſt plate, but the ſhakes on a ſecond plate, which are indicated by the black and white ciphers. The finger over the white open cipher is to be ſhook; tones, ſemitones, ſhakes, beats, coup de langue, accents, ſlurs, &c. muſt be practiſed ſeparately.

Flute *ſtop on an Organ*, is a range of pipes, conſtructed to imitate the notes of the common flute or flageolet: it is ſofter than the principal in its tone: its pitch is an octave above the notes of the diapaſons, or in uniſon with the principal ſtop.

Flute, or *Fluyt*, is alſo a kind of long veſſel, with flat ribs, or floor timbers, round behind, and ſwelled in the middle; ſerving chiefly for the carrying of proviſions in fleets, or ſquadrons of ſhips: though it is often uſed in merchandize.

The word flute, taken for a ſort of boat, or veſſel, is derived, according to Borel, from the ancient *flotte*, a little boat. In the verbal proceſs of the miracles of St. Catherine of Sweden, in the 12th century, we read, "Unus equum ſuum una cum mercibus magni ponderis introduxit ſuper inſtrumentum de lignis fabricatum, vulgariter dictum fluta." Upon which the Bollandiſts obſerve, that in ſome copies it is read *flotta*, an inſtrument called by the Latins *ratis*; and that the word *flutta*, or *flotta*, aroſe from *flotten* or *vlotten*, to float.

Flute, in *weaving tapeſtry*. See Tapestry.

Flutes, or *Flutings*, are longitudinal concavities depreſſed in the ſurface of a piece of architecture, generally of a circular or elliptic ſection, meeting each other in lines, or ſeparated with a part of the ſurface from which the excavation is made left ſtanding between. The ſurface ſeparating every two flutes is called a fillet: if the flutes are parallel or diminiſh according to any law, the fillets are alſo made parallel or to diminiſh in the ſame law.

And if the flutes run in a ſtraight line, or in a curve at right angles to the ſection, the fillets follow the ſame direction. When fillets ſeparate the flutes from each other, each fillet is in breadth from one-third to one-fifth of the breadth of the flute. That ſpecies of fluting where the flutes meet each other without the intervention of fillets, is generally applied to the ſhaft of the Doric order, and the other with fillets to the ſhafts of Ionic and Corinthian. Flutes frequently terminate ſemicircularly on the face or with ſpheric heads, and ſometimes their terminations are planes at right angles to their longitudinal direction. The Greeks never applied fluting to any member of the Doric order, except to the ſhaft, which was almoſt a univerſal practice, there only being two known examples to the contrary, nor even to the Ionic. The Romans frequently overcharged all the plain and cylindric members. For a more particular deſcription of fluting, ſee Doric and Ionic *Orders*.

Flutes, or *Flutings*, are alſo uſed, in *Botany*, to denote the ſtems and fruits of certain plants, which have furrows analogous to thoſe of theſe columns.

FLUTTER, in *Muſic*, is a term applied by Dr. Robert Smith (Harmonics, p. 97.) to the fluttering roughneſs in the ſound of two notes which are diſcords to each other: a phenomenon very diſtinct from the *beats* of imperfect conſonances; the latter beating, becauſe the ſucceſſion of their ſhort cycles are periodically confuſed and interrupted, whereas diſcords have this characteriſtic fluttering, when their ratios are quite perfect, and when concords, under the ſame circumſtances, ceaſe to have any beats, but produce a perfect conſonance, or uniformity of ſound. See Concord.

FLUVANNA, in *Geography*, a county of Virginia, bounded N. by Albemarle, N. E. by Louiſa, E. by Goochland, W. by Amherſt, and S. by Fluvanna or James river, which divides it from Buckingham. It is about 22 miles long and 20 broad, and contains 2703 free inhabitants, and 1920 ſlaves. There is great plenty of marble, both white and variegated with blue, red, and purple veins found in this county, on James river at the mouth of Rockfiſh; where it forms a large precipice overhanging a navigable part of the river.

FLUVIALIS, in *Botany*, Vaill. Mem. de l'Acad. des Sciences for 1719. See Najas.

FLUVIANA, in *Geography*, a river of Spain, in Catalonia, which runs into the Mediterranean, in the gulf of Roſes. N. lat. 42° 10'. E. long. 2° 56'.

FLUVIATILES Cochleæ, freſh-water ſhell-fiſh, a term uſed by naturaliſts to expreſs thoſe kinds of ſhell-fiſh which never inhabit the ſea, but are found in our ponds, rivers, and ditches. Theſe, though much leſs numerous than the ſpecies of ſea ſhells, are yet of a greater variety and beauty than is uſually ſuppoſed. See Conchology.

FLUX, in *Enamel*, is that glaſſy body that forms the baſis of all enamels, whether tranſparent, ſemi-tranſparent, or opaque. Now as the painting on enamel is performed with vitreous colours, which to ſpeak truly can be nothing more or leſs than coloured enamels, it muſt be evident that flux likewiſe forms a principal part in the compoſition of enamel colours.

Flux, *Enameller's*, is a ſort of enamel principally uſed for the upper ſurfaces of plates intended for enamel painting. It differs from the common enamels, in being of a more mellow and rich quality, whilſt its properties facilitate the fuſion of thoſe colours which are employed in painting on it. The beſt kinds having been generally brought from Venice, have acquired the name of *Venetian* flux, and are commonly imported in the form of ſmall beads, hence called *bead*-flux, or ſhort pipes about three-eighths of an inch in diameter, and from three quarters of an inch to an inch in length: the latter is called *pipe*-flux. The fluxed plates, when prepared as deſcribed under Enamelling, have a rich yellow hue, or cream colour; by which they are rendered of particular utility in paintings where much of the naked figure is expoſed. The flux muſt always be laid upon *hard* enamel; as the properties of glaſs enamel are inimical to effective coheſion, the flux cracking in circles, or flying off in pieces as the plates cool.

In order to give a clear idea of the nature of fluxes, it will not be improper previouſly to inquire more particularly into the nature of the ingredients, their operations on each other in a ſtate of compoſition, as well as the power which each exerts in producing a proper effect; ſince by this means ſuch an initiative knowledge may be obtained, as will enable perſons unacquainted with the art to conduct their experiments with more certainty, than they poſſibly could by any particular recipes, however good they might be.

There are two kinds of ſubſtances which enter into the compoſition of enamel fluxes; the one, the proper matter of the flux, being principally ſuch bodies as are by their nature endued with a ſtrong propenſity to run into the vitreous fuſion, and be converted into glaſs, at the ſame time that they aſſimilate and change other bodies in combination with them into their own vitreous nature. This kind conſiſts principally of ſalts, lead, and arſenic. The other kind conſiſts of the correctives of theſe proper fluxings, which without their admixture would be found to have qualities that would deprave them for enamels or the fluxes for paintings. For all kinds of ſalts, when vitrified by themſelves, or with a ſmall proportion of other bodies, are ſtill liable to be diſſolved by aqueous moiſture; and flux, made of ſuch ingredients only, would be corroded even by the common air, and turn black and dull on its ſurface; hence it becomes neceſſary to add ſome other bodies as correctives to prevent theſe bad tendencies, and render the flux more durable. Lead and arſenic, when formed into glaſs, of which they compoſe the principal ingredients, are particularly liable to be thus corroded; to prevent which, when uſing theſe ſubſtances, it is neceſſary to add conſiderable proportions of the corrective matter. The truth of theſe remarks may be readily aſcertained by the appearance of the enamel door-plates about this town, in many of which the lead, having been uſed in too great a proportion as a flux for the black colour, has been ſo far corroded as to have admitted the air to come in contact with the colouring matter, in which caſe the whole writing is almoſt obliterated.

The moſt common of theſe corrective bodies of the proper matter of the flux, and which therefore make the ſecond kind of ſubſtances of which enamel fluxes are compoſed, are calcined flints, and Lynn ſand, or what is generally known by the name of ſilver ſand, which being perfectly white, and reſiſting when vitrified the corroſive and decompoſing action of all menſtrua, give body and hardneſs to the fluxes, without any other diſadvantage than that of diminiſhing, in a certain degree, their inclination to vitrify, and on that account rendering them ſomewhat weaker as fluxes than they would be if uſed alone.

The moſt active kind of ſalt as a general flux is borax, which poſſeſſes the greateſt power of any ſimple body hitherto known. Lead, which is the next, vitrifies with a very ſlight heat, and at the ſame time aſſimilates other bodies to its own nature, ſuch as earths, ſtones, the oxyds of metals, &c. Arſenic is likewiſe a powerful fluxing ſubſtance; but whenever this is uſed it ſhould be with bodies that have been previouſly vitrified and ground tolerably fine, otherwiſe it is apt to ſublime and fly off from the compoſition with which it is mixed, and which of courſe muſt render any recipe, where a certain proportion of this is to be uſed, very liable to error without ſuch precautions. Several kinds of ſalts poſſeſs the next degree of fluxing power, the principal of which is ſea ſalt; but it muſt be evident from what has been mentioned, that they are not ſufficiently ſtrong to form an enamel flux by themſelves, yet as they are perfectly colourleſs when vitrified, which is not the caſe with lead, they will be found very uſeful in compoſition with lead, or when uſed in place of that ſubſtance, aſſiſted by borax, eſpecially where any tinge of yellow would be detrimental to the colouring matter that is to be uſed with the flux.

Having endeavoured to give the reader an idea of the nature of the ſubſtances that are uſed in the formation of fluxes, we ſhall next endeavour to explain the method of compounding them before they are fuſed, and alſo ſome obſervations upon that part of the proceſs.

When the materials are procured, taking care that they are of the beſt quality, each ſhould be ſeparately levigated either in an agate mortar, or one made of the ſame kind of glaſs as the common wine bottles are made of: the peſtle in either caſe ſhould be of flint or agate. The proportions of each ſubſtance, having firſt been thoroughly mixed, the whole muſt be put into crucibles of a proper ſize, and placed in an air furnace, or what is more commonly called a wind hole, where the heat ſhould be increaſed till the matter is perfectly vitrified, which may be known by its becoming clear and tranſparent. The heat muſt be ſufficiently powerful, yet not too violent, for though a great heat may accelerate the vitrification, yet it at all times hardens the compoſition, and greatly reduces the fluxing power. The ſimple method of dipping the end of a tobacco pipe in the flux while in a ſtate of fuſion, and examining the ſmall quantity that adheres to it, will enable a perſon to form an accurate judgment of the whole; for if it appears clear and tranſparent it may be concluded that the vitrification is complete, but if any cloudy parts appear incloſing opaque ſpecks, it is evident that a longer continuation of heat is neceſſary. When the quantity is ſmall it becomes very difficult to get the whole out of the pot; the beſt method perhaps is to hold the edge of the pot with a convenient pair of tongs, and at the ſame time ſcrape the matter out with a ſmall piece of iron, the edge of which ſhould be previouſly made to fit the bottom of the crucible. Whoever would have flux in the greateſt degree of purity, muſt previouſly prepare the glaſs of lead to be ready at all times for uſe, for although lead might be mixed with the other ingredients for common purpoſes, yet it will be better in all caſes to prepare it previouſly by the following means.

Take of the beſt minium, or, as it is commonly called, red lead, four pounds; of Lynn ſand, or calcined flints, two pounds and a quarter: theſe two ſubſtances ſhould be thoroughly mixed, and be put into a very ſound crucible. One that has had flux or a little flint glaſs melted in it before would be preferable, for when a new pot is uſed, the lead is very liable to ſtrain through the pores, and thus occaſion an uncertain reſult, although the quantities ſhould have been ever ſo nicely adjuſted. This is to be vitrified in the ſame manner as directed for flux, and when perfect will be of a beautiful topaz or tranſparent gold colour. When the matter is cold, it ſhould be ground in the mortar before deſcribed, and then kept perfectly free from duſt.

In moſt large concerns in the glaſs buſineſs ſand is greatly preferable to flints, as the trouble of calcining and grinding the latter, where large quantities are wanted, is a ſerious objection to their uſe. But in the caſe of flux, where quality is of more conſequence than quantity, flints are certainly preferable.

The method of preparing the flints for uſe, is to place them in a clear fire, in which they ſhould continue two or three hours; the fire ſhould be then increaſed till they attain a white heat, at which time they ſhould be taken very quickly from the fire and plunged into cold water, which will cauſe them to crack and flaw in innumerable parts; they muſt then be broken into pieces, and if they are of an uniform whiteneſs throughout, they may be conſidered as fit for grinding; but if any black and diſcoloured places appear, they muſt be again ſubmitted to the fire, and the immerſion in water repeated; the calcination being then completed, they muſt be broken as ſmall as poſſible with a ſteel-faced hammer, and ground very fine in the glaſs or agate mortar.

A very important advantage attending this preparation of the glaſs of lead, is the eaſe with which a very perfect vitrification of the ſand or flints is effected without the aid of intenſe heat; at the ſame time the mixture is rendered more capable of aſſimilating with a larger proportion of ſalts, which will in all caſes add greatly to the ſoftneſs of the flux.

Very little hope is entertained that any more of the Venetian hard enamel or flux for grounds will be imported into this country, as we are aſſured that Bertolini, the celebrated maker of thoſe ſubſtances, periſhed in the hands of the French at Naples, on account of his political opinions. We feel much pleaſure in being able to ſtate, however, that Mr. Griffiths of Broad Court, Long Acre, London, after many years ſpent in making enamel colours, has ſucceeded in making flux for grounds equal to any of the Venetian, which he has conſtantly for ſale. He has likewiſe, within the laſt three years, brought to perfection a beautiful white, hard enamel, which is ſo nearly equal to the Venetian, that the one might be miſtaken for the other, the colour and fracture being ſo much alike.

The firſt recipe for the formation of a flux, and which we ſhall call N° 1, is the white glaſs enamel, which, containing a large proportion of arſenic in a ſemi-vitrified ſtate, requires to be broken into ſmall pieces, and fuſed till the matter becomes quite clear and tranſparent; the arſenic will by this means be completely vitrified, and convert the glaſs into a ſoft and uſeful flux, fit to be mixed with moſt of the earths that may be uſed as colours, and likewiſe with the oxyds of all the metals, gold and ſilver excepted; for it muſt be remembered, that lead and arſenic are both apt to injure the beauty of the colours that are produced by gold and ſilver: therefore, whenever theſe are uſed, it muſt be with a flux that is compoſed without either of theſe ingredients; or if they do enter the compoſition, it muſt be in very ſmall proportions.

Compoſition of a ſofter flux for common purpoſes, where the glaſs may be found too hard, N° 2.—Take of the glaſs of lead one pound; of pearl aſhes, five ounces; of borax, five ounces; and of arſenic, half an ounce. This flux is ſuited, by its ſoftneſs, to be mixed with colours that are to be uſed in glazing over others, where a harder flux has been uſed, and in moſt caſes, where burning the colours with a ſlight heat is advantageous.

Compoſition of a flux perfectly pellucid and very ſoft, N° 3.—Take of common flint glaſs, powdered very fine, ſeven ounces; of borax, one ounce and a half; of pearl aſhes, two ounces; and of ſea-ſalt, one ounce. This flux, by its ſoftneſs and clearneſs, will be found very uſeful for the oxyds of gold and ſilver; likewiſe in all caſes where a tinge in the flux might be detrimental to the colouring ſubſtance that is to be uſed.

Theſe fluxes, in the proportion here given, have been found to anſwer the purpoſes for which they are intended extremely well; but as the ingredients ſometimes vary in their quality, it is evident that much muſt at all times be left for the ingenuity of the operator to ſupply. Indeed, when the difficulties that every perſon muſt meet with in attempts of this nature, without a previous knowledge of chemiſtry, are conſidered, we cannot do better than adviſe a ſtudy of that ſcience as an introduction to the art of enamelling and enamel painting, by which means a complete theory of the various ſubſtances may be obtained, which, in the courſe of practice, may lead to uſeful diſcoveries; or, to ſay the leaſt, will many times prevent uſeleſs experiments being made.

We muſt not omit noticing in this place, that dial-plate enamellers found great inconvenience in the loſs of the Venetian white hard enamel, as that ſubſtance was principally uſed for the bottoms or backs of dial-plates manufactured of the Engliſh glaſs enamel; for the expanſion of theſe two ſubſtances ſo exactly ſuited each other, that it was very rare that any of them cracked in the fire. This, however, was not the caſe with all the kinds that were brought from Venice, and particularly a blue ſort, ſtamped on the cakes with the figure of a monkey, and commonly called monkey-enamel. This ſort was very apt to crack the plates in circles, after they had been made a few weeks, unleſs it was uſed in compoſition with other ſubſtances, whoſe fluxes, being ſofter, contributed to counteract this diſagreeable property.

Theſe obſervations tend to confirm what we have before ſtated reſpecting the neceſſity of laying flux for grounds on hard enamel, becauſe the Engliſh glaſs enamel, being much harder from the nature of its compoſition, does not run into fuſion with the ſame heat as the flux; conſequently a perfect adheſion cannot take place between theſe two ſubſtances. For a further account of the proportions of flux uſed in enamel colours, ſee Painting *on Enamel*. Handmaid to the Arts, vol. i. and ii.

Flux, in *Hydrography*, a regular, periodical motion of the ſea, happening twice in twenty-four hours; wherein the water is raiſed, and driven violently againſt the ſhores.

The flux, or flow, is one of the motions of the tide, (ſee Tide): the other, whereby the water ſinks and retires, is called the reflux, or ebb.

There is alſo a kind of reſt, or ceſſation of about half an hour, between the flux and reflux; during which time the water is at its greateſt height, called *high-water*.

The flux is made by the motion of the water of the ſea, from the equator towards the poles; which, in its progreſs, ſtriking againſt the coaſts in its way, and meeting with oppoſition from them, ſwells, and where it can find paſſage, as in flats, rivers, &c. riſes up, and runs into the land.

This motion follows, in ſome meaſure, the courſe of the moon; as it loſes or comes later every day by about three quarters of an hour; or, more preciſely, by forty-eight minutes: and by ſo much is the motion of the moon ſlower than that of the ſun. It is always higheſt and greateſt in full moons, particularly thoſe of the equinoxes. In ſome parts, as at mount St. Michael, it riſes eighty or ninety feet, though in the open ſea it never riſes above a foot or two; and in ſome places, as about the Morea, there is no flux at all. It runs up ſome rivers above a hundred and twenty miles. Up the river Thames it only goes eighty, *viz.* near to Kingſton in Surry.

Above London-bridge, the water flows four hours, and ebbs eight; and below the bridge, flows five hours, and ebbs ſeven. See Tides.

Flux, in *Medicine*, often called alſo *bloody flux*, the popular appellation of *Dyſentery*, which ſee.

Flux, in *Metallurgy*. All thoſe ſubſtances which have been employed to facilitate the ſeparation of metals from their ores, or to give greater fluidity in the fuſing or ſoldering of metals, have by manufacturers been denominated fluxes.

Fluxes employed in ſeparating metals from their ores have the effect of rendering the ſubſtances with which the metal is combined, capable of fuſion. The whole is, by this addition of the flux, rendered fluid; the metal, being the heavieſt fluid, ſinks to the bottom; while the fluid maſs, ariſing from the earthy matters of the ore, combined with the flux, floats on the ſurface: the latter, on cooling, puts on a vitreous appearance, and is, by manufacturers, called *ſcoria*. Hence it will appear, that the flux employed muſt be ſuch a ſubſtance as may be beſt calculated to render thoſe ſubſtances more fuſible with which the metal is combined.

If the ore abounds with ſilex, potaſh or ſoda is beſt calculated to ſeparate it from the metal. Tartar, which conſiſts of the tartaric acid united with the potaſh, and frequently abounds with much vegetable matter, is employed to great advantage in the ſmall way. The hydrogen and carbon preſent, take the oxygen from the metal; while the potaſh combines with the ſilex, forming a fluid vitreous maſs, more or leſs coloured by the oxyd of the metal.

The ſubſtances known by the names of black flux and white flux are generally uſed in the ſmaller experiments. The former is made by detonating one part of nitre with three of tartar, ſo that it contains at leaſt an exceſs of carbonaceous matter, which is fitted for the reduction of the metallic oxyd, while the potaſh, derived from the nitre and tartar, combines with the earthy products.

That called white flux, is formed by detonating equal parts of nitre and tartar, by projecting the mixture, by a ſmall quantity at a time, into a red-hot crucible. In theſe proportions the whole of the carbonaceous matter of the tartar is deſtroyed by the oxygen of the nitre, and nothing more is obtained than a ſub-carbonat of potaſh.

It will appear evident to every chemiſt, that common tartar, or for nice experiments, that ſuper-tartaret of potaſh, will anſwer all the purpoſe of the black flux, and the ſub-carbonat of potaſh be equally well taken for the latter. Some have recommended the nitre and tartar to be uſed together; but this will always be improper where the oxydation of a ſubſtance is intended. Nitre poſſeſſes a power ſo much the contrary, that it is capable of oxydating gold.

In the large way, on account of cheapneſs, lime is employed to ſeparate the ſilex. Barytes, if it could be found more plentifully, might be uſed to more advantage for ſeparating ſilex, particularly from iron ore.

Lime is found to be the beſt flux for ſmelting the aluminous iron ores, from the great fuſibility of due proportions of thoſe two earths. Should the ore abound with ſilex, its reduction is found more difficult. It might be an advantage, where ores of this kind occur, to uſe ſome cheap compound of barytes, ſuch as the ſulphat of that earth.

From what has been obſerved, it will appear that it is of the greateſt importance to be acquainted with the nature of the earthy matter in the different ores. Whether the ore contain alumine, lime, or both theſe ſubſtances, ſuch a quantity of one of them ſhould be added, as will make the moſt fuſible compound of the two. If the alumine be in exceſs, lime muſt be added, but if the ore be calcareous, which is ſometimes the caſe, it is found neceſſary to add clay. In the ſmelting of iron ores, however, the fuſibility of the earths is much increaſed by the oxyd of iron, which always, more or leſs, colours the ſcoria. The oxyd of iron is found to exert a much ſtronger affinity upon ſilex than upon any of the other earths, and hence thoſe iron ores abounding with ſilex, when ſmelted, afford more coloured ſcoria, and in conſequence are leſs productive.

In the ſmelting of copper ores, which contain ſilex, it is common to add ſome ſubſtance which contains oxyd of iron; pyrites is generally uſed to afford this ſubſtance. But many copper ores contain iron, and need not the addition of this ſubſtance as a flux. The oxyd of iron combines with the ſilex, forming a dark coloured fuſible compound, which floats on the ſurface, leaving the copper free from both thoſe ſubſtances.

Moſt of the fluxes uſed in fuſing or ſoldering thoſe metals liable to oxydate by the preſence of the oxygen of the atmoſphere are ſuch, as by fuſing, when the metal would begin to oxydate, envelope the metallic ſurface, and prevent the combination of the oxygen. Of this claſs are many ſaline bodies, ſuch as borax, pot-aſh, ſoda, tartar, muriat of ſoda, &c. In ſhort it ſhould be ſuch a ſubſtance as may fuſe before the body becomes very hot. It ſhould have no action upon the metal itſelf, and it ſhould poſſeſs ſo much fixity as not to be volatilized by the heat required for the fuſion of the metal. If the flux be at all liable to fly off, a freſh quantity ſhould be frequently added.

Another ſpecies of fluxes act by reducing the oxyd as faſt as it may be formed. The fuſible metals are generally treated with thoſe inflammable bodies, which combine with oxygen, with great facility, and at the ſame time involve the metallic ſurface. Roſin and fatty ſubſtances are moſtly employed for lead, tin, antimony, and biſmuth, or their alloys. Zinc requires to be treated in a cloſe veſſel with charcoal powder, or pounded pit-coal.

The vitreous and ſaline fluxes which act by preventing oxydation, are employed for caſt iron, copper, braſs, &c.

Pounded glaſs, or a mixture of lime and clay, may be employed for caſt iron; pot-aſh or tartar for copper and braſs.

The ſcoria of blaſt furnaces is generally uſed in the fuſion of ſteel which is to be caſt into ingots. If too much of theſe fluxes be uſed, the firmneſs of the crucible will be endangered. Muriat of ammonia has a very peculiar property of freeing the ſurfaces of metals from oxygen. This has been explained, by ſuppoſing that the ammonia is decompoſed; the hydrogen of which combines with the oxygen. This does not, however, clearly explain the fact, for the muriat of ammonia is not decompoſed by this proceſs, and much leſs by the ammonia. It is well known to thoſe who manufacture this muriat, that if any metallic oxyd be preſent when this ſalt is ſublimed, the oxyd riſes with it, forming a triple ſalt. Indeed the ſubſtance, known in medicine by the name of *floria martialis*, is formed in this way, and is a triple muriat of iron and ammonia.

The great utility of this ſalt in the ſoldering of metals, therefore, conſiſts in carrying off the oxyd from the ſurface, at the time it ſublimes.

Roſin and fat ſubſtances uſed in ſolderings give great fluidity and brightneſs to the ſolder, and clear the ſurfaces to be united, by their carbon and hydrogen taking the oxygen which may be preſent.

The flux employed for ſoldering iron, braſs, and copper, are generally borax, (ſub-borat of ſoda.) After the ſolder and the ſurfaces are once made clean, this borax acts, by preventing oxydation, till the ſolder fuſes, and unites the two ſurfaces.

That this is the true explanation of the action of a flux, in ſoldering, we have abundant proof, in ſoldering one noble metal with another. When fine gold is employed for ſoldering platina, the gold is obſerved at the time of fuſion to aſſume a degree of fluidity far ſuperior to any ſolder made of oxydable metals, although the latter be aſſiſted with the beſt flux.

In the fuſion of thoſe metals liable to oxydate, whether the fuſion may be for the purpoſe of ſoldering or caſting, certain fluxes are found to be indiſpenſable. The fluidity is ſo much improved, that in the latter proceſs, without a flux, the ſolder would not be able to run between the ſurfaces to be united, independent of its action in preventing the oxydation of the ſurfaces. In the caſting of metals, the fluidity would ſometimes be ſo imperfect, without the preſence of the flux, that impreſſions taken from the mould would be exceedingly defective, and ſmall articles, ſuch as needles and fiſh hooks, could not be caſt at all.

We ſhall conclude this article by giving a ſhort explanation of the cauſe of increaſe of fluidity by the agency of fluxes.

Although an idea is entertained by chemiſts, that there is no medium between that pulverulent ſtate called the oxydated and the metallic ſtates, it will be found that the oxydable metals combine with oxygen when expoſed to the air in a ſtate of fuſion, without loſing their metallic form. They however loſe much of their luſtre and fluidity. Of this fact we have a ſtriking proof in ſilver, which in the act of refining has been long expoſed to a current of oxygen for the purpoſe of freeing it from the baſer metals. At the time the ſilver aſſumes the ſolid form, the oxygen is given out in the form of gas. Mr. Lucas, a refiner of Sheffield, by throwing the liquid ſilver into water, collected an abundance of pure oxygen gas.

The partial loſs of luſtre and fluidity from the combined oxygen, is ſoon very apparent in melted zinc, both of which may be completely reſtored, by treating it in a cloſe veſſel with charcoal powder. All the oxydable metals are more or leſs ſuſceptible of this change, proportionate to their affinity for that ſubſtance.

From what has been obſerved we may infer, that it is highly injudicious to expoſe much of the melted ſurface of metals to the air. Hence the iron ladles uſed for the fuſible metals, as well as crucibles, ought to be as narrow as poſſible at the top, at the ſame time that ſome ſubſtance ſhould be employed, which will either prevent the oxydation, or reduce the oxyd as it is formed.

Fluxes, in the *Manufacture of Glaſs*, are red-lead, pearl-aſhes, nitre, ſea-ſalt, borax, arſenic, the ſcoriæ of forges, commonly called clinkers, and wood-aſhes. See Glass.

FLUXION, was a term, in *Surgery*, much employed by the ancient writers and practitioners to ſignify the motion by which, according to theories now exploded, the humours were ſpontaneouſly determined, with a certain velocity, towards any particular part of the body, ſo as to occaſion there a tumour, attended with heat. When the humours were depoſited in a ſlower and more gradual way, the old medical writers uſed to ſay, that the tumour was produced by *congeſtion*.

Fluxion, in the *Newtonian Analyſis*, denotes the velocity with which a flowing quantity is increaſed by its generative motion: by which it ſtands contradiſtinguiſhed from fluent or the flowing quantity, which is gradually, and indefinitely increaſing, after the manner of a ſpace which a body in motion deſcribes.

Or, a fluxion may be more accurately defined, as the magnitude by which any flowing quantity *would be* uniformly increaſed in a given portion of time, with the generating celerity at any propoſed poſition, or inſtant, ſuppoſing it from thence to continue invariable.

Thus, if the point m move from A, and generate the right line Am, (*Plate* VII. *Analyſis*, *fig.* 1.) and the celerity at R be ſuch as would be ſufficient, ſuppoſing it to continue uniform from that point, to deſcribe the line Rr in the given time; then Rr repreſents the fluxion of the variable line Am in that poſition. The rectangle AS, *fig.* 2. may be conceived to be generated by the parallel motion of the invariable line mn between AF and BG; and ſince Rr is the fluxion of Am, the rectangle $RrsS$ will be the ſpace which would be uniformly deſcribed by mn, whilſt Am would be uniformly increaſed by mr, and it is, therefore, the fluxion of the generated rectangle $ABSR$. Farther, if the curvilineal ſpace Amn, *fig.* 3. be generated by the parallel motion of mn, conſidered as variable, and Rr be the fluxion of Am, the rectangle $RrsS$ would be uniformly generated with the celerity, with which it begins to be generated, and with which the ſpace Amn is increaſed in the poſition Rs, when the length and velocity of mn are ſuppoſed to continue invariable from that poſition, and, therefore, agreeably to the definition, will be the fluxion of the generated ſpace Amn.

From this definition it appears, that the fluxions of quantities are, always, as the celerities by which the quantities themſelves increaſe in magnitude.

Mr. Simpſon obſerves, that there is an advantage in conſidering fluxions, not as mere velocities, but as the magnitudes which theſe velocities would, uniformly, generate in a given finite time: the imagination is not here confined to a ſingle point, and the higher order of fluxions are rendered much more eaſy and intelligible. And though ſir Iſaac Newton defines fluxions to be the velocities of motions, yet he hath recourſe to the increments or moments generated in equal particles of time, in order to determine thoſe velocities, which he afterwards teaches us to expound by finite magnitudes of other kinds. Simpſon's Fluxions, vol. i. pref. p. 6. and p. 2, &c.

Fluxions, *Method of*, is the arithmetic and analyſis of fluxions and fluents, or flowing quantities.

Foreigners uſually define the method of fluxions as the arithmetic, or analyſis, of infinitely, or rather indefinitely, ſmall variable quantities; or the method of finding an infiniteſimal, or infinitely ſmall quantity, which, being taken an infinite number of times, becomes equal to a given quantity.

Sir I. Newton, and after him, the Engliſh authors, call theſe infinitely ſmall quantities *moments*; conſidering them as the momentary increments, or decrements, of variable quantities, *e. gr.* of a line conſidered as generated by the flux of a point, or of a ſurface generated by the flux of a line.

Accordingly, the variable quantities are called fluent, or flowing quantities; and the method of finding either the fluxion, or the fluent, the method of fluxions.

M. Leibnitz conſiders the ſame infinitely ſmall quantities as the differences, or differentials, of two quantities; and calls the method of finding thoſe differences the *differential calculus*. (See Calculus.) Each of theſe ways of conſidering and denominating, has its advantages, which the retainers to this or that method ſtrenuouſly aſſert.

Flowing quantities, *i. e.* ſuch as, in the geneſis of figures by local motion are continually increaſing and diminiſhing, are certainly very properly denominated fluents: and as all figures may be conceived as ſo generated, the infinitely ſmall increments or decrements of ſuch quantities are very naturally denominated fluxions.

Beſide this difference in the name, there is another in the notation.

Sir I. Newton expreſſes the fluxion of a quantity, as x, by a dot placed over it, as $\dot{x}$; and M. Leibnitz expreſſes his differential of the ſame x, by prefixing a d, as dx; each of which methods of notation has likewiſe its advantage.

Setting aſide theſe circumſtances, the two methods are the ſame.

The method of fluxions is one of the greateſt, moſt ſubtle, and ſublime diſcoveries of this, or, perhaps, of any age: it opens a new world to us, and extends our knowledge, as it were, to infinity; it carries us beyond the bounds that ſeemed to have been preſcribed to the human mind, at leaſt infinitely beyond thoſe to which the ancient geometry was confined.

The hiſtory of this important diſcovery, as freſh as it is, is a little dark and embroiled. Two of the greateſt men of this age do both of them claim the invention, ſir I. Newton, and M. Leibnitz; and nothing can be more glorious for the method itſelf, than the zeal wherewith the partiſans of either ſide have aſſerted their reſpective title.

To give the reader a juſt view of this noble diſpute, and of the pretenſions of each party, we ſhall lay before him the origin of the diſcovery, and mark where each claim commenced, and how it was ſupported.

The firſt time the method made its appearance in public, was in 1684, when M. Leibnitz gave the rules thereof in the Leipſic Acts of that year; but the demonſtrations he kept to himſelf. The two brothers, the Bernouillis, were preſently ſtruck with it, and found out the demonſtrations, though very difficult; and practiſed the calculus with ſurpriſing ſucceſs.

However, M. Leibnitz began to propoſe his differential method in a letter, dated 21 Jun. 1677, in which he exactly purſues Dr. Barrow's method of tangents, publiſhed in 1670, and ſir I. Newton communicated his method of drawing tangents to Mr. Collins, in a letter dated 10 Dec. 1672: which letter, together with another dated 13 June, 1676, were ſent to M. Leibnitz by Mr. Oldenburgh, in 1676. So that there is a ſtrong preſumption that he might avail himſelf of the information contained in theſe letters, and other papers tranſmitted with them, and alſo in 1675, before the publication of his own letter, containing the firſt hint of his differential method. And it ſufficiently appears, that ſir I. Newton had invented his method before the year 1669, and that he actually made uſe of it in his Compendium of Analyſis and Quadrature of Curves before that time. His attention ſeems to have been directed this way, even before the plague which happened in London in 1665, and 1666, when he was about twenty-three years of age: and, therefore, there is no foundation for the hint ſuggeſted by the authors of the Encyclopedie Art. *Differentielle*, that ſir Iſaac borrowed the differential method from Dr. Barrow.

This is all we hear of it, till the year 1687, when ſir Iſaac Newton's admirable Principia came forth, which is almoſt wholly founded on the ſame calculus.

The common opinion, at that time, was, that ſir Iſaac, and M. Leibnitz, had each invented it about the ſame time: and what confirmed it was, that neither of them made any mention of the other; and that, though they agreed in the ſubſtance of the thing, yet they differed in their ways of conceiving; called it by different names, and uſed different characters.

In effect, M. Leibnitz's character was ſuppoſed, by foreigners, to be ſomewhat more commodious than that of ſir Iſaac Newton: accordingly, the method ſoon ſpreading itſelf, throughout Europe, M. Leibnitz's character went with it; by which means the geometricians were inſenſibly accuſtomed to look on him as the ſole, or principal inventor.

The two great authors themſelves, without any ſeeming concern, or diſpute, as to the property of the invention, enjoyed the glorious proſpect of the progreſſes continually making under their auſpices, till the year 1699, when the peace began to be diſturbed.

M. Fatio, in a treatiſe "Of the Line of ſwifteſt Deſcent," declared, that he was obliged to own ſir Iſaac Newton as the firſt inventor of the differential calculus, and the firſt by many years; and that he left the world to judge whether M. Leibnitz, the ſecond inventor, had taken any thing from him. This preciſe diſtinction between firſt and ſecond inventor, with the ſuſpicion it inſinuated, raiſed a controverſy between M. Leibnitz, ſupported by the editors of the Leipſic Acts, and the Engliſh geometricians, who declared for ſir Iſaac Newton. Sir Iſaac himſelf never appeared on the ſcene; his glory was become that of the nation; and his adherents, warm in the cauſe of their country, needed not him to animate them.

Writings ſucceeded each other but ſlowly on either ſide; probably on account of the diſtance of places; but the controverſy grew ſtill hotter and hotter; till, at length, it came to ſuch paſs, that in the year 1711, M. Leibnitz complained to the Royal Society, that Dr. Keill had accuſed him of publiſhing the method of fluxions invented by ſir Iſaac Newton, under other names and characters. He inſiſted, that nobody knew better than ſir Iſaac himſelf, that he had ſtolen nothing from him; and required, that Dr. Keill ſhould publicly diſavow the ill conſtruction which might be put on his words.

The ſociety, here appealed to as a judge, appointed a committee to examine all the old letters, papers, &c. that had paſſed among the ſeveral mathematicians relating to the point; and, after a ſtrict examen of all the evidences that could be procured, gave in their report to this purpoſe: "That M. Leibnitz was in London in 1673, and kept a correſpondence with Mr. Collins by means of Mr. Oldenburgh, till Sept. 1676, when he returned from Paris to Hanover, by way of London and Amſterdam: that it did not appear that M. Leibnitz knew any thing of the differential calculus before his letter of the 21ſt June, 1677, which was a year after a copy of a letter, wrote by ſir I. Newton, in the year 1672, had been ſent to Paris to be communicated to him, and above four years after Mr. Collins began to communicate that letter to his correſpondents: wherein the method of fluxions was ſufficiently explained, to let a man of his ſagacity into the whole matter: and that ſir I. Newon had even invented his method before the year 1669, and, of conſeqnence, fiftcen years before M. Leibnitz had given any thing on the ſubject in the Leipſic Acts." And thence they concluded, that Dr. Keill had not at all injured M. Leibnitz in what he had ſaid.

The ſociety printed this cenſure of theirs, together with all the pieces and materials relating thereto, under the title of "Commercium Epiſtolicum de Analyſi Promota," Lond. 1712. This book was carefully diſtributed through Europe, to vindicate the title of the Engliſh nation to the diſcovery; for ſir Iſaac, as already hinted, never appeared in it: whether it were that he truſted his honour with his compatriots, who werc zealous enough in the cauſe; or whether it were that he was even ſuperior to the glory thereof.

M. Leibnitz and his friends, however, could not ſhew the ſame indifference: he was accuſed of a theft; and the whole Commercium Epiſtolicum either expreſſes it in terms, or inſinuates it. Soon after its publication, a looſe ſheet was printed, at Paris, in behalf of M. Leibnitz, then at Vienna. It is written with great zeal and ſpirit; and maintains, boldly, that the method of fluxions had not preceded that of diffcrences: and evcn inſinuates, that it might have ariſen from it. The detail of the proofs, on each ſide, would be too long, and could not be underſtood without a large comment, which muſt enter into the deepeſt geometry.

M. Leibnitz had begun to work upon a Commercium Epiſtolicum, in oppoſition to that of the Royal Society; but he died before it was completed.

A ſecond edition of the Commercium Epiſtolicum was printed at London in 1722; where ſir Iſaac Newton, in the preface, account, and annotations, which were added to that edition, particularly anſwered all the objections which M. Leibnitz and M. Bernouilli were able to make ſince the Commercium firſt appeared in 1712. See alſo Raphſon's Hiſt. Fluxion. From the laſt edition of the Commercium, and the various original papers contained in it, it evidently appears that ſir Iſaac Newton had diſcovered his method of fluxions many years before M. Leibnitz's pretenſions.

It muſt be owned, that there are ſtrong preſumptions in favour of M. Lcibnitz; preſumptions, we mean, that he was no plagiary: for that ſir Iſaac Newton was the firſt inventor, is paſt all diſpute; his glory is ſecure; the reaſonable part, even among the foreigners, allow it: and the queſtion is only, whether M. Leibnitz took it from him, or fell upon the ſame thing with him; for, in his "Theory of Abſtract Notions," which he dedicated to the Royal Academy, 1671, before he had ſeen any thing of ſir Iſaac Newton's, he already ſuppoſed infinitely ſmall quantities, ſome greater than others; which is one of the great principles of the ſyſtem.

The doctrine conſiſts of two parts, *viz.* the *Direct method of fluxions,* called alſo *Calculus differentialis;* and the *Inverſe method of fluxions,* or *Calculus integralis.*

The latter is directly oppoſite to the former, and is a ſequel of it: both of them are adopted into the new geometry, and make reigning methods therein.

The firſt deſcends from finitc, to infinite; the latter aſcends from infinitely ſmall, to finite: the one de-compounds a magnitude; the other re-eſtabliſhes it.

The foundation of the direct method of fluxions amounts to this problem: the length of the ſpace deſcribed being continually (that is, at all times) given, to find the vclocity at any time propoſed.

The foundation of the inverſe method of fluxions amounts to this problem; the velocity of the motion being continually given, to find the ſpace deſcribed by it at any time propoſed.

Direct method of fluxions.—All finite magnitudes are here conceived to be reſolved into infinitely ſmall ones, ſuppoſed to be generated by motion, as a line by the motion of a point, a ſuperficies by a line, and a ſolid by a ſuperficies; and thcy are the elements, moments, or differences thcreof.

The art of finding theſe infinitcly ſmall quantities, or the velocities by which they are generated, and of working on them, and diſcovering other infinite quantities, by their means, makes the direct method of fluxions.

What renders the knowledge of infinitely ſmall quantities of ſuch ſignal uſe and extent is, that they have relations to each other, which the finite magnitudes, whcreof they are the infiniteſimals, have not.

Thus, *e.g.* in a curve, of any kind whatever, the infinitely ſmall differences of the ordinate and abſciſs have the ratio to each other, not of the ordinatc and abſciſs, but of the ordinate and ſubtangent; and, of conſequence, the abſciſs and ordinate alone being known, give the ſubtangent unknown; or, which amounts to the ſame, the tangent itſelf. See the *Inverſe method of fluxions.*

The method of notation in fluxions, introduced by the inventor, ſir I. Newton, is thus:

The variable, or flowing quantity, to be uniformly augmented, as ſuppoſe the abſciſs of a curve, he denotes by the final lctters v, x, y, z, and their fluxions by the ſame letters with dots placed over thcm, thus, $\dot{v}\,\dot{x}\,\dot{y}\,\dot{z}$. And the initial letters a, b, c, d, &c. are uſed to expreſs invariable quantities.

Again, if the fluxions themſelves arc alſo variable quantities; and are continually incrcaſing, or decrcaſing, he conſiders the velocities with which they increaſe, or decreaſe, as the fluxions of the formcr fluxions or ſecond fluxions; which are denoted by two dots over them, thus, $\ddot{y}\,\ddot{x}\,\ddot{z}$.

After the ſame manner one may conſider the augments, and diminutions of theſe, as their fluxions, alſo; and thus proceed to the third, fourth, fifth, &c. fluxions which will be noted thus, $\dddot{y}\;\dddot{x}\;\dddot{z}:\;\ddddot{y}\;\ddddot{x}\;\ddddot{z}:\;\overset{\therefore\!:}{y}\;\overset{\therefore\!:}{x}\;\overset{\therefore\!:}{z}$, &c. We may obſervc, in general, that the fluxions of all kinds and ordcrs whatcver, are contemporaneous, or ſuch as may be generated together, with their reſpective celerities, in one and the ſame time.

Laſtly, if the flowing quantity be a ſurd, as $\sqrt{\overline{a-b}}$; he notes its fluxion $\sqrt{\overset{\cdot}{\overline{a-b}}}$; if a fraction $\frac{x \quad x}{d-y}$ he notes it, $\frac{\dot{x}}{}:\frac{x}{d-\dot{y}}$. Vide Wallis's Algebra, p. 392, apud Oper. vol. ii. See FLUENT.

The chief ſcope and buſineſs of fluxions is, from the flowing quantity given, to find the fluxion; for this we ſhall lay down onc general rule, as ſtated by Dr. Wallis, and afterwards apply and exemplify it in the ſeveral caſes. "Multiply each term of the equation ſeparately by the ſeveral indices of the powcrs of all the flowing quantities contained in that term; and in each multiplication change one root or letter of the power into its proper fluxion: the aggregate of all the products connected togcther by their proper ſigns, will be the fluxion of the equation deſired."

The application of this rule will be contained in the following caſes. 1. To expreſs the fluxions of ſimple variable quantities, as already mentioned, you need only put the letter, or letters, which expreſs them, with a dot over them: thus, the fluxion of x is $\dot{x}$, and the fluxion of y is $\dot{y}$, and the fluxion of $x + y + v + z$, is $\dot{x} + \dot{y} + \dot{v} + \dot{z}$, &c.

Note, For the fluxion of permanent quantities, when any ſuch are in the equation, you muſt imagine o, or a cypher; for ſuch quantities can have no fluxion, properly ſpeaking, becauſe they are without motion, or invariable.

Again, the fluxion of a quantity, which decreaſes, inſtead of increaſing, is to be conſidered as negative!

2. *To find the fluxions of the products of two or more variable or flowing quantities.*—Multiply the fluxion of each ſimple quantity by the factors of the products, or the product of all the reſt; and connect the laſt products by their proper ſigns: then the ſum, or aggregate, is the fluxion ſought.

Thus, the fluxion of $x\,y$, is $\dot{x}\,y + x\,\dot{y}$. For let two right lines, D E and F G, move parallel to themſelves from two other right lines, B A and B C, (*Plate* VII. *Analyſis*, *fig.* 4) and generate the rectangle D F. Let them always interſect each other in the curve B H R, and let D d ($\dot{x}$) and F f ($\dot{y}$) be the fluxions of the ſides B D (x) and B F (y); and draw $d\,m$ and $f\,n$ parallel to D H and F H. The fluxion of the area B D H (ſee the beginning of this article) is D m or $y\,\dot{x}$, and that of the area B F H is F n or $x\,\dot{y}$, and therefore the fluxion of the whole rectangle E F $= x\,y =$ B D H + B F G will be $\dot{x}\,y + x\,\dot{y}$. The fluxion of $\dot{y}\,z\,u$ is $\dot{y}\,z\,u + y\,\dot{z}\,u + y\,z\,\dot{u}$; for if x be put $= z\,u$, then $y\,z\,u$ will be $= y\,x$, and its fluxion $= y\,\dot{x} + x\,\dot{y}$: but x being $= z\,u$, and $\dot{x} = z\,\dot{u} + u\,\dot{z}$, $y\,\dot{x} + x\,\dot{y}$, by ſubſtitution, will be $= \dot{y}\,z\,u + y\,u\,\dot{z} + y\,z\,\dot{u}$. And the fluxion of $x\,u\,y\,z$, is $x\,u\,y\,\dot{z} + x\,u\,\dot{y}\,z + x\,\dot{u}\,y\,z + \dot{x}\,u\,y\,z$; and the fluxion of $\overline{a + x} \times \overline{b - y}$ (the common product being $a\,b + b\,x - y\,a - x\,y$) will be $b\,\dot{x} - \dot{y}\,a - \dot{x}\,y - x\,\dot{y}$.

3. *To find the fluxion of a fraction.*—Multiply the fluxion of the numerator by the denominator, and from this product ſubtract the fluxion of the denominator drawn into the numerator; this will be the numerator, and the ſquare of the denominator will be the denominator of the fraction expreſſing the fluxion of the given fraction.

Thus, the fluxion of $\frac{x}{y}$ is $\frac{\dot{x}\,y - x\,\dot{y}}{y\,y}$.

For ſuppoſe $\frac{x}{y} = z$, then will $x = y\,z$, which equal quantities muſt have equal fluxions; therefore $\dot{x} = \dot{y}\,z + \dot{z}\,y$ and $\dot{x} - z\,\dot{y} = \dot{z}\,y$; and dividing all by y, $\frac{\dot{x} - z\,\dot{y}}{y} = \dot{z} =$ (becauſe $\frac{x}{y} = z$) $\frac{\dot{x} - \frac{x}{y} \times \dot{y}}{y} = \frac{\dot{x}\,y - x\,\dot{y}}{y} \div y = \frac{\dot{x}\,y - x\,\dot{y}}{y\,y}$; wherefore this laſt is the fluxion of the fraction $\frac{x}{y} = z$; becauſe z being $= \frac{x}{y}$, $\dot{z}$ will be equal to the fluxion of $\frac{x}{y}$.

And the fluxion of $\frac{a}{x}$ will be $\frac{-\dot{x}\,a}{x\,x}$; for the permanent quantity a having no fluxion, there can be no product of the fluxion of the numerator into the denominator, as there would have been, had a been x, z, or any other variable quantity.

4. *To find the fluxion of a power.*—Multiply the fluxion of the root by the exponent of the power, and the product by that power of the ſame root, whoſe exponent is leſs by unit than the given exponent; and likewiſe by the invariable quantity and co-efficient, if there be any.

Thus, the fluxion of $x\,x$ will be $2\,x\,\dot{x}$; for $x\,x = x \times x$; but the fluxion of $x \times x = \dot{x}\,x + x\,\dot{x} = 2\,\dot{x}\,x$, &c. and the fluxion of x^3 will be $3\,x\,x\,\dot{x}$. That of x^8 will be $8\,x^7\,\dot{x}$, &c. that of $5\,x^5$ will be $25\,x^4\,\dot{x}$; that of $3\,a\,x^4$ will be $12\,a\,x^3\,\dot{x}$.

Or, if m expreſs the index of any power, as ſuppoſe x^m; its fluxion will be $m\,x^{m-1}\dot{x}$.

If the power be produced from a binomial, &c. as ſuppoſe $\overline{x + y}|^2$, or $x\,x + 2\,x\,y + y\,y$, its fluxion will be $2 \times \overline{x + y} \times \overline{\dot{x} + \dot{y}}$, or $2\,x\,\dot{x} + 2\,x\,\dot{y} + 2\,\dot{x}\,y + 2\,y\,\dot{y}$.

If the exponent be negative, as ſuppoſe x^{-m} or $\frac{1}{x^m}$, its fluxion will be $-m\,\dot{x}\,x^{-m-1}$.

Or, if you would do it by way of fraction, $\frac{-m\,x^{m-1}\dot{x}}{x^{2m}}$ (for the ſquare of x^m is x^{2m}) $= -m\,x^{m-1-2m}\,\dot{x} = -m\,x^{-m-1}\dot{x}$ as before; =, removing x^{-m-1} to the denominator, by changing the ſign of the exponent, $\frac{-m\,\dot{x}}{x^{m+1}}$.

If the power be imperfect, *i. e.* if its exponent be a fraction, as ſuppoſe $\sqrt[n]{x^m}$; or in the other notation $x^{\frac{m}{n}}$, ſuppoſe $x^{\frac{m}{n}} = z$: then if you raiſe up each member to the power of n, it will ſtand thus, $x^m = z^n$: the fluxion of which will be, by this general rule, $m\,x^{m-1}\,\dot{x} = n\,z^{n-1}\,\dot{z}$. Wherefore $\dot{z}$ will be $= \frac{m\,\dot{x}\,x^{m-1}}{n\,z^{n-1}}$ (by dividing both parts by $n\,z^{n-1}$) and $\frac{m\,\dot{x}\,x^{m-1}}{n\,z^{n-1}} = \frac{m}{n} \times \frac{x^{m-1}}{z^{n-1}} \times \dot{x}$; or $\frac{m}{n}\,\dot{x}\,\sqrt[n]{x^{m-n}}$; putting, inſtead of z^{n-1}, its value $x^{\frac{m\,n - m}{n}}$, and the above expreſſion will become $\frac{m}{n}\,\dot{x} \times \frac{x^{m-1}}{x^{\frac{m\,n - m}{n}}} = \frac{m}{n}\dot{x} \times x^{m-1-\frac{m\,n + m}{n}} = \frac{m}{n}\dot{x} \times x^{\frac{m\,n - n - m\,n + m}{n}} = \frac{m}{n}\dot{x} \times x^{\frac{m-n}{n}} = \frac{m}{n}\dot{x}\,\sqrt[n]{x^{m-n}}$. Or, more briefly, according to the rule, the fluxion of $\sqrt[n]{x^m}$ or $x^{\frac{m}{n}}$ will be $\frac{m}{n} \times \dot{x} \times x^{\frac{m}{n} - 1} = \frac{m}{n}\,\dot{x}\,x^{\frac{m-n}{n}}$, &c.

5. *To find the fluxions of ſurd quantities.*—Suppoſe it required to find the fluxion of $\sqrt{2\,r\,x - x\,x}$, or $\overline{2\,r\,x - x\,x}|^{\frac{1}{2}}$. Suppoſe $\overline{2\,r\,x - x\,x}|^{\frac{1}{2}} = z$; then is $2\,r\,x - x\,x = z\,z$; and conſequently $r\,\dot{x} - x\,\dot{x} = z\,\dot{z}$; and by diviſion, $\frac{r\,x - x\,\dot{x}}{z} = \dot{z} =$ (by ſubſtitution) $\frac{r\,\dot{x} - x\,\dot{x}}{\sqrt{2\,r\,x - x\,x}}$ = to the fluxion of $\sqrt{2\,r\,x - x\,x}$.

Or, by the preceding rule, the fluxion of $\overline{2\,r\,x - x\,x}|^{\frac{1}{2}}$, will be $\frac{1}{2} \times \overline{2\,r\,\dot{x} - 2\,x\,\dot{x}} \times \overline{2\,r\,x - x\,x}|^{\frac{1}{2}-1} = \overline{r\,\dot{x} - x\,\dot{x}} \times \overline{2\,r\,x - x\,x}|^{-\frac{1}{2}} = \frac{r\,\dot{x} - x\,\dot{x}}{\overline{2\,r\,x - x\,x}|^{\frac{1}{2}}}$. See Power.

If it be required to find the fluxion of $\overline{a y - x x}|^{\frac{1}{3}}$; for $\overline{a y - x x}|^{\frac{1}{3}}$ put z; then $a y - x x = z^{\frac{1}{3}}$, and $a \dot y - 2 x \dot x = \frac{1}{3} \dot z z^{-\frac{2}{3}}$; and multiplying by 3, $3 a \dot y - 6 x \dot x = \dot z z^{-\frac{2}{3}}$ and, conſequently, $3 a z^{\frac{2}{3}} \dot y - 6 z^{\frac{2}{3}} x \dot x = \dot z$; equal (ſubſtituting $\overline{a y - x x}|^{2} = z^{\frac{2}{3}}$) $3 a^3 y^2 \dot y - 6 a^2 x^2 y \dot y + 3 a x^4 \dot y - 6 a^2 y^2 x \dot x + 12 a y x^3 \dot x - 6 x^5 \dot x$ = to the fluxion of $\overline{a y - x x}|^{\frac{1}{3}}$.

6. *To find the fluxion of quantities compounded of rational and ſurd quantities.*—Let it be required to find the fluxion of $\overline{b x^2 + c a x + e a^2} \times \sqrt{x x + a a} = z$. Put $\overline{b x^2 + c a x + e a^2} = p$, and $\sqrt{x x + a a} = q$. Then the given quantity is $p q = z$, and the fluxion thereof is $p \dot q + q \dot p = \dot z$: but $\dot q$ is $= \frac{x \dot x}{\sqrt{x x + a a}}$, and $\dot p$ is $= 2 b x \dot x + c a \dot x$; therefore, in the equation $p \dot q + q \dot p = \dot z$, if in the place of $p, q, \dot p, \dot q$, we reſtore the quantities they repreſent, we ſhall have, $\frac{\overline{b x^3 + c a x^2 + e a^2 x} \times \dot x}{\sqrt{x^2 + a a}} + 2 b x \dot x \times \sqrt{x^2 + a^2} + c a \dot x \times \sqrt{x^2 + a^2} = \dot z$. Which being reduced to one denomination, gives $\frac{\overline{3 b x^3 + 2 a c x^2 + e a^2 x + 2 b a^2 x + c a^3} \times \dot x}{\sqrt{x x + a a}} = \dot z$ = to the fluxion of the given quantity.

7. *To find the fluxion of a logarithm.*—The fluxion of the hyperbolic logarithm of any quantity is equal to the fluxion of that quantity divided by the quantity itſelf: *e. gr.* the fluxion of the hyperbolic logarithm of x is $= \frac{\dot x}{x}$: for let L Q, *Plate* VII. *Analyſis, fig.* 5. be an hyperbola, whoſe aſymptotes are O R and O S, and whoſe parameter is A L = A O = 1: draw an ordinate P M parallel to A L, and the ſpace A P M L will be the hyperbolic logarithm of the line O P; and, therefore, the fluxion of the ſpace A P M L will be equal to the fluxion of the hyperbolic logarithm of the line O P. But the fluxion of this ſpace, O P being $= x$, and P M $= y$, is $= y \dot x$, and O P : A O :: L A : M P by the nature of the curve; *i. e.* $x : 1 :: 1 : y = \frac{1}{x}$; therefore $y \dot x = \frac{\dot x}{x}$. Then, from the nature of logarithms, the hyperbolic logarithm of 10 (*viz.* 2.30258, &c.) is to the common logarithm of 10 (*viz.* 1) as the hyperbolic logarithm of any number x to the common logarithm of the ſame number x; *i. e.* L being made = 2.30258, &c. L : 1 :: the hyperbolic logarithm of x : common logarithm of x; and therefore L : 1 :: the fluxion of the hyperbolic logarithm of x : the fluxion of the common logarithm of x: *i. e.* L : 1 :: $\frac{\dot x}{x} : \frac{\dot x}{L x}$, which is the fluxion of the common logarithm of x; or becauſe $\frac{1}{L} = 0.43429$, &c. the modulus of the Brigean or common form of logarithms, if $\frac{1}{L}$ be = M, the fluxion of the common logarithm of x (*viz.* $\frac{\dot x}{L x}$) will be $= \frac{\dot x}{x} \times M$; or, the fluxion of the hyperbolic logarithm of any number multiplied by M or 0.43429, &c. is = the fluxion of the common logarithm of the ſaid number.

8. *To find the fluxion of an exponential or percurrent quantity, i. e.* of a quantity having a variable exponent as y^x. Suppoſe $y^x = u$; then by the properties of logarithms, $x \times \log. y = \log. u$. And finding the fluxions of theſe terms, $\dot x \times \log. y + \frac{M \dot y}{y} \times x = \frac{M u}{u}$, M being as in the preceding article: conſequently, the fluxion of y^x or $u = \frac{u \dot x}{M} \times \log. y + \frac{\dot y x u}{y} = \frac{\dot x}{M} \times y^x \times \log. y + x y^{x-1} \dot y$. Hence, if y be conſtaut, then $\dot y = 0$, and $\dot u = \frac{\dot x}{M} \times y^x \times \log. y$. If x be conſtant, $\dot x = 0$, and $\dot u = x y^{x-1} \dot y$.

9. *To find the fluxion of a rectangle, when one ſide x increaſes, and the other y decreaſes.*—In this caſe the fluxion of the decreaſing quantity is negative with reſpect to that of the increaſing quantity (ſee the beginning of this article), and therefore the ſign of the term affected with it ought to be changed; *e. gr.* the fluxion of the rectangle $x y$ in theſe circumſtances will be expreſſed by $\dot x y - x \dot y$.

10. *To find the ſecond, third, &c. fluxion of a flowing quantity.*—Theſe fluxions differ in nothing, except their order and notation, from firſt fluxions, being actually ſuch to the quantities from which they are immediately derived; and therefore they may be found, in the ſame manner, by the general rules already delivered.

Thus, by the 4th rule, the firſt fluxion of x^3 is $3 x^2 \dot x$; and if x be ſuppoſed conſtant, or if the root x be generated with an equable celerity, the fluxion of $3 x^2 \dot x$, or $3 \dot x \times x^2$, will be $3 \dot x \times 2 x \dot x = 6 x \dot x^2$, which is the ſecond fluxion of x^3; and $6 x^3$ will be its third fluxion: but if the celerity with which x is generated be variable, either increaſing or decreaſing, then $\dot x$, being variable, will have its fluxion denoted by $\ddot x$, &c. In this caſe, the fluxion of $3 x^2 \times \dot x$ will be, by the 2d and 4th rules, $6 x \dot x \times \dot x + 3 x^2 \times \ddot x = 6 x \dot x^2 + 3 x^2 \ddot x$, the ſecond fluxion of x^3. And the third fluxion of x^3, obtained in like manner from the laſt, will be $6 \dot x \times \dot x^2 + 6 x \times 2 \dot x \ddot x + 6 x \dot x \times \ddot x + 3 x^2 \dddot x = 6 \dot x^3 + 18 x \dot x \ddot x + 3 x^2 \dddot x$. Thus alſo, if $y = n x^{n-1} \dot x$, then $\ddot y = n \times \overline{n - 1} \times x^{n-2} \dot x^2 + n \ddot x x^{n-1}$; and if $\dot z^2 = \dot x \dot y$, then $2 \dot z \ddot z = \dot x \ddot y + \dot y \ddot x$, &c.

Fluxions, *inverſe method of*, or *calculus integralis*, conſiſts in finding finite magnitudes from the infinitely ſmall parts thereof, and in determining the variable quantity or fluent from the velocity with which it flows at any point or term aſſigned, or the given fluxion.

It proceeds, as already obſerved, from infinitely ſmall quantities to finite; and recompounds and ſums up what the other has reſolved; whence it is alſo called, by ſome, the *ſummatory calculus*.

But what that has decompounded, this does not always re-eſtabliſh; ſo that the inverſe method is limited and imperfect, at leaſt hitherto; if it were once complete, geometry would be arrived at its laſt perfection.

To give an idea of its nature and office, take the inſtance already propoſed in the direct method: in that the infinitely ſmall quantities of the ordinates and abſciſs, being known, give the ſubtangent required; in this, on the contrary, the ſubtangent of an unknown curve being had, gives the infinitely ſmall quantities of the abſciſs and ordinate which produced it, and, of conſequence, the abſciſs and ordinate themſelves; which are finite magnitudes, in whoſe relation the whole eſſence of the curve is founded.

But the diſtinguiſhing uſe of this method is in meaſuring.

The baſe of a parallelogram multiplied by the infinitely ſmall element of its altitude, gives an infinitely ſmall parallelogram; which is the element of the finite parallelogram, and is repeated an infinity of times therein, *i. e.* as many times as there are points in the height of the parallelogram.

To have the finite parallelogram, therefore, by means of its element, the element muſt be multiplied by the altitude; which is the inverſe method of fluxions, re-aſcending from the infinitely ſmall quantity to the finite.

Such a circuit of infiniteſimals, it is true, would be impertinent, in ſo ſimple a caſe; but when we have to do with ſurfaces terminated by curves, the method then becomes neceſſary, or at leaſt ſuperior to any other.

Suppoſe, *e. gr.* in a parabola, the ſpace included between two infinitely near ordinates, an infinitely ſmall portion of the axis, and an infinitely little arc of the curve; it is certain, this infinitely ſmall ſurface is no parallelogram; ſince the two parallel ordinates which terminate it on one ſide are not equal; and the arc of the curve, oppoſite to the little portion of the axis, is frequently neither equal nor parallel thereto; and yet this ſurface, which is no parallelogram, may be conſidered, in the ſtricteſt geometry, as if it really were one, becauſe it is infinitely ſmall; and the error, of conſequence, infinitely little, *i. e.* none.

So that, to meaſure it, there needs nothing but to multiply an ordinate of the parabola by the infinitely ſmall portion of the axis correſponding thereto. Thus we have the element of the whole parabola; which element being raiſed, by the inverſe method, to a finite magnitude, is the whole ſurface of the parabola.

This advantage, ſo peculiar to the geometry of infinites, of being able, without any error, to treat little arcs of curves as if they were right lines; curvilinear ſpaces, as if rectilinear ones, &c. enables it not only to go with more eaſe and readineſs than the ancient geometry to the ſame truths, but to reach a great number of truths which were inacceſſible to the other.

Its operations, in effect, are more eaſy, and its diſcoveries more extenſive; and ſimplicity and univerſality are its diſtinguiſhing characters.

The preceding obſervations are more properly applicable to the method of infinites and indiviſibles than to the Newtonian method of fluxions, in which magnitudes of various kinds are capable of increaſe, not by a repeated acceſſion of parts, but by a continued motion or flux. See the ſequel of this article.

Fluxion given, to find the flowing quantity belonging to any.—To have the doctrine of the inverſe method correſpond and keep pace with that of the direct, we will apply it in the ſame caſes.

1. In the general, to expreſs the variable quantity of a fluxion, there needs nothing but to write the letters without the dots, or to ſubſtitute the variable or flowing letter for its fluxion. Thus, the flowing quantities of $\dot{x}, \dot{y}, \dot{z}$, are x, y, z.

2. To find the fluent of a compound fluxional expreſſion conſiſting of the products of two or more flowing quantities drawn into their fluxions; or which conſiſts of the fluxion of each quantity drawn into the other, or product of the reſt of the quantities.

Multiply the flowing quantities together; and the product is the fluent required. *E. gr.* the fluent of $\dot{x}y + x\dot{y}$ is $= xy$; of $\dot{x}yz + x\dot{y}z + xy\dot{z}$ is $= xyz$, &c.

3. To find the fluent of a fraction. The following rule will ſerve in many caſes. Divide the laſt term in the numerator by the fluxion of the negative ſquare root of the denominator; then divide this quotient by the affirmative ſquare root of the denominator for the required fluent. Thus, the fluent of $\frac{\dot{x}y - x\dot{y}}{y^2}$ is $= \frac{x}{y}$.

4. To find the fluent of an expreſſion compounded of different fluxionary terms connected together by the ſigns + and −.

Find the ſeparate fluents of the different terms, and connect them together by the ſigns of their reſpective fluxions. Thus, the fluent of $a\dot{x} + \dot{x}y + x\dot{y} - \frac{\dot{x}y - x\dot{y}}{y^2}$ is $= ax + xy - \frac{x}{y}$.

5. To find the flowing quantity belonging to the fluxion of any power, either perfect or imperfect. Take the fluxionary letter, or letters, out of the equation; then augment the index of the fluxion by 1, or unity: laſtly, divide the fluxion by the index of its power ſo increaſed by unity.

Thus, ſuppoſe $3xx\dot{x}$ propoſed; by taking away $\dot{x}$ it will be $3xx$; and by increaſing its index by unity, it will be $3xxx$; then dividing it by 3, its now (augmented) index, the quotient will be xxx; the flowing quantity required.

Again, the fluent of $\frac{n}{m}\dot{x}x\frac{n-m}{m}$ will be $x\frac{n}{m}$. In compound fluxionary expreſſions, if the fluxionary part is equal, or in an invariable ratio to the fluxion of the quantity under the vinculum, the fluent may be had by adding 1 to the index of the power, and dividing by the fluxion of the quantity under the vinculum drawn into the index of the power thus increaſed. *E. gr.* the fluent of $\overline{x + x^2}|^2 \times \overline{3\dot{x} + 6x\dot{x}}$ is $= \frac{\overline{x + x^2}|^3 \times \overline{3\dot{x} + 6x\dot{x}}}{3 \times \overline{\dot{x} + 2x\dot{x}}} = \overline{x + x^2}|^3$: the fluent of $\overline{a + cz^n}|^m \times dz^{n-1}\dot{z}$ is $= \frac{\overline{a + cz^n}|^{m+1} \times dz^{n-1}\dot{z}}{\overline{m + 1} \times nc\dot{z}z^{n-1}} = \frac{\overline{a + cz^n}|^{m+1} \times d}{nc \times \overline{m + 1}}$; and the fluent of $\overline{a^m + z^m}|^n \times z^{m-1}\dot{z}$ is $= \frac{\overline{a^m + z^m}|^{n+1}}{m \times \overline{n + 1}}$.

By theſe methods the fluent is found when the fluxion is given; and the rules are derived from thoſe of the direct method; as the rules in diviſion and evolution in algebra are deduced from thoſe of multiplication and involution. As when a fluent conſiſts of a variable and invariable part, the latter does not appear in the fluxion; ſo when any fluxion is propoſed, it is only the variable part of the fluent that can be derived from it. If $\dot{x}$ repreſent any fluxion that may be propoſed, the variable part of the fluent will be equal to x; for ſuppoſing y to be any variable quantity, if $x + y$ could repreſent the fluent of $\dot{x}$, then $\dot{x} + \dot{y}$ would be equal to $\dot{x}$, and $\dot{y} = o$, or y would be invariable, againſt the ſuppoſition. But ſuppoſing K to repreſent any invariable quantity, then $x + \mathrm{K}$ may generally repreſent the fluent of $\dot{x}$. If it be required to find ſuch a fluent of $\dot{x}$ as ſhall vaniſh when x is ſuppoſed to vaniſh, it can be no other than x; and if it be required that the fluent ſhould vaniſh when x is equal to any given quantity a, then by ſuppoſing $x + \mathrm{K}$ to vaniſh when x becomes equal to a; we ſhall have $a + \mathrm{K} = o$, or $\mathrm{K} = -a$; whence the fluent is $x - a$. In the ſame manner, the fluent of $-\dot{x}$ may be generally repreſented by $\mathrm{K} - x$. When a fluxion that is propoſed coincides with any of thoſe which were deduced from their fluents in the preceding articles, the variable part of the fluent required muſt coincide with that which was there propoſed. As diviſion in algebra leads us to fractions, and evolutions to ſurds; ſo the inverſe method of fluxions leads us often to quantities that are not known in common algebra, and that cannot be expreſſed by common algebraic ſymbols. Maclaurin's Flux. art. 735.

We cannot here pretend to enter into a detail of the rules of the inverſe method of fluxions. We ſhall only obſerve in general, that a fluxion being propoſed, its fluent may ſometimes be found accurately in algebraic terms; but this is far from being always poſſible; and recourſe muſt ſometimes be had to a converging ſeries. Thus, if $n x^{n-1} \dot{x}$ were propoſed, the variable part of the fluent is found by adding unity to the exponent of the power, dividing by the exponent thus increaſed, and by the fluxion of the root; that is, the variable part of the fluent of $n x^{n-1} \dot{x}$ will be $\frac{n x^{n-1+1} \dot{x}}{\overline{n-1+1} \times \dot{x}} = x^n$. But in many caſes this fluent requires the addition or ſubtraction of ſome conſtant quantity to render it complete, which can only be known from the nature of the problem under conſideration: *e.gr.* the fluent of $n x^{n-1} \dot{x}$ may be either repreſented by x^n or by $x^n \pm a$, becauſe a being conſtant, the fluxion of $x^n \pm a$, as well as of x^n is $n x^{n-1} \dot{x}$. To find this invariable quantity that muſt be added or ſubtracted, is to correct the fluent. In order to do this, the beſt way is to conſider how much the variable part of the fluent, firſt found, differs from the truth, in that particular circumſtance when the required quantity which the whole fluent ought to expreſs, is equal to nothing; then, that difference added to or ſubtracted from the variable part, as occaſion requires, will give the fluent truly corrected. For, ſince the difference of two quantities flowing with the ſame celerity, or having equal fluxions, is either nothing at all, or conſtantly the ſame, the difference in that circumſtance will likewiſe be the difference in all other circumſtances; and therefore, being added to the leſſer quantity, or ſubtracted from the greater, both become equal. Let the variable quantities x and y be firſt ſuppoſed to begin their exiſtence together, or to be generated at the ſame time: *e.gr.* 1. Let $\dot{y} = a^2 x \dot{x}$, the fluent will be $y = \frac{a^2 x^2}{2}$; if $y = o$, $\frac{a^2 x^2}{2}$ vaniſhes, becauſe x is alſo $= o$, and the fluent needs no correction. 2. Let $\dot{y} = \overline{a+x}|^{3} \times \dot{x}$; and y will be equal $\frac{\overline{a+x}|^{4}}{4}$; but when $y = o$ and $x = o$, $\frac{\overline{a+x}|^{4}}{4}$ becomes $= \frac{a^4}{4}$; and, therefore, $\frac{\overline{a+x}|^{4}}{4}$ always exceeds y by $\frac{a^4}{4}$, and the fluent properly corrected will be $y = \frac{\overline{a+x}|^{4} - a^4}{4} = a^2 x + \frac{3 a^2 x^2}{2} + a x^3 + \frac{x^4}{4}$. But this fluent may be found without correction, by expanding $\overline{a+x}|^{3}$ in the original equation, which will become $\dot{y} = a^3 \dot{x} + 3 a^2 x \dot{x} + 3 a x^2 \dot{x} + x^3 \dot{x}$, whence $y = a^3 x + \frac{3 a^2 x^2}{2} + a x^3 + \frac{x^4}{4}$. 3. Let $\dot{y} = \overline{a^2 - x^2}|^{\frac{1}{2}} \times x \dot{x}$; then $y = - \frac{\overline{a^2 - x^2}|^{\frac{3}{2}}}{3}$, and y being $= o$, $- \frac{\overline{a^2 - x^2}|^{\frac{3}{2}}}{3}$ becomes $= - \frac{a^3}{3}$; therefore $- \frac{\overline{a^2 - x^2}|^{\frac{3}{2}}}{3}$ is too little by $\frac{a^3}{3}$; and the fluent corrected will be $y = \frac{a^3}{3} - \frac{\overline{a^2 - x^2}|^{\frac{3}{2}}}{3}$, &c.

In the ſolution of other problems, the value of y will be equal to nothing, when that of x is equal to any given quantity a. *E. gr.* Let $\dot{y} = x^2 \dot{x}$, and y is $= \frac{x^3}{3}$; but when $y = o$, $\frac{x^3}{3}$ is $= \frac{a^3}{3}$, by ſuppoſition; therefore the corrected fluent will be $y = \frac{x^3 - a^3}{3}$. 2. Let $\dot{y} = - x^n \dot{x}$, then $y = - \frac{x^{n+1}}{n+1}$, which corrected becomes $y = \frac{a^{n+1} - x^{n+1}}{n+1}$, &c. But if the propoſed fluxion were $\frac{a \dot{x}}{a - x}$, we cannot find its fluent by the rule above given; however, we may throw the fluxion into an infinite ſeries (ſee SERIES) by dividing a by $a - x$ in the uſual method, and we ſhall find the quotient or $\frac{a}{a-x} = 1 + \frac{x}{a} + \frac{x^2}{a^2} + \frac{x^3}{a^3}$, &c. Hence $\frac{a \dot{x}}{a-x} = \dot{x} + \frac{x \dot{x}}{a} + \frac{x^2 \dot{x}}{a^2} + \frac{x^3 \dot{x}}{a^3} +$, &c. Now the fluent of each term of this ſeries may be found by the foregoing rule; and therefore the fluent of $\frac{a \dot{x}}{a-x}$ will be expreſſed by the ſeries $x + \frac{x^2}{2a} + \frac{x^3}{3a^2} + \frac{x^4}{4a^3}$, &c. which may be of uſe for determining the fluent when x is very ſmall in reſpect of a; becauſe in that caſe, a few terms at the beginning of the ſeries will be nearly equal to the value of the whole. But it often happens that the ſeries deduced in this method converges ſo ſlowly, as to be of little or no uſe. Or, becauſe the fluxion of the hyperbolic logarithm of any quantity is equal to the fluxion of that quantity divided by the quantity itſelf, the fluent of $\frac{a \dot{x}}{a-x}$ will be $= x \times$ hyp. log. of $a - x$. For the fluxion of $a - x$ is $- \dot{x}$, which divided by $a - x$ is $\frac{\dot{x}}{a-x}$. See Maclaurin's Tr. of Fluxions, art. 737. 744. 827. Stirling, De Summat. Serier. p. 28. and Simpſon's Fluxions, vol. i. p. 87. &c.

Mathematicians do not always immediately recur to infinite ſeries, when it does not appear that a fluent can be aſſigned in a finite number of algebraic terms. The arcs of a circle, and hyperbolic areas or logarithms cannot be aſſigned in algebraic terms, but have been computed with great exactneſs by ſeveral methods. By theſe with algebraic quantities, any ſegments of conic ſections, and the arcs of a parabola, are eaſily meaſured; and when a fluent can be aſſigned by them, this is conſidered as the ſecond degree of reſolution. When it does not appear that a fluent can be meaſured by the areas of conic ſections, it may however be meaſured in ſome caſes by their arcs, and this may be conſidered as the third degree of reſolution. If it does not appear that a fluent can be aſſigned by the arc of any conic ſections (the circle included), it may however be of ſome uſe to aſſign the fluent by an area or arc of ſome other figure, that is eaſily conſtructed or deſcribed; and it is often important, that the propoſed fluxion be reduced to a proper form, in order that the ſeries for the fluent may not be too complex, and that it may not converge at too ſlow a rate.

We may, therefore, conſtitute three orders or claſſes of fluents. Firſt, ſuch as can be accurately aſſigned in finite terms by common algebraic expreſſions. Secondly, thoſe which can be reduced to circular arcs and logarithms. Thirdly, ſuch as can be aſſigned by hyperbolic or elliptic arcs. The firſt two claſſes (conſidering triangles and circles as conic ſections) may therefore be meaſured by the areas of conic ſections; and the third claſs by their perimeters, or lines that bound them.

The fluent of $\frac{\dot{x}}{\sqrt{1 \pm x}}$ is of the firſt claſs; that of $\frac{\dot{x}}{\sqrt{x} \times \sqrt{1 \pm x}}$, or of $\frac{\dot{x}}{\sqrt{1 \pm xx}}$ of the ſecond; but the fluents of $\frac{\dot{x}\sqrt{x}}{\sqrt{1 \pm xx}}$, $\frac{\dot{x}}{\sqrt{x} \times \sqrt{1 \pm xx}}$, $\frac{\dot{x}}{\overline{1 \pm xx}|^{\frac{1}{4}}}$, and $\frac{\dot{x}}{\overline{1 \pm x^4}|^{\frac{3}{4}}}$ are of the third claſs, and as far as has appeared hitherto, cannot be reduced to the former. See Maclaurin's Flux. book ii. chap. iii. art. 755. 798, &c.

It is to be obſerved, as to the fluent of $\frac{\dot{x}}{\sqrt{x} \times \sqrt{1 \pm xx}}$, or of $\frac{\dot{x}}{\overline{1 \pm z^4}|^{\frac{3}{4}}}$, that it does not appear poſſible to repreſent them by any hyperbolic and algebraic quantities. But by aſſuming an elliptic arc likewiſe, they may be conſtructed. See Maclaurin, lib. cit. art. 802.

So likewiſe to repreſent the fluent of $\frac{\dot{x}}{\sqrt{x} \times \sqrt{b^2 \pm 2ez - zz}}$ or of $\frac{\dot{p}}{\sqrt{a^2 b^2 \pm 2aep^2 - p^4}}$, we muſt have recourſe to both the hyperbolic and elliptic arcs. Maclaurin, lib. cit. art 805.

The fluent of $\frac{z^{\frac{rn}{4} - 1}\dot{z}}{\sqrt{e + fz^n}}$ is aſſignable by the arcs of conic ſections, when r is an integer number; that is, by right lines, when r is equal to four, or to any multiple of 4; by circular and parabolic arcs (reducible to logarithms) with right lines, when r is any other even number; by arcs of an equilateral hyperbola with right lines, when r is any number of the ſeries 3, 7, 11, 15, &c. and by arcs of the ſame hyperbola and right lines, with arcs of an ellipſis, that has its excentricity equal to the ſecond axis, when r is any of the numbers 1, 5, 9, 13, &c. See Maclaurin, ibid. art. 809. See FLUENT and FUNCTION.

We preſume, upon the whole, that few will be ſo ſcrupulous as to deny the Newtonian doctrine of fluxions to be intelligible, and accurately demonſtrated. But on the other hand it muſt be confeſſed, that the introduction of the notions of motion and velocity, which are mechanical, ſeems not to have thrown any light on this part of geometry. The conſideration of the limiting ratios of variable quantities, and that of the limiting polygons of curves, as it requires no other knowledge but what depends on the common properties of number and magnitude, ſo it ſeems, in all reſpects, the moſt clear and unexceptionable manner of conſidering the ſubjects treated of in the higher geometry. An eminent mathematician ſeems to declare himſelf of this opinion, when he ſays, that quadrature by limiting polygons is one of that kind which requires no other knowledge but what depends on the common properties of number and magnitude; and ſo may ſerve as an inſtance to ſhew, that no other is requiſite for the eſtabliſhment of principles for arithmetic and geometry; a truth which, though certain in itſelf, may perhaps ſeem doubtful from the nature and tendency of the preſent inquiries in mathematics. For among the moderns ſome have thought it neceſſary, for the inveſtigation of the relations of quantities, to have recourſe to very hard hypotheſes; ſuch as that of numbers infinite and indeterminate; and that of magnitudes in *ſtatu fieri*, exiſting in a potential manner, which are actually of no bigneſs. And others, whoſe names are truly to be reverenced, on account of their great and ſingular inventions, have thought it requiſite to have recourſe even to principles foreign to mathematics, and have introduced the conſideration of efficient cauſes and phyſical powers, for the production of mathematical quantities; and have ſpoken of them, and uſed them, as if they were a ſpecies of quantities by themſelves. Vide Machin, in Phil. Tranſ. N° 447.

The elements of the doctrine of fluxions have been delivered by its great author in ſo conciſe a manner, as to give occaſion to one of the moſt ingenious writers of the laſt age to repreſent it as founded on inconceivable principles, and full of falſe reaſonings. This author in a letter, under the title of the "Analyſt," publiſhed in the year 1734, has been at great pains to convince his readers that the objects, principles, and inferences of the modern analyſis by fluxions, are not more diſtinctly conceived, or more evidently deduced, than religious myſteries and points of faith. He ſays he does not controvert the truth of the concluſions, but only the logic and method of mathematicians. He aſks how they demonſtrate, what objects they are converſant with, and whether they conceive them clearly; what principles they proceed upon, how ſound they may be, and how they apply them; declaring himſelf not concerned about the truth of the theorems, but only about the way of coming at them, whether it be legitimate or illegitimate, clear or obſcure, ſcientific or tentative. He conſiders the concluſions not in themſelves, but in their premiſes; not as true or falſe, uſeful or inſignificant, but as derived from ſuch principles, and by ſuch inferences. And for as much as it may ſeem an unaccountable paradox, that mathematicians ſhould deduce true propoſitions from falſe principles, be right in the concluſion, and yet err in the premiſes, he endeavours particularly to explain how this may come to paſs, and ſhew how error may bring forth truth, though it cannot bring forth ſcience. His ſolution of the paradox is, that in the application of the method of infiniteſimals and fluxions, two errors are committed, which being equal and contrary, deſtroy each other. We cannot enter into a detail of all he ſays on theſe and many other heads, nor of all that has been ſaid on the other ſide, in defence of the method of fluxions, and of its inventor, ſir Iſaac Newton. An anſwer to the "Analyſt," under the title of "Geometry no Friend to Infidelity," appeared very early under the name of Philalethes Cantabrigienſis, ſuppoſed to be Dr. Jurin; a ſecond, by the ſame hand, in defence of the firſt, intitled, "The Minute Mathematician, or the Free-thinker no juſt Thinker," publiſhed in 1735; a Diſcourſe of Fluxions, by Mr. Robins, firſt publiſhed in 1735 (ſee his Collection of Tracts, by Wilſon, vol. ii.); a Treatiſe of ſir Iſaac Newton's, with a commentary by Mr. Colſon; and ſeveral other pieces were publiſhed on this ſubject; particularly a very full and excellent treatiſe of fluxions, by Mr. Maclaurin, late profeſſor of mathematics in the univerſity of Edinburgh, containing not only a moſt diſtinct account of the principles of fluxions, but alſo of the chief diſcoveries in geometry, and mathematical philoſophy of this age. The curious may find an elegant account of this treatiſe in the Philoſophical Tranſactions, N° 468, 469.

We preſume that Mr. Maclaurin's demonſtrations are ſufficient to ſatisfy the moſt ſcrupulous; it would exceed the bounds of our deſign to inſert them at length here; but we cannot omit mentioning what ſeems neceſſary to explain and illuſtrate the notion of fluxions; and the principles on which this method of computation is founded. In the doctrine of fluxions, magnitudes are conceived to be generated by motion; and the velocity of the generating motion is the fluxion of the magnitude. Lines are ſuppoſed to be generated by the motion of points: the velocity of the point that deſcribes the line, is its fluxion, and meaſures the rate of its increaſe or decreaſe. When the motion of a point is uniform, its velocity is conſtant, and is meaſured by the ſpace deſcribed by it in a given time: when the motion varies, the velocity at any term of the time is meaſured by the ſpace which would be deſcribed in a given time, if the motion was to be continued uniformly, from that term, without any variation. And this is analogous to the general doctrine of powers, or may be conſidered as a particular application of it. As a power which acts continually and uniformly is meaſured by the effect that is produced by it in a given time, ſo the velocity of an uniform motion is meaſured by the ſpace that is deſcribed in a given time. If the action of the power vary, then its exertion at any rate of the time is not meaſured by the effect that is produced after that term in a given time, but by the effect that would have been produced if its action had continued uniform from that term; and in the ſame manner, the velocity of a variable motion at any given term of time is not to be meaſured by the ſpace that is actually deſcribed after that term in a given time, but by the ſpace that would have been deſcribed, if the motion had continued uniformly from that term. If the action of a variable power, or the velocity of a variable motion, may not be meaſured in this manner, they muſt not be ſuſceptible of any menſuration at all. When it is ſuppoſed that a body has ſome velocity or other at any term of the time, during which it moves, it is not therefore ſuppoſed, that there can be any motion in a term, limit, or moment of time, or in an indiviſible point of ſpace; and as velocity is always meaſured by the ſpace that would be deſcribed by it, continued uniformly for ſome given finite time, it cannot ſurely be ſaid, that geometers pretend to conceive motion or velocity without regard to ſpace or time, as the author of the Analyſt often ſuggeſts. This is a ſhort view of the nature and tendency of the doctrine of fluxions, which we ſhall now proceed to explain more particularly.

We have already ſaid that lines may be conceived as generated by the motion of points; in like manner ſurfaces may be conceived as generated by the motion of lines; ſolids, by the motion of ſurfaces; angles, by the rotation of their ſides; the flux of time being ſuppoſed to be always uniform. The velocity with which a line flows, is the ſame as that of the point which is ſuppoſed to deſcribe or generate it. The velocity with which a ſurface flows, is the ſame as the velocity of a given right line; that, by moving parallel to itſelf, is ſuppoſed to generate a rectangle which is always equal to the ſurface. The velocity with which a ſolid flows, is the ſame as the velocity of a given plain ſurface, that, by moving parallel to itſelf, is ſuppoſed to generate an erect priſm or cylinder that is always equal to the ſolid. The velocity with which an angle flows, is meaſured by the velocity of a point, that is ſuppoſed to deſcribe the arch of a given circle, which always ſubtends the angle, and meaſures it. In general, all quantities of the ſame kind (when we conſider their magnitude only and abſtract from their poſition, figure, and other affections) may be repreſented by right lines, that are ſuppoſed to be always in the ſame proportion to each other as theſe quantities. They are repreſented by right lines in this manner in Euclid's Elements, in the general doctrine of proportion, and by right lines and figures in the data of that accurate geometer. In this method likewiſe, quantities of the ſame kind may be repreſented by right lines, and the velocities of the motions by which they are ſuppoſed to be generated, by the velocities of points moving in right lines. All the velocities we have mentioned are meaſured, at any term of the time of the motion, by the ſpaces which would be deſcribed in a given time, by theſe points, lines, or ſurfaces, with their motions continued uniformly from that term.

A fluxion being the velocity with which a quantity flows at any term of the time while it is ſuppoſed to be generated, is therefore always meaſured by the increment or decrement that would be generated in a given time by this motion, if it was continued uniformly from that term without any acceleration or retardation; or it may be meaſured by the quantity that is generated in a given time by an uniform motion, which is equal to the generating motion at that term.

Time is repreſented by a right line that flows uniformly, or is deſcribed by an uniform motion; and a moment or termination of time is repreſented by a point or termination of that line. A given velocity is repreſented by a given line, the ſame which would be deſcribed by it in a given time. A velocity that is accelerated or retarded, is repreſented by a line that increaſes or decreaſes in the ſame proportion. The time of any motion being repreſented by the baſe of a figure, and any part of the time by the correſponding part of the baſe; if the ordinate at any point of the baſe be equal to the ſpace that would be deſcribed, in a given time, by the velocity at the correſponding term of the time continued uniformly, then any velocity will be repreſented by the correſponding ordinate. The fluxions of quantities are repreſented by the increments or decrements, deſcribed in the foregoing paragraph, which meaſure them; and inſtead of the proportion of the fluxions themſelves, we may always ſubſtitute the proportion of their meaſures.

When a motion is uniform, the ſpaces that are deſcribed by it in any equal times are always equal. When a motion is perpetually accelerated, the ſpaces deſcribed by it in any equal times that ſucceed after one another, perpetually increaſe. When a motion is perpetually retarded, the ſpaces that are deſcribed by it in any equal times that ſucceed after one another, perpetually decreaſe.

It is manifeſt, converſely, that if the ſpaces deſcribed in any equal times are always equal, then the motion is uniform. If the ſpaces deſcribed in any equal times that ſucceed after one another perpetually increaſe, the motion is perpetually accelerated; for it is plain, that if the motion was uniform for any time, the ſpaces deſcribed in any equal parts of this time would be equal; and if it was retarded for any time, the ſpaces deſcribed in equal parts of this time that ſucceed after one another would decreaſe; both of which are againſt the ſuppoſition. In like manner it is evident, that a motion is perpetually retarded, when the ſpaces that are deſcribed in any equal times that ſucceed after one another, perpetually decreaſe. The following axioms are as evident as that a greater or leſſer ſpace is deſcribed in a given time, according as the velocity of the motion is greater or leſs.

Axiom 1. The ſpace deſcribed by an accelerated motion is greater than the ſpace which would have been deſcribed in the ſame time, if the motion had not been accelerated, but had continued uniform from the beginning of the time.

Axiom 2. The ſpace deſcribed by a motion while it is accelerated, is leſs than the ſpace which is deſcribed in an equal time by the motion that is acquired by that acceleration continued uniformly.

Axiom 3. The ſpace deſcribed by a retarded motion is leſs than the ſpace which would have been deſcribed in the ſame time if the motion had not been retarded, but had continued uniform from the beginning of the time.

Axiom 4. The ſpace deſcribed by a motion while it is retarded is greater than the ſpace which is deſcribed in an equal time by the motion that remains after that retardation, continued uniformly.

From theſe axioms, general theorems concerning motion, of uſe in the doctrine of fluxions, may be demonſtrated.

Thus, when the ſpaces deſcribed by two variable motions are always equal, or in a given ratio, the velocities are always equal, or in the ſame given ratio; and converſely, when the velocities of two motions are always equal to each other, or in a given ratio, the ſpaces deſcribed by thoſe motions in the ſame time are always equal, or in that given ratio; that when a ſpace is always equal to the ſum or difference of the ſpaces deſcribed by two other motions, the velocity of the firſt motion is always equal to the ſum or difference of the velocities of the other motions; and converſely, that when a velocity is always equal to the ſum or difference of two other velocities, the ſpace deſcribed by the firſt motion is always equal to the ſum or difference of the ſpaces deſcribed by theſe two other motions. See Mr. Maclaurin's Treatiſe of Fluxions, book i. chap. 1.

The main point, in the method of fluxions, is to obtain the fluxion of the rectangle, or product of two indeterminate quantities, ſince from thence may be derived rules for all other products and powers, be the co-efficients, or the indices, what they will, integers, or fractions, rational or ſurd; according to the manner of ſir Iſaac Newton, in the ſecond lemma of his ſecond book of Principles.

Mr. Maclaurin has therefore been very full in eſtabliſhing this point; and after what he has ſaid, we preſume that no reaſonable objection can lie either againſt the clearneſs and diſtinctneſs of the notion of fluxions, or againſt the truth of the principles, or accuracy of the demonſtrations by which their meaſures are determined. We cannot here inſert his demonſtrations at length; but as many readers may, perhaps, be deſirous of ſeeing the argument contracted into a narrow compaſs, we ſhall here give a ſummary of it, from the Philoſophical Tranſactions, N° 468, p. 331, or Martyn's Abridg. vol. viii. p. 31, &c.

A triangle that has two of its ſides given in poſition, is ſuppoſed to be generated by an ordinate moving parallel to itſelf along the baſe. When the baſe increaſes uniformly, the triangle increaſes with an accelerated motion, becauſe its ſucceſſive increments are trapezia, that continually increaſe; therefore if the motion with which the triangle flows, was continued uniformly from any term for a given time, a leſs ſpace would be deſcribed by it than the increment of the triangle, which is actually generated in that time by axiom 1; but a greater ſpace than the increment which was actually generated in an equal time preceding that term, by axiom 2. And hence it is demonſtrated, that the fluxion of the triangle is accurately meaſured by the rectangle contained by the correſponding ordinate of the triangle, and the right line which meaſures the fluxion of the baſe. The increment which the triangle acquires in any time, is reſolved into two parts; that which is generated in conſequence of the motion with which the triangle flows at the beginning of the time, and that which is generated in conſequence of the acceleration of this motion for the ſame time. The latter is juſtly neglected in meaſuring that motion (or the fluxion of the triangle at that term), but may ſerve for meaſuring its acceleration, or the ſecond fluxion of the triangle. The motion with which the triangle flows, is ſimilar to that of a body deſcending in free ſpaces by an uniform gravity, the velocity of which, at any term of the time, is not to be meaſured by the ſpace deſcribed by the body in a given time, either before or after that term, becauſe the motion continually increaſes, but by a mean between theſe ſpaces.

When the ſides of a rectangle increaſe or decreaſe with uniform motions, it may be always conſidered as the ſum or difference of a triangle and trapezium; and this fluxion is derived from the laſt propoſition. If the ſides increaſe with uniform motions, the rectangle increaſes with an accelerated motion; and in meaſuring this motion at any term of the time, a part of the increment of the rectangle that may be determined, is rejected, as generated in conſequence of the acceleration of that motion.

Thoſe who have well underſtood what precedes will not be at a loſs to conceive, that the fluxions of a curvilineal area, whether generated by an ordinate moving parallel to itſelf, or by a radius revolving round a given centre, may be determined by demonſtrations of the ſame kind. When the ordinates of the figure increaſe, the increment of the area may be reſolved in like manner into two parts, one of which only is to be retained in meaſuring the fluxion of the area, the other being rejected as generated in conſequence of the acceleration of the motion with which the figure flows.

What has been hitherto ſaid will ſet the difference between the notion of fluxions and that of infiniteſimals in a clear light. Fluxions may always be repreſented by finite quantities. The ſuppoſition of an infinitely little magnitude is too bold a poſtulatum for ſuch a ſcience as geometry. Nor have authors accounted explicitly for the truth and perfect accuracy of the concluſions derived from this conſideration. When they determine what is called the *difference*, but more accurately the fluxion of a quantity, they tell us, they reject certain parts of the element, becauſe they become infinitely leſs than the other parts. But this is no proper reaſon, not only becauſe a proof of this nature may leave ſome doubt as to the accuracy of the concluſion, but becauſe it may be demonſtrated that theſe parts ought to be neglected by them at any rate, or that it would be an error to retain them. If an accountant, that pretends to a ſcrupulous exactneſs, ſhould tell us, he had neglected certain articles, becauſe he found them to be of ſmall importance; and it ſhould appear that they ought not to have been taken into conſideration by him on that occaſion, but belong to a different account, we ſhould approve his concluſions as accurate, but not his reaſons. See Maclaurin's Treatiſe of Fluxions in the preface, and book i. chap. 12. where the method of infiniteſimals is expreſsly treated of. Mr. Maclaurin, in the firſt part of his treatiſe, conſiders fluxions in a merely geometrical form, and has demonſtrated the rules of the method with all poſſible accuracy and rigour; but as the great improvements made by this doctrine are chiefly to be aſcribed to the facility, conciſeneſs, and great extent of the methods of computation, or the algebraic part, it is neceſſary to add ſome account of theſe methods alſo.

Any quantities produced from each other by an algebraic operation, or whoſe relation is expreſſed by any algebraic form, being ſuppoſed to increaſe or decreaſe together, ſome will be found to increaſe or decreaſe by greater differences, or at a greater rate, others by leſs differences, or at a leſs rate: and while ſome are ſuppoſed to increaſe or decreaſe at one conſtant rate by equal ſucceſſive differences, others increaſe or decreaſe by differences that are always varying. Theſe rates of increaſe or decreaſe may be determined by comparing the velocities of points that always deſcribe lines proportional to the quantities as before mentioned, but they may alſo be determined without having recourſe to ſuch ſuppoſition, by a juſt reaſoning from the ſimultaneous increments or decrements themſelves.

When a quantity A increaſes by differences equal to a, 2 A increaſes by differences equal to 2 a, and manifeſtly increaſes or decreaſes at a greater rate than A in the proportion of 2 a to a or 2 to 1; and if m and n be invariable, $\frac{mA}{n}$ increaſes or decreaſes by differences equal to $\frac{ma}{n}$, and therefore at a greater or leſs rate than A in proportion as $\frac{ma}{n}$ is greater or leſs than a, or m is greater or leſs than n. This ſeems to be eaſily conceived, without having recourſe to any other conſiderations than the relation of the differences by which the quantities increaſe or decreaſe. In order therefore to avoid figurative expreſſions in the algebraic part, it will be proper to ſubſtitute in the place of the definition and axioms before mentioned, others that are rather of a more general import, but are perfectly conſiſtent with them: Thus,

Fluxions of quantities are any meaſures of their reſpective rates of increaſe, or decreaſe, while they vary or flow together.

There can be no difficulty in determining thoſe meaſures when the quantities increaſe or decreaſe by ſucceſſive differences, that are always in the ſame invariable proportion to each other. While A by increaſing becomes equal to A + a, or by decreaſing equal to A — a, 2 A becomes equal to 2 A + 2 a, or to 2 A — 2 a; and as 2 A increaſes or decreaſes at a greater rate than A in the proportion of 2 a to a; ſo the fluxion of A being ſuppoſed equal to a, the fluxion of 2 A muſt be equal to 2 a.

In the ſame manner the fluxion of $\frac{m}{n} \times A$, or of $\frac{m}{n} \times A \mp e$, (ſuppoſing m, n, and e to be invariable) is $\frac{m}{n} \times a$; and ſince m may be to n in any aſſignable ratio, a quantity may be always aſſigned that ſhall increaſe or decreaſe at a greater or leſs rate than A in any proportion, or that ſhall have its fluxion greater or leſs than the fluxion of A in any ratio. In ſuch caſes, the ratio of the fluxions and that of the differences, by which the quantities increaſe or decreaſe, are the ſame.

But while A is ſuppoſed to increaſe at a conſtant rate by any equal ſucceſſive differences, if B increaſe or decreaſe by differences that are always varying, B cannot be ſaid to increaſe or decreaſe at any one conſtant rate; and it is not ſo obvious how the fluxion of A being ſuppoſed equal to its increment a, the variable fluxion of B is to be determined. It cannot be ſuppoſed that the fluxions and differences are always in the ſame proportion in this caſe; but it is evident that if B increaſe by differences, that are always greater than the equal ſucceſſive differences by which $\frac{m}{n} \times A$ increaſes, it cannot increaſe at a leſs rate than $\frac{m}{n} \times A$; and it cannot increaſe at a greater rate than $\frac{m}{n} \times A$, while its ſucceſſive differences are always leſs than thoſe of $\frac{m}{n} \times A$. The fluxion of A being ſtill repreſented by a, the fluxion of B therefore cannot be leſs than $\frac{m}{n} \times a$ in the former caſe, or greater than $\frac{m}{n} \times a$ in the latter. The following propoſitions are conſequences of this, and will enable us to determine at what rate B increaſes, when its relation to A is known.

The ſucceſſive values of the root A being repreſented by A — a, A, A + a, &c. which increaſe by any conſtant difference a, let the correſponding values of any quantity produced from A, by any algebraic operation (or that has a dependence upon it ſo as to vary with it) be B — b, B, B + b, &c. Then if the ſucceſſive differences b, b, &c. of the latter quantity always increaſe, how ſmall ſoever a may be, then B cannot be ſaid to increaſe at ſo great a rate as a quantity that increaſes uniformly by equal ſucceſſive differences greater than b, or at ſo ſmall a rate as any quantity that increaſes uniformly by equal ſucceſſive differences leſs than b. In like manner, if the relation of the quantities is ſuch, that the ſucceſſive differences b, b, &c. continually decreaſe; then B cannot be ſaid to increaſe at the ſame rate as a quantity that increaſes uniformly by equal ſucceſſive differences greater than b, or leſs than b.

Therefore the fluxion of A being ſuppoſed equal to the increment a, the fluxion of B cannot be greater than b or leſs than b, when the ſucceſſive differences b, b, &c. continually increaſe; and cannot be greater than b or leſs than b, when theſe ſucceſſive differences always decreaſe.

In the ſame manner, if the latter quantity decreaſe while the former increaſes, and its ſucceſſive values be B + b, B — b, &c. then if the decrements b, b, &c. continually increaſe, B cannot be ſaid to decreaſe at ſo great a rate as a quantity that decreaſes uniformly by equal ſucceſſive differences greater than b, or at ſo ſmall a rate as a quantity that decreaſes uniformly by equal ſucceſſive differences leſs than b. Therefore in this caſe the fluxion of A being ſuppoſed equal to a, the fluxion of B cannot be greater than b or leſs than b. And in the ſame manner if the ſucceſſive decrements b, b, &c. always decreaſe, the fluxion of B cannot be greater than b, or leſs than b. Vide Maclaurin's Flux. book ii. chap. 1. tom. ii. p. 579, ſeq.

As the fluxions of quantities are any meaſures of the reſpective rates, according to which they increaſe or decreaſe; ſo it is of no importance how great or ſmall thoſe meaſures are, if they be in the juſt proportion or relation to each other. Therefore if the fluxions of A and B may be ſuppoſed equal to a and b reſpectively, they may be likewiſe ſuppoſed equal to $\frac{1}{2}$ a and $\frac{1}{2}$ b, or to $\frac{ma}{n}$ and $\frac{mb}{n}$.

Prop. 1. *The fluxion of the root* A *being ſuppoſed equal to* a, *the fluxion of the ſquare* A A *will be equal to* 2 A × a.

To demonſtrate this, let the ſucceſſive values of the root be $A - u$, A, $A + u$, and the correſponding values of the ſquare will be $AA - 2Au + uu$, AA, $AA + 2Au + uu$, which increaſe by the differences $2Au - uu$, $2Au + uu$, &c. and becauſe thoſe differences increaſe, it follows from what has been ſaid, that if the fluxion of A be repreſented by u, the fluxion of A A cannot be repreſented by a quantity that is greater than $2Au + uu$, or leſs than $2Au - uu$. This being premiſed, ſuppoſe, as in the propoſition, that the fluxion of A is equal to a; and if the fluxion of A A be not equal to $2Aa$, let it firſt be greater than $2Aa$ in any ratio, as that of $2A + o$ to $2A$, and conſequently equal to $2Aa + oa$. Suppoſe now that u is any increment of A leſs than o; and becauſe a is to u as $2Aa + oa$ is to $2Au + ou$, it follows, that if the fluxion of A ſhould be repreſented by u, the fluxion of A A would be repreſented by $2Au + ou$, which is greater than $2Au + uu$. But it has been ſhewn, that if the fluxion of A be repreſented by u, the fluxion of A A cannot be repreſented by a quantity greater than $2Au + uu$. And theſe being contradictory, it follows, that the fluxion of A being equal to a, the fluxion of A A cannot be greater than $2Aa$. If the fluxion of A A can be leſs than $2Aa$ when the fluxion of A is ſuppoſed equal to a, let it be leſs in any ratio of $2A - o$ to $2A$, and therefore equal to $2Aa - oa$. Then becauſe a is to u as $2Aa - oa$ is to $2Au - ou$, which is leſs than $2Au - uu$, (u being ſuppoſed leſs than o, as before) it follows, that if the fluxion of A was repreſented by u, the fluxion of A A would be repreſented by a quantity leſs than $2Au - uu$, againſt what has been ſhewn. Therefore the fluxion of A being ſuppoſed equal to a, the fluxion of A A muſt be equal to $2Aa$.

The fluxion of A and B being ſuppoſed equal to a and b, reſpectively, the fluxion of $A + B$ will be $a + b$, the fluxion of $\overline{A+B}^2$, or of $AA + 2AB + BB$, will be $2 \times \overline{A+B} \times \overline{a+b}$, or $2Aa + 2Bb + 2Ba + 2Ab$, by the laſt article. The fluxion of $AA + BB$ is $2Aa + 2Bb$, by the ſame; conſequently the fluxion of $2AB$ is $2Ba + 2Ab$; and the fluxion of AB is $Ba + Ab$. Hence if P be equal to A B, and the fluxion of P be p, then p will be equal to $B.a + Ab$, and dividing by P, or A B, we find $\frac{p}{P} = \frac{a}{A} + \frac{b}{B}$. If $Q = \frac{A}{B}$, and q be the fluxion of Q, then $QB = A$, $\frac{q}{Q} + \frac{b}{B} = \frac{a}{A}$, or $\frac{q}{Q} = \frac{a}{A} - \frac{b}{B}$; and conſequently $q = \frac{Qa}{A} - \frac{Qb}{B} = \frac{a}{B} - \frac{Ab}{BB}$, or $\frac{aB - Ab}{BB}$.

When any one of the quantities decreaſes, its fluxion is to be conſidered as negative.

The rule for finding the fluxion of a power is uſually deduced from the binomial theorem of ſir Iſaac Newton. But as this theorem, though eaſily found by induction, is not ſo eaſy to demonſtrate, it is proper to proceed upon a principle, the truth of which may be ſhewn from the firſt algebraic elements, with more facility and perſpicuity. This principle is, that if n be any integer number, and the ſum of the terms E^{n-1}, $E^{n-2}F$, $E^{n-3}F^2$, $E^{n-4}F^3$, &c. continued till their number be equal to n, be multiplied by $E - F$, the product will be $E^n - F^n$. For the terms being formed by ſubducting continually unity from the index of E, and adding it to the index of F, the laſt term will be F^{n-1}. The product of the ſum of the terms multiplied by E will be $E^n + E^{n-1}F + E^{n-2}F^2 \ldots\ldots + EF^{n-1}$; their ſum multiplied by $-F$ gives $-E^{n-1}F - E^{n-2}F^2 \ldots\ldots - EF^{n-1} - F^n$; and the ſum of theſe two products is $E^n - F^n$. Suppoſing E to be greater than F, $E^n - F^n$ will be leſs than $nE^{n-1} \times \overline{E-F}$, but greater than $nF^{n-1} \times \overline{E-F}$. For each of the terms E^{n-1}, $E^{n-2}F$, $E^{n-3}F^2$, is greater than the ſubſequent term in the ſame ratio that E is greater than F, and E^{n-1} is the greateſt term; conſequently the number of terms being equal to n, nE^{n-1} is greater than their ſum; and $nE^{n-1} \times \overline{E-F}$ is greater than their ſum multiplied by $\overline{E-F}$, or (by the laſt paragraph) greater than $E^n - F^n$. Becauſe the laſt term F^{n-1} is leſs than any preceding term, $nF^{n-1} \times \overline{E-F}$ is leſs than the ſum of the terms multiplied by $\overline{E-F}$, or leſs than $E^n - F^n$.

When n is any integer poſitive number, the root A being ſuppoſed to increaſe by any equal ſucceſſive differences, the ſucceſſive differences of the power A^n will continually increaſe. For let $A - a$, A, $A + a$ be any ſucceſſive values of the root, and $\overline{A-a}^n$, A^n, $\overline{A+a}^n$ will be the correſponding values of the power. But $\overline{A+a}^n - A^n$ is greater than $nA^{n-1}a$; as appears by ſubſtituting in the laſt paragraph $\overline{A+a}$ for E, A for F, and a for $\overline{E-F}$. In like manner, $nA^{n-1}a$ is greater than $A^n - \overline{A-a}^n$. Therefore $\overline{A+a}^n - A^n$ is greater than $A^n - \overline{A-a}^n$, and the ſucceſſive differences of the power continually increaſe.

Prop. II. *The fluxion of the root* A *being ſuppoſed equal to* a, *the fluxion of the power* A^n *will be* naA^{n-1}.

For if the fluxion of A^n can be greater than naA^{n-1}, let the exceſs be equal to any quantity r; ſuppoſe o equal to the exceſs of $\sqrt[n-1]{A^{n-1} + \frac{r}{na}}$ above A, and conſequently $\overline{A+o}^{n-1} = A^{n-1} + \frac{r}{na}$. Then $na \times \overline{A+o}^{n-1}$ will be equal to $naA^{n-1} + r$, the fluxion of A^n. Let u be any increment of A leſs than o; and becauſe a is to u as $na \times \overline{A+o}^{n-1}$ to $nu \times \overline{A+o}^{n-1}$, it follows (from what has been ſaid) that if the fluxion of A be now repreſented by the increment u, the fluxion of A^n will be repreſented by $nu \times \overline{A+o}^{n-1}$, which is greater than $nu \times \overline{A+u}^{n-1}$, and this laſt is itſelf greater than $\overline{A+u}^{n-1} - A$. But when the ſucceſſive values of the root are $A - u$, A, $A + u$, thoſe of the power are $\overline{A-u}^n$, A^n, $\overline{A+u}^n$, the ſucceſſive differences of which continually increaſe: conſequently if the fluxion of A be repreſented by u, the fluxion of A^n cannot be repreſented by a quantity greater than $\overline{A+u}^n - A^n$, or leſs than $A^n - \overline{A-u}^n$. And theſe being contradictory, it follows, that when the fluxion of A is ſuppoſed equal to a, the fluxion of A^n cannot be greater than naA^{n-1}. If it can be leſs than naA^{n-1}, let it be equal to naA^{n-r}, or (by ſuppoſing $o = A - \sqrt[n-1]{A^{n-1} - \frac{r}{na}}$) to $na \times \overline{A-a}^{n-r}$. Then u being ſuppoſed leſs than o, if the fluxion of A was repreſented by u, the fluxion of A^n would be repreſented by $nu \times \overline{A-o}^{n-1}$, which is leſs than $nu \times \overline{A-u}^{n-1}$ (becauſe we ſuppoſe u to be leſs than o) and therefore leſs than $A^n - \overline{A-u}^n$. But this is repugnant to what has been demonſtrated. Therefore the fluxion of A being ſuppoſed equal to a, the fluxion of A^n muſt be equal to $n\,a\,A^{n-1}$.

Prop. III. *The fluxion of* A *being ſuppoſed equal to* a, *the fluxion of* $A^{\frac{m}{n}}$ will be $\frac{m\,a}{n} \times A^{\frac{m}{n}-1}$.

Firſt, let the exponent $\frac{m}{n}$ be any poſitive fraction whatſoever, ſuppoſe $A^{\frac{m}{n}} = K$; conſequently $A^m = K^n$; and the fluxion of K being ſuppoſed equal to k, $m\,a\,A^{m-1} = n\,k\,K^{n-1}$, and k, or the fluxion of $A^{\frac{m}{n}}$, will be equal to $\frac{m\,a\,A^{m-1}}{n\,K^{n-1}} = \frac{m\,a\,K}{n\,A} = \frac{m}{n} \times a\,A^{\frac{m}{n}-1}$. When $\frac{m}{n}$ is negative, let it be equal to $-r$; and ſuppoſe $A^{-r} = K$, or $1 = A^r K$, then taking the fluxions, $r\,A^{r-1}\,a\,K + k\,A^r = 0$, and $k = -\frac{r\,A^{r-1}\,a\,K}{A^r} = -r\,A^{-r-1}\,a = \frac{m}{n} \times a\,A^{\frac{m}{n}-1}$.

Prop. IV. *Suppoſing* P *to be the product of any factors A, B, C, D, E, &c. and the fluxions of P, A, B, C, &c. reſpectively equal to* p, a, b, *&c. then will* $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{d}{D}$, &c.

Let Q be equal to the product of all the factors of P, the firſt A excepted, that is, ſuppoſe $P = A\,Q$. Suppoſe R equal to the product of all the factors, the firſt two, A and B, excepted; that is, let $P = A\,B\,R$, or $Q = B\,R$. In the ſame manner let $R = C\,S$, $S = D\,T$, and ſo on. Then the fluxions of Q, R, S, T, &c. being ſuppoſed reſpectively equal to q, r, s, t, &c. it follows that $\frac{p}{P} = \frac{a}{A} + \frac{q}{Q} =$ (becauſe $\frac{q}{Q} = \frac{b}{B} + \frac{r}{R}$) $\frac{a}{A} + \frac{b}{B} + \frac{r}{R} =$ (becauſe $\frac{r}{R} = \frac{c}{C} + \frac{s}{S}$) $\frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{s}{S} =$ (becauſe $\frac{s}{S} = \frac{d}{D} + \frac{t}{T}$) $\frac{a}{A} + \frac{b}{B} + \frac{c}{C} + \frac{d}{D} + \frac{t}{T}$, and ſo on. Therefore $\frac{p}{P}$ is equal to the ſum of the quotients when the fluxion of each factor is divided by the factor itſelf.

If the factors be ſuppoſed equal to each other, and their number be equal to n, then $P = A^n$, and by the laſt propoſition $\frac{p}{P} = \frac{n\,a}{A}$; conſequently $p = \frac{n\,P\,a}{A} = n\,a\,A^{n-1}$, as was before demonſtrated.

Prop. V. *If* $P = \frac{A\,B\,C,\ \&c.}{K\,L\,M,\ \&c.}$ *and the fluxions of the reſpective quantities be expreſſed by the ſmall letters* p, a, b, c, &c. *as before, then* $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} - \frac{k}{K} - \frac{l}{L} - \frac{m}{M}$, &c.

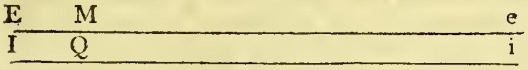
For PKLM, &c. = ABC, &c. and $\frac{p}{P} + \frac{k}{K} + \frac{l}{L} + \frac{m}{M}$, &c. $= \frac{a}{A} + \frac{b}{B} + \frac{c}{C}$, &c. whence by tranſpoſition $\frac{p}{P} = \frac{a}{A} + \frac{b}{B} + \frac{c}{C} - \frac{k}{K} - \frac{l}{L}$, &c. Maclaurin, ibid.

The notation we have hitherto uſed is the ſame as ſir Iſaac Newton's, in the ſecond lemma of the ſecond book of his Principles. But it is generally more convenient to diſtinguiſh fluxions from other algebraic expreſſions, and in ſuch manner, that the ſecond and higher fluxions may be repreſented ſo as to preſerve the original fluent in view. Hence ſir Iſaac Newton, in his laſt method, repreſented variable or flowing quantities by the final letters of the alphabet, as x, y, z; their firſt, ſecond, &c. fluxions, reſpectively, by $\dot{x}, \dot{y}, \dot{z}$; and $\ddot{x}, \ddot{y}, \ddot{z}$, &c. But as this doctrine has been conteſted and repreſented by the author of the Analyſt, as inconceivable and ſophiſtical, we thought it proper more fully to explain and demonſtrate the principles thereof, from Mr. Maclaurin's excellent treatiſe on this ſubject.

It is to be obſerved, that the fluxions of powers are commonly delivered in an algebraic form; but this is not neceſſary. The ſame may be done geometrically, by ſuppoſing a ſeries of lines in geometric progreſſion, the firſt term of which is invariable. Then if the ſecond term be ſuppoſed to increaſe uniformly, all the ſubſequent terms will increaſe with an accelerated motion. The velocities of the points that deſcribe thoſe lines being compared, it may be demonſtrated from common geometry, that the fluxions of any two terms, are in a ratio compounded of the ratio of thoſe terms, and of the ratio of the numbers that expreſs how many terms precede them reſpectively in the progreſſion. Thus, if, A, B, C, D, E, &c. repreſent any lines in geometric progreſſion, the firſt term (A) of which is invariable, then will the fluxion, for inſtance, of E be to the fluxion of D as 4 E is to 3 D, and the fluxion of E will be to the fluxion of B, as 4 E to B. The analogy between powers in algebra and lines in geometric progreſſion is ſufficiently known. Thus, A being invariable may be called unity, or 1; let $B = x$, then will $C = x\,x$, $D = x^3$, $E = x^4$, &c. and conſequently the fluxion of E, or x^4, will be to the fluxion of B or x, as $4\,x^4$ is to x, or as $4\,x^3$ is to 1. Therefore if the fluxion of x be expreſſed by $\dot{x}$, the fluxion of x^4 will be expreſſed by $4\,x^3\,\dot{x}$, agreeably to the common algebraic method of expreſſion. Vide Mr. Maclaurin's Flux. book i. chap. 6. See alſo the Preſent State of the Rep. of Let. Oct. 1735, p. 248, 249, &c.

If the fluxion of B, or the ſecond term of the progreſſion be invariable, every term of the progreſſion will have fluxions of as many degrees as there are terms that precede it in the progreſſion. And the increment of any term, generated in a given time, may be reſolved into as many parts as it has fluxions of different orders; and each part may be conceived to be generated in conſequence of its reſpective fluxion. Hence fluxions of all orders may be illuſtrated and meaſured.

As to the higher order of fluxions, it is to be obſerved, that when a motion is accelerated or retarded continually, the velocity may itſelf be conſidered as a variable or flowing quantity, and may be repreſented as a line that increaſes or decreaſes continually. When a velocity increaſes uniformly, ſo as to acquire equal increments in equal times, its fluxion is meaſured by the increment which is generated in any given time. In this caſe the velocity is repreſented by a line that is deſcribed by an uniform motion; and its fluxions by the conſtant velocity of the point that deſcribes the line, or by the ſpace which this point deſcribes in a given time. When a velocity is not accelerated uniformly, but acquires increments in equal times, that continually increaſe or decreaſe, then its fluxion at any term of the time is not meaſured by the increment which it actually acquires, but by that which it would have acquired, if its acceleration had been continued uniformly from that term for a given time. And in the ſame manner, when a motion is retarded continually, the quantity by which it would be diminiſhed in a given time, if its retardation was continued uniformly for any term, meaſures its fluxion at that term. While the point M deſcribes the line E e, let the point Q deſcribe the line I i, ſo that I Q may be always equal to the ſpace that would be deſcribed by the motion of M, if it was continued uniformly for a given time. Then I Q ſhall always repreſent the velocity of M, and the velocity of the point Q ſhall repreſent the fluxion of the velocity of M; which therefore is meaſured, at any term of the time, by the ſpace which would be deſcribed by Q, with its motion at that term continued uniformly for a given time. The velocity of M is the fluxion of E M; and therefore the velocity of Q repreſents the fluxion of the fluxion of E M. (See the beginning of this article.) Thus, when a fluxion of a quantity is variable, it may be conſidered itſelf as a fluent, and may have its fluxion which is called the ſecond fluxion of that quantity. This may alſo have its fluxion, which is called the third fluxion of the firſt fluent; and motions may be eaſily conceived to vary in ſuch a manner, as to give ground for admitting ſecond fluxions, and thoſe of any higher order. And as the firſt fluxion of a variable quantity, at any term of the time, is meaſured by the increment or decrement, which would be produced, if the generating motion was continued uniformly from that term, for a given time; ſo its ſecond fluxion may be meaſured by twice the difference betwixt this increment, or decrement, and that which would be produced, if the acceleration, or retardation, of the generating motion was continued uniformly from that term for the ſame time. Maclaurin, lib. cit. book i. chap. 1. § 70. 75. and chap. 5, 6.



See a farther illuſtration of ſecond and third fluxions, in the ſame author (chap. 3, and 4.) deduced from the conſideration of the fluxions of ſolids.

The author of the Analyſt has repreſented the notions of ſecond and third fluxions as inextricable myſteries; and, indeed, when ſome ſpeak of the velocities of velocities, &c. it is not eaſy to ſay what they mean. But it is to be obſerved, that the firſt fluxion of any fluent is not the velocity of that fluent, but the velocity of the motion by which the fluent is conceived to be generated. And in like manner, the ſecond fluxion of that fluent is not the velocity of the velocity of this fluent, but the velocity of the motion by which the quantity is generated that always repreſents its firſt fluxion; and ſo of the reſt.

When the fluxion of a quantity is variable, it may be conſidered as a fluent; and its fluxion, which is the ſecond fluxion of the propoſed quantity, may be determined by the preceding propoſitions. Thus the fluxion of A being ſuppoſed equal to a, the fluxion of A A is 2 A a; and if A be ſuppoſed to increaſe at an uniform rate, or its fluxion a to be invariable, 2 A a will increaſe by equal ſucceſſive differences; conſequently its fluxion, or the ſecond fluxion of A A, will be equal to any of theſe differences, as to $2a \times \overline{A+a} - 2Aa$, or $2aa$. If a be variable, let its fluxion be equal to z, and the fluxion of 2 A a (or ſecond fluxion of A A) will be $2aa + 2Az$. In the ſame manner the fluxion of A being conſtant, the fluxion of $n A^{n-1}a$, or the ſecond fluxion of A^n, is $na \times \overline{n-1} \times A^{n-2}a$, or $n \times \overline{n-1} \times aaA^{n-2}$; the fluxion of this, or third fluxion of A^n, is $n \times \overline{n-1} \times \overline{n-2} \times a^3A^{n-3}$. And the fluxion of A^n of any order denoted by m, is $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times a^mA^{n-m}$, where the factors in the coefficient are to be continued till their number be equal to m. When n is in any integer poſitive number, the fluxion A^n, of the order n, is invariable and equal to $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times a^n$. The quantities that repreſent theſe fluxions of A^n depend on a, which repreſents the fluxion of A. When A remains of the ſame value, the firſt fluxion of A^n is greater or leſs in the ſame proportion, as a is ſuppoſed to be greater or leſs; the ſecond fluxion of A^n, is in the duplicate ratio of a; and its fluxion of the order m, is as a^m. If a be variable, but z the fluxion of a, or the ſecond fluxion of A, be conſtant; then the fourth fluxion of A A will be conſtant and equal to $6zz$; for we found that the ſecond fluxion of A A was $2aa + 2Az$; the fluxion of this is $4az + 2az$, or $6az$; and the fluxion of this is $6zz$. In like manner, the ſixth fluxion of A^3 will be conſtant in this caſe, and equal to $90z^3$.

The ſecond differences of any quantity B are the ſucceſſive differences of its firſt differences; and as the fluxion B increaſes when its ſucceſſive differences increaſe; ſo its ſecond fluxion, or its fluxions of any higher order increaſe when its ſecond or higher differences increaſe. If we arrive at differences of any order that are conſtant, the fluxion of the ſame order is conſtant, and is expreſſed by that difference. Thus, when A is ſuppoſed to increaſe by conſtant differences equal to a, and its fluxion is ſuppoſed equal to a, the ſecond difference of A A (or $\overline{A+a}^2 - 2AA + \overline{A-a}^2$) is $2aa$, which is likewiſe its ſecond fluxion; and the third difference of A^3 is $6a^3$, which is its third fluxion. When n is any integer and poſitive number, the fluxion of A^n of the order n is equal to the fluxion of any of its firſt differences of the order $n-2$, and ſo on. For the fluxion of $\overline{A+a}^n - A^n$ (one of the firſt differences of A^n) of the order $n-1$ is $n \times \overline{n-1} \times \overline{n-2}$, &c. $\times \overline{\overline{A+a}^{n-n+1} - A} \times a^{n-1} = n \times \overline{n-1} \times \overline{n-2}$, &c. $\times a^n$, where the coefficients are ſuppoſed to be continued till their number be $n-1$, ſo that the laſt muſt be 2. And this we found to be the fluxion of A^n of the order n, in the preceding paragraph. In the ſame manner the fluxion of $\overline{A+a}^n - 2A^n + \overline{A-a}^n$ (the ſecond difference of A^n) of the order $n-2$, is equal to the fluxion of $\overline{A+a}^n - A$ of the order $n-1$; and conſequently equal to the fluxion of A^n of the order n. Theſe fluxions are invariable and equal to the laſt or invariable differences. But in other caſes the fluxions of A^n of any order are leſs than its ſubſequent differences of the ſame order, but greater than the preceding differences, as before mentioned. Maclaurin's Flux. art. 720, ſeq.

By ſuppoſing one of the variable quantities to flow uniformly, it will have no ſecond or higher fluxions, and the higher fluxions depending on it will be expreſſed in a more ſimple manner. Thus the fluxion of x being ſuppoſed conſtant, the firſt fluxion of x^n being $nx^{n-1}\dot{x}$, its ſecond fluxion will be $n \times \overline{n-1} \times \dot{x}^2x^{n-2}$, and its fluxion of any order m will be $n \times \overline{n-1} \times \overline{n-2} \times \overline{n-3}$, &c. $\times \dot{x}^mx^{n-m}$, where the factors in the coefficient are to be continued till their number be equal to m.

The ſecond or higher fluxions of quantities may be found by particular theorems (without computing thoſe of the preceding orders) as may be ſeen by the laſt example. See farther in Maclaurin's Fluxions, art. 734. See rule 10, in the beginning of this article.

The uſe of the direct method of fluxions, ſee ſpecified under the articles Evolute, Inflection, Maximis and Minimis, and Tangents.

Thoſe of the inverſe method, ſee under Quadrature and Rectification *of Curves.*

FLY, in *Natural Hiſtory*. See Musca; ſee alſo Entomology.

Fly, *Fire*. See Fire-*flies*.

Fly, *Fiſhing*. See Fishing-*fly*.

Fly, *Flower*, in *Natural Hiſtory*, the name of a ſmall but very beautiful fly, deſcribed by Cluſius. It is black, and has two ſilvery wings, two white eyes, ſeven yellow ſpots on the back, and a black one in the middle.

Fly, *Harveſt*. See Harvest.

Fly, *Humble-bee*. See Humble-bee-*fly*.

Fly, *Lantern*. See Lantern-*fly*.

Fly, *Roſe*. See Rose.

Fly, *Scorpion*. See Scorpion-*fly*.

Flies, *Eggs of*. See Eggs.

Flies, *Eyes of*. See Eye.

Flies, *Legs of*. See Leg.

Flies, *Rings of*. See Rings.

Fly, *St. Mark*, the name of a ſpecies of fly, which makes its firſt appearance every year about St. Mark's day, and is then ſeen in vaſt numbers; it is ſomewhat ſmaller than the large blue fleſh-fly, and has no trunk, but a mouth without teeth: notwithſtanding this ſeemingly innocent organization, the creature does great miſchief, and every gardener knows the effects of it at one time or other.

Fly, in *Mechanics*, is an apparatus employed to equalize and regulate the velocity and power of many machines which require ſuch regulation from the inequality either of the moving power, or of the reſiſtance it has to overcome. A fly acts upon the principle that any body, being put in motion with a certain velocity at a certain expence of power, will continue to move until its motion is ſtopped by a reſiſtance equal to its momentum or ſum of the power and velocity which firſt cauſed its motion. This principle is carried into effect by various forms of the apparatus; the maſs being generally made to revolve upon a centre, and the parts on the oppoſite ſides of the centre being balanced. Two, four, or any other number of equal weights, placed on the oppoſite ends of arms or radii which are affixed to an axis, conſtitute a fly. If the weights be ſuppoſed to touch each other, or a hoop or ring of one piece be ſubſtituted, its form will be much improved; and it is now termed a fly-wheel, and is the manner in which the fly is moſt generally uſed.

The friction or reſiſtance which the air oppoſes to any body in motion, and the friction of the pivots which ſupport the axis of a fly-wheel, are conſiderable deductions from the power communicated to it; ſo that inſtead of a fly-wheel gaining power, as ſome imagine, it requires a conſtant exertion of power to keep it in motion, even when no other reſiſtance is applied to prevent it. For this reaſon a mechanic ſhould never introduce a fly-wheel into a machine, unleſs the advantages to be derived from its action are greater than the actual loſs of power it occaſions. As an inſtance, we will ſuppoſe a heavy ſtamper or hammer to be raiſed by a water-wheel; the action of the water upon the wheel is conſtant and uniform, and whilſt the machine is lifting the hammer, this action is nearly balanced; but the inſtant the hammer falls, the principal reſiſtance or load to the water-wheel is removed, and the water urges it rapidly forwards, until it meets the hammer again, when it is ſuddenly checked, and moves with diminiſhed velocity, until it again loſes its load. In ſuch a caſe as this the fly-wheel is of great ſervice, for in the interval while the reſiſtance to the water-wheel is not in action, it prevents its acceleration, the power of the water-wheel being employed to give a momentum to the fly-wheel; and as ſoon as the velocity of the water-wheel is at all diminiſhed, by the return of its load, the momentum of the fly acts to carry it forwards, and continue the motion with the ſame velocity until the momentum is expended in aſſiſting the water-wheel. By this time the hammer has fallen, and the water-wheel left at liberty to communicate a new impulſe to the fly.

In this, and many other ſimilar caſes, the power expended in giving motion to the fly is trifling, compared with what it preſerves from complete loſs during the interval in which the reſiſtance of the water-wheel is inactive. If the water-wheel had been applied to raiſing a ſtamper, the equalization might have been made by uſing three or four ſtampers in place of one, and adapting the machine to raiſe them ſucceſſively: by this means, the load being divided and applied continually, the motion would be rendered nearly as uniform as by a fly-wheel, and without its inconveniences.

In this manner in many machines where fly-wheels are introduced, they are not abſolutely neceſſary, ſaw mills, pump mills, &c., where a ſingle machine which only acts in one direction is to be moved, all theſe might be improved by dividing the load, and cauſing its parts to act in ſucceſſion; and for pump mills the double acting pumps may be uſed to great advantage, in lieu of a ſingle one with a fly-wheel.

It is a great object in conſtructing flies to form them ſo as to preſent the ſmalleſt reſiſtance to the air. For this purpoſe a wheel ſhould always be uſed; the ring ſhould be ſmooth and truly circular without any projecting nuts, &c.; the radii ſhould be made to preſent a thin edge to the air, and the whole ſhould be made of metal, that the greateſt weight may be contained under the ſmalleſt ſurface; and for this purpoſe, if the ſection of the ring is a circle, the ſmalleſt ſurface will be expoſed to form a reſiſtance to the air, the radii ſhould be of an elliptic figure, the narroweſt edge meeting the air. This form of a fly-wheel is uſed by Meſſrs. Murray and Wood of Leeds in the ſteam engines which they erect, and is included in a patent they have for ſteam engines, and though they may have been the firſt who applied it to ſteam engines, the idea is not original, as Mr. Sully gave that form to his watch-balances many years ago.

A fly-wheel ſhould be caſt in one piece of metal, if it is not too weighty; in which caſe, the pieces of which it is compoſed ſhould be melted together in the moſt ſolid manner imaginable, leſt the centrifugal force of ſuch a large maſs, moving with a conſiderable velocity, ſhould endanger the ſeparation of its pieces. If by any accident the bolts connecting them become looſe, or are weakened by ruſting, (this failure, which has ſome times happened, is truly dreadful,) the force with which a fragment of the wheel is projected is irreſiſtible; and if it ſhould chance to ſtrike the walls of the building, it would be in danger of total deſtruction. A method has been lately introduced of putting fly-wheels together, by dove-tailing inſtead of ſcrew-bolts. The arms are faſtened into the ring, and the ſegments of the ring faſtened together by a ſyſtem of dove-tails, which only admit of being put together in one direction, which is contrary to that in which the centrifugal force acts. Precaution on this head will not appear uſeleſs, when it is conſidered that fly-wheels of 8 and 10 tons in weight in the ring and arms are common in the machinery uſed for the manufacturing of iron, and their circumference moving at the rate of 300 feet per minute. We have ſeen one applied to a ſteam engine of 16 tons in weight, and moving much quicker. The ring is uſually in ſix pieces, of about a ton each, and connected only by a few wrought iron bolts as it revolves. The weight of theſe pieces, conſtantly acting in new directions, independent of the centrifugal force, is a ſevere ſtrain upon the bolts and parts forming the connection.

The mode of calculating the ſize, weight, and velocity of a fly-wheel, proper to regulate the motion of any given piece of machinery, muſt be very intricate; though it is not uſual for practical mechanics to employ calculation, their fly-wheels being adopted from the proportion of ſome other ſimilar machine, which is found to anſwer its purpoſe. This ſubject has not been inveſtigated in the elementary works on mechanics that we have ſeen; though, from its great practical utility, it would well repay the labour of any competent analyſt, who would turn his thoughts to the ſubject.

The fly-wheel only acts when the velocity of the machine is variable: for having naturally a tendency to preſerve an uniform velocity in itſelf, it will tend to move the machine connected with it in the ſame manner. On this account, it would be abſurd to employ a fly-wheel in any machine where the power and reſiſtance are always uniform, or bear the ſame proportion to each other: hence the motion of any machine, deriving aſſiſtance from a fly-wheel, cannot be perfectly regular, as it is only when a change in the velocity of the machine takes place that the fly-wheel has any action, and the power it exerts to continue the motion is greater or leſs, as the change in velocity of the machine is more ſudden or ſlow.

In rolling mills, where the power which will be required is not to be eſtimated, and at the ſame time the reſiſtance to the mill is not in action, a great proportion of the time, a large and heavy fly-wheel is neceſſary; in this caſe it acts as a collector of power. If the workman has an extraordinary large piece of metal to be rolled, he ſuffers the mill to work without obſtruction a few revolutions of the water-wheel, that the fly-wheel may acquire ſuch a velocity as will overcome the reſiſtance to be oppoſed to it, which is perhaps far beyond the power of the mill to accompliſh without ſuch aid.

The coining preſs, or fly-preſs, is another example of the ſame ſort. The momentum of a fly, put in motion by a continued action of ſeveral ſeconds, is expended in an inſtantaneous ſtroke upon a piece of metal, acting with aſtoniſhing power. The ſledge hammer may be inſtanced as a ſimilar caſe. The power given to the hammer in a certain ſpace of time, is exerted in an infinitely ſhort time, and with proportional power.

In all caſes where the moving force is variable, a fly-wheel muſt be added, unleſs the reſiſtance can be adapted to vary in the ſame degree. A man, turning a winch by his hand, or a crank by his foot, can exert three times the power in many poſitions which he can in others, particularly in the latter caſe: a fly-wheel is, therefore, of eſſential ſervice, and the rotative motion obtained from the ſteam engine is wholly dependent on the aſſiſtance of the fly-wheel.

The fly may be applied to ſeveral ſorts of engines, whether moved by men, horſes, wind, or water; and is of great uſe in thoſe parts of an engine which have a quick circular motion, and where the power or reſiſtance acts unequally in the different parts of a revolution. In this caſe the fly, without adding any new force, becomes a moderator, making the motion of revolution almoſt every where equal and uniform: thus the engine becomes more eaſily and conveniently acted upon and moved by the impelling force; and this is the only advantage obtained by the fly. The beſt form of this appendage to machines is that of a wheel or circle, of a proper ſize, as this will not only be leſs reſiſted by the air, but by being continuous, and the weight every where equally diſtributed through the perimeter of the wheel, the motion will be more eaſy, uniform, and regular. In this form, the fly is moſt aptly applied to the perpendicular drill, which it likewiſe ſerves to keep upright by its centrifugal force; as alſo to a windlaſs or common winch, where the motion is quick; for in pulling upwards from the lower part, a perſon can exerciſe a greater power than in thruſting forward in the upper quarter; when, of courſe, part of his force would be loſt, if it were not accumulated and maintained in the equable motion of the fly. Hence, by this application of force, a man may work all day in drawing up a weight of 40 lbs. whereas 30 lbs. would occaſion to him greater labour in a day without the fly.

The force of a fly, when joined with the ſcrew, for ſtamping the image upon coins, may be calculated thus; ſuppoſe its two arms to be each fifteen inches long, meaſuring from the centre of the weights to the axis of the motion, and the weights to be fifty pounds each, and the diameter of the axis preſſing upon the dye to be one inch; if every ſtroke be made in half a ſecond, and the weights deſcribe an half circumference, which will in this caſe be of four feet, the velocity will at the inſtant of the ſtroke be at the rate of eight feet in a ſecond, and, therefore, the momentum eight hundred; but the arms of the fly being as levers, one brachium of which is fifteen inches long, whilſt the other, *viz.* the ſemi-axis, is but half an inch, we muſt increaſe this force thirty times, which will give twenty-four thouſand; an immenſe force, equal to that of a hundred pound weight falling a hundred and twenty feet, or near two ſeconds in time; or to that of a body of ſeven hundred and fifty pounds, falling $16\frac{1}{12}$ feet, or one ſecond in time.

Some of theſe engines for coining crown-pieces have the arms of the flies five times as long, and the weights twice as heavy as thoſe here mentioned, ſo that the effect is ten times greater. Deſaguliers' Exper. Philoſoph. vol. i. p. 245. 339.

Beſides the utility of fly-wheels, as regulators of machinery, they have been employed for accumulating or collecting power. If motion be communicated to a fly-wheel by means of a ſmall force, and if this force be continued till the wheel has acquired a great velocity, ſuch a quantity of motion will be accumulated in its circumference as to overcome reſiſtances, and produce effects, which could never have been accompliſhed by the original force. So great is this accumulation of power, that a force equivalent to 20 pounds, applied for the ſpace of 37 ſeconds to the circumference of a cylinder, 20 feet diameter, which weighs 4713 pounds, would, at the diſtance of one foot from the centre, give an impulſe to a muſket-ball equal to that which it receives from a full charge of gun-powder. In the ſpace of ſix minutes ten ſeconds, the ſame effect would be produced, if the cylinder were driven by a man who conſtantly exerted a force of 20 pounds at a winch one foot long. This has been demonſtrated by Mr. Atwood in his "Treatiſe on Rectilineal and Rotatory Motion." This accumulation of power is exemplified in the Sling; and alſo in the machine for coining, as already ſtated. Meſſrs. Watt and Boulton have employed a new kind of fly, called the "Conical Pendulum," for regulating the admiſſion of ſteam into the cylinder of the STEAM-*engine*, which ſee.

Notwithſtanding the great advantages of fly-wheels, both as regulators of machines, and collectors of power, their utility wholly depends upon the poſition which is aſſigned them, with reſpect to the impelled and working points of the engine. This poſition depends altogether on the ſtructure of the machinery. It may be obſerved, however, in general, that where fly-wheels are employed to regulate machinery, they ſhould be near the impelling power. And, when uſed to accumulate force in the working point, they ſhould not be far diſtant from it. In hand-mills for grinding corn, the fly is for the moſt part very injudiciouſly fixed on the axis to which the winch is attached. It ſhould always be faſtened to the upper mill-ſtone, ſo as to revolve with the ſame rapidity. In the firſt poſition, indeed, it muſt equalize the varying efforts of the power which moves the winch, but when it is attached to the turning mill-ſtone, it not only does this, but contributes very effectually to the grinding of corn. Ferguſon's Mechanics, by Brewſter, vol. i.

Fly-*preſs*, an inſtrument of moſt extenſive uſe in many manufactures for ſtamping or cutting ſmall articles in metal. It conſiſts of a chiſſel, punch, or cutting tool, moved by a ſcrew, which is furniſhed with weights acting as a fly. When theſe are turned rapidly round, the tool exerts an immenſe power on any ſubſtance ſubjected to its action. The preſs is often uſed without the fly, and is ſtill called, though improperly, a fly-preſs.

Figs. 1, 2, 3, and 4, of *Plate* XXVII. (*Mechanics*) repreſent a fly-preſs with its minor parts, ſuch as is in common uſe in Sheffield in a variety of manufactures, which we ſhall enumerate in their proper heads. A AA, *figs.* 1 and 2, is a maſſive frame of caſt-iron, of the dimenſions expreſſed by the drawing and ſcale annexed. In the upper part of this frame a female ſcrew, or ſcrew-box is fitted, and the ſcrew B paſſes through it. The top of the ſcrew is fixed to a curved handle *a b c*, furniſhed with a heavy weight *c*, which acts as a fly, when the handle is turned round by a workman ſitting before a bench or table, on which the preſs is faſtened by two bolts paſſing through projecting pieces, *d*, *d*, of the iron frame. At *e* a piece of iron is faſtened, projecting from the iron frame, and ſupporting a ſocket for the ſquare iron ſlider *f* to ſlide up and down through, and to avoid any ſhake in its motion. The ſocket can be at any time made to fit the ſlider by the four ſcrews (ſeen in both figures) which draw the two halves of the ſocket together. The upper end of the ſlider *f* is connected with the ſcrew B, by a joint which allows the ſcrew to turn round independent of the ſlider, but obliges the latter to accompany the ſcrew in its vertical motion, either aſcending or deſcending. At the lower end of the ſlider *f*, the punch or tool, *g*, is faſtened by a clamp-ſcrew: it acts in combination with another tool, *h*, called the die, fixed below it in the frame by four ſcrews *i*, as ſhewn in *fig.* 3, which allow of its adjuſtment in the true poſition beneath the tool. The lower tool, or die, *i*, is fitted into a block, which is held by the four ſcrews, and by this means the die can be quickly changed without diſturbing the preſs. The upper tool can be removed in the ſame manner by releaſing the clamp-ſcrew which holds it in the ſlider *f*.

Theſe, as the eſſential parts of the fly-preſs and its operation, are too ſimple to require much explanation. The workman, being ſeated before the preſs, holds the piece of metal to be acted upon in his left-hand, and draws the handle *a* towards him with the other: this, by turning the ſcrews, forces the punch down upon the metal, and the momentum of the weight *c* cauſes it to act with ſuch force, that the reſiſtance of punching through a thick piece of metal is ſcarcely perceptible upon the handle. The principal part of this power is gained by the ſcrew as well as by the accumulated *vis inertiæ* of the fly. For many purpoſes where the reſiſtance is but ſlight, the weight *c* is removed: the preſs acts ſimply by the lever and ſcrew. It ſtill retains, though improperly, the name of the fly-preſs. This alteration is intended to give the workman ſuch a command of the machine, that he can more quickly reverſe the motion than will be the caſe when the fly is in action. This can be only done where the reſiſtance is very ſlight. Nails, the teeth of ſaws, open-work of fenders, and ſimilar articles, are cut with appropriate tools in this manner. *Figs.* 4. and 5. repreſent ſome of the tools to be uſed in the preſs; *a* is a punch, and *b* the ſocket, or die, for perforating a circular hole, either with the view of forming a hole in a metallic plate for rivetting, &c. or to preſerve the piece ſtruck out for boat-builders rivets, waſhers, or collets, buttons, ornamental ſtuds for fenders, and a vaſt variety of other purpoſes in which ſmall circles of metal are uſeful. Theſe pieces are forced through the die, and fall through a hole made in the frame A, into a ſmall drawer placed beneath the bench for their reception.

C, D, are another pair of tools, in which the die D is emboſſed to the ſhape intended to be impreſſed on the ornamental ſtuds cut by the former punch. Theſe are forced into it by the flat ſurface of the upper tool C. In ſome caſes this tool at the ſame time punches a ſmall hole by which the ſtud is to be rivetted to the article it is intended to ornament, and the die muſt then be perforated with a ſmall hole to convey away the fragment of metal forced out by the punch. In many caſes theſe ſtuds are intended to be faſtened on by a ſmall pin projecting from their lower ſurface: in this caſe they are forged or caſt in the manner of a nail, and the point or ſhank of a ſtud being inſerted into a hole. In the lower die the upper tool is forced down upon it, and imprints its figure upon its head: it is plain that here the upper tool muſt be emboſſed inſtead of the lower. A concave or convex figure is given to the ſmall circles before-mentioned, by making the end of the punch *a*, *fig.* 4. concave or convex, and the preſſure it exerts to force out a piece of plate is ſufficient to impoſe upon the fragment the figure of the punch. In *fig.* 5. E, F are another ſmall pair of dies for punching ſmall circular holes, and G H is a ſimilar pair of tools for ſquare holes.

The manner of punching out the concave ſhells for ſmall buttons, which are termed *ſhell* buttons, is deſerving of notice. Firſt, ſmall circles, (one of which is ſeen in the ſection at *r*, *fig.* 6.) are cut out from plate-braſs, by a plain round punch and die, ſimilar to *a b*, *fig.* 4; the dies, (*fig.* 6.) are now uſed. The circle of braſs, being placed over the hole of the die L, is forced through it by the end of the other tool, K, which being ſmooth and of a ſpherical figure, cauſes the plate of metal to aſſume the ſame form, and fall into the drawer beneath in the ſtate of *s*, when it is fit for uſe. It muſt be obſerved, that the aperture through the die, L, is as much larger than the tool K, as to admit the thickneſs of the metal all round it, and the upper ſide of the whole muſt not be left ſharp, but rounded off, ſo as not to cut, but only bend the piece of metal in paſſing through it: alſo the circle of metal muſt be larger than the hole, that there may be a ſufficiency to form the cup or hemiſphere *s*. The ſize of this circle is ſhewn by the dotted circle *r*, in the plan *fig.* 6, which likewiſe ſhews a piece of braſs *t*, in the form of a ſquare; it is faſtened upon the die, to guide and ſtop the circle in the point where it is concentric with the hole over which it is placed.

The open-work in fenders, and ornamental fire-grates, is ſtamped out by the fly-preſs. For this purpoſe the pattern intended to be cut out is deſcribed upon the plate of caſt-ſteel intended to form the fender, and by appropriate punches the holes are ſucceſſively cut out. In this manner the diamonds, lozenges, triangles, and other figures, we obſerve in theſe articles are removed with great facility. This operation has lately received great improvement from Mr. Proctor of Sheffield. By this new method a great number of punches, and of different figures, are moved at the ſame time, and the neceſſity of deſcribing the pattern upon the plate is obviated; whereas in the common method the fenders muſt paſs through the preſs as many times as there are figures in the pattern, and it requires ſome ſkill and judgment in placing the fender ſo correctly in its true poſition beneath the tool of the preſs, as to have no inaccuracies in the pattern diſcernible to the eye.

Fig. 7. is the preſs uſed for the purpoſe, though not excluſively, all heavy articles being ſtamped in a preſs of this kind. The improved apparatus is ſeen on the ground by the ſide of the preſs, where A A is the piece of ſteel plate, incloſed between two leaves of a frame B, ſimilar to book-lids. The leaves are two plates of ſteel, hardened and tempered; the figure of D (*fig.* 8.) cut out in exactly the ſame pattern as the fender is intended to be. Theſe plates are attached, by four ſcrews in each, to an iron frame B, connected by hinges E; when ſhut together, as at A A, the apertures in the upper and lower leaves correſpond, and the plate A is interpoſed between them. A number of ſteel punches of the proper figure, as T, are placed in the holes of the upper leaf, ſo as to fill them all up, and the whole is placed upon the lower bed H of the preſs, and the flat iron bed I being forced down upon the punches by the ſcrew, drives them all through at once, and removes correſponding pieces from the ſteel plate A A. The punches fall through the plate, and are received in a ſmall drawer, beneath the bed of the preſs. The ſcrew being turned back, the tools and plate are removed to the table K before the preſs, the book opened, and the plate is put forwards through the leaves, ſo as to cut out another length. To enſure the paralleliſm and proper diſtance from the former pattern, the leaves have one more hole in them than is intended to be cut out at the operation. In *fig.* 8. *a* repreſents this hole, which is brought to coincide with the hole cut by *b* at the former operation. By this means, it is certain to be in a ſtraight line, and to keep it ſo. A punch is put through the plate in this hole *a* before it is placed under the preſs a ſecond time. The workman is ſeated upon the beam L, before the table K, and finds the punches, which had fallen through into the drawer, ſtanding up in it in the true poſition; and he has only to transfer them to the leaves for the next ſtamp. At N is ſhewn another pair of leaves; and at *fig.* 9. a piece of the plate cut between them: *n*, are two of the punches; the leaves are repreſented as opened to admit the plate, and its poſition is adjuſted by paſſing two of the punches through the holes ſtamped in the plate by the former ſtroke.

The preſs (*fig.* 7.) is of large dimenſions; its frame P double to give greater ſtrength; the lever R loaded at each end with heavy weights. It is many feet in length, though it is ſeen endways, and conſequently foreſhortened in the drawing. The frame S S L is placed beneath the ſurface of the ground, and a circular walk is made for the two men who run round with the end of the lever R, to give it as great a velocity as poſſible, that its momentum may give a great energy to the action of the ſcrew. The workman ſeated upon L, is low enough to be beneath the lever as it moves over his head. The ſcrew is pointed at the lower end, and acts in a ſocket on the top of the ſlider M; to the lower end of which the moving bed I of the preſs is faſtened; to balance the weight of the ſlider and bed, a lever X, and a heavy weight Y, are applied, which raiſes them up when the ſcrew is turned back, ſo as to admit the work being placed beneath the preſs.

Fly, in *Rural Economy*, a diſeaſe incident to ſheep, in conſequence of their being ſtricken by a fly, which produces a ſort of maggot that eats into, and remains in the fleſh. The ſheep that are in a poor weakly ſtate, and in the wool of which there is a deficiency of what is denominated the *yoke*, are the moſt expoſed to ſuch attacks, as the moſt ſuitable *nidus* is, in ſuch caſes, afforded for the fly to depoſit its *ova* in. After the eggs are thus depoſited, they are quickly hatched by the warmth of the animal, directly eating into, and feeding upon it when not guarded againſt. Its attacks are the moſt frequent in hot ſunny ſeaſons. In order to the removal of the maggots, ſome have recourſe to the cutting or clipping away the wool about the parts affected, and afterwards to the application of tar, or a mixture of train oil and ſulphur upon them. When, however, the maggots are not completely formed, the parts are often only duſted with white lead in the ſtate of fine powder. Where precautions of theſe kinds are neglected, the ſheep are ſpeedily deſtroyed by the diſeaſe. In ſituations where the incloſures are ſmall and much ſurrounded with woods, it is eſſentially neceſſary to keep a conſtant attention to ſheep, to ſee that they are not ſtruck by the fly, as a few hours may often prove of the utmoſt conſequence in the removal of the diſeaſe, and the ſafety of the animals.

It has been ſuggeſted that the ſhepherds in the midland diſtricts of the kingdom employ a variety of applications as preventatives of the fly, eſpecially with lambs. They find train oil efficacious, but it fouls the wool, and makes the ſheep unpleaſant to touch. An ointment, compoſed of butter, and the flower of ſulphur, is in the higheſt eſteem. In preparing it the butter is firſt melted over a ſlow fire, and then a proper quantity of ſulphur ſtirred into it, until it becomes of a pretty thick conſiſtence, and rather firm. In applying it, a piece about the ſize of a ſmall walnut is rubbed between the hands, which are then drawn along the backs or other parts of the ſheep. As inſects have certainly their antipathies, it is uſeful and intereſting to find out thoſe of the ſheep-fly. The manner of deſtroying the maggots juſt noticed is both effectual, and when reſorted to in time, ſimple and eaſy. In the part of the country mentioned above, inſtead of clipping the wool from the part which is affected, and forcing out the maggots with the points of the ſhears, the wool is parted by the fingers, and the maggots removed by the point of a knife, or diſlodged in ſome other manner, without breaking the coat; and then a ſmall quantity of white lead, finely ſcraped from a lump, is mixed in the wool, which, by being agitated with it, is carried down in an even manner upon the part which had been affected. It is found that a large quantity diſcolours the wool, while a little prevents any further harm from the maggots that may have been left among it, driving them away from the wound; and at the ſame time promotes its healing. It is ſtated that in well ſhepherded flocks, that are ſeen regularly twice in the courſe of the day, there is no ſuch thing as a broken coat. But though the practice that has been juſt laid down may be extremely proper in many caſes, it does not always prove ſucceſsful. The oxyds or calces of mercury are found far more effectual in ſome caſes of this troubleſome diſeaſe.

Fly, a diſeaſe in turnips, which is ſuppoſed to be produced by a fly that eats the leaves. It has been obſerved by the author of the "Philoſophy of Agriculture and Gardening," that if this deſtructive inſect be of the *ſcarabæus* or beetle kind, which ariſes out of the earth, it may be deſtroyed by rolling. He remarks, that the Chineſe are ſaid by ſir George Staunton to ſteep all their ſeeds in liquid manure until they ſwell, and their germination begins to appear, which they believe not only haſtens the growth of the plants, but alſo defends them againſt inſects beneath the ſoil; and that to this, ſir George obſerves, it may be owing that the Chineſe turnips eſcape the fly, ſo injurious to them in this country. An obſervation of Mr. Guillet, in the Bath Agricultural Papers, ſeems, he ſays, alſo to confirm this idea. He aſſerts, that when turnip ſeed is ſown during rain, or has rain immediately afterwards, the firſt leaves are ſo vigorous that the fly never attacks them; or that the rain itſelf is ſo inconvenient to the fly as to prevent its appearance. It is likewiſe ſuppoſed by the Rev. Mr. Stacy, in his "Obſervations on the Failure of Turnip Crops," that the dryneſs of the ſoil at the time the ſeed is put into the ground, and the great heat of the ſeaſon, by not ſuffering the ſeed to vegetate quickly, is a principal cauſe of the deſtruction that ſo frequently takes place in crops of this kind. It is alſo aſſerted by Mr. Exeter, in the Tranſactions of the London Society of Arts, that the ſowing turnips in drills deeper than by broadcaſt, accelerates the growth of the plant, by giving it more moiſture; whence it ſooner puts forth its rough leaves, and eſcapes the depredations of the fly. He ſpeaks highly of the uſe of the drill, adviſes the rows to be one foot diſtant, uſes three quarters of a pound of ſeed to an acre, and ſows them from one inch and a half to two inches deep. As it is probable that injury may be done by ſowing too deep, as well as by the contrary, in either caſe it will be the moſt proper practice to conſtantly chooſe as moiſt a ſeaſon as poſſible for ſowing the ſummer crops of this ſort of plants. And whenever the ſeaſon is very dry, to have recourſe to the ſteeping of the ſeed for a few hours, but not more than that, before it is put into the ground. It is likewiſe ſuppoſed by ſome, that by ſowing raddiſh, muſtard, or ſome other ſort of ſeed that this inſect may prefer when in the ſtate of young plants, at the ſame time with the turnip ſeed, the diſeaſe may be much leſſened, if not wholly prevented.

But another, and probably a better mode of guarding againſt and preventing the diſeaſe, is that of having the land well enriched with manure before the crop is put in, as by that means the young plants are rapidly puſhed forward into broad leaf, when they become ſecure from the ravages of the fly. The ſooting the rows of the young turnips juſt as they appear, by ſprinkling the ſoot along them in a ſort of ſtream, from a ſeed lip, has alſo been adviſed as a ſucceſsful practice, which was long ago known to Ellis. Several other methods have been recommended at different times, but no certain mode of removing or preventing the effects of this inſect on young turnip plants has hitherto been diſcovered. See TURNIPS.

FLY, in the *Sea Language*, that part of the mariner's compaſs on which the thirty-two winds are drawn, and to which the needle is faſtened underneath. See COMPASS.

FLY *of an Enſign*, is the breadth or extent from the ſtaff to the extremity or edge that flutters looſe in the wind.

Let FLY *the ſheets*, at *Sea*, a word of command, in caſe of a guſt of wind, leſt the ſhip ſhould overſet, or ſpend her top-ſails and maſts, to have the ſheet go-amain, and then the ſail will hold no wind.

FLY *the Heels*, in the *Manege*. A horſe is ſaid to fly the heels when he obeys the ſpurs. See HEELS and SPURS.

To FLY *groſs*, in *Falconry*, is ſaid of a hawk, when ſhe flies at the great birds; as cranes, geeſe, herons, &c.

FLY *on Head*, is when the hawk, miſſing her quarry, betakes herſelf to the next check, as crows, &c. See HAWK.

FLY-*boat*, or *Flight*, a large flat-bottomed Dutch veſſel, whoſe burthen is generally from four to ſix hundred tons. It is diſtinguiſhed by a remarkably high ſtern, reſembling a Gothic turret, and by very broad buttocks below.

FLY-*tool*, is a very light narrow wooden ſpade ſhod with iron, which the navigators of a canal uſe for cutting or throwing out any ſoft clay, peat, or the like, and which they do ſo quickly and dextrouſly as to keep two ſucceſſive pieces flying in the air together.

FLY-*catcher*, in *Ornithology*. See MUSCICAPA.

FLY-*catcher of Edwards*, *grey* and *yellow*. See TODUS *cinereus*.

FLY-*catcher of Latham*, *paradiſe*. See TODUS *paradiſeus*.

FLY-*catcher*, *green black-cap*, and *blue-headed green*, varieties of the CERTHIA *Spiza*.

FLY-*catcher*, *yellow tail*. See MOTACILLA *flavicauda*.

FLY-*bane*, in *Botany*. See SILENE.

FLY-*honeyſuckle*. See LONICERA.

FLY-*honeyſuckle*, *African*. See HALLERIA.

FLY-*tree*, in *Natural Hiſtory*, a name given by the common people in America to a tree, whoſe leaves, they ſay, at a certain time of the year, produce flies. On examining theſe leaves about the middle of ſummer, the time at which the flies uſed to be produced, there are found on them a ſort of bags of a tough matter, of about the ſize of a filbert, and of a duſky greeniſh colour; on opening one of theſe bags with a knife, there is uſually found a ſingle full-grown fly of the gnat kind, and a number of ſmall worms, which, in a day or two more have wings, and fly away in the form of their parent. The tree is of the mulberry kind, and its leaves are uſually very largely ſtocked with theſe inſect bags, and the generality of them are found to contain the inſects in the worm ſtate; when they become winged, they ſoon make their way out. The bags begin to appear when the leaves are young, and afterwards grow with them; but they never rumple the leaf, or injure its ſhape. They are of the kind of leaf-galls, and partake in all reſpects, except ſize, of a ſpecies we have frequent on the large maple, or, as it is called, the ſycamore. Philoſ. Tranſ. N° 431. See farther, Reaumur's Hiſt. vol. vi. p. 34. See PUCERON.

FLY-*wort*. See SILENE.

FLY-*iſland*, in *Geography*, an iſland in the South Pacific ocean, diſcovered by Le Maine and Schouten in the year 1616, ſo called from the number of flies found there. It is covered with trees, but within overflowed at high water. Some inhabitants were ſeen naked. S. lat. 15°. W. long. 150° 20′.

FLYERS, in *Architecture*, are the ſeries of ſteps, which taken altogether conſtitute a flight, and any ſingle ſtep is called a flyer, the treads of which are of equal breadth throughout, and thus flyers differ from winders; the treads of the latter diminiſh continually from the wall of the ſtaircaſe to the well-hole.

FLYING, the progreſſive motion of a bird, or other winged animal, in the liquid air.

Flying is either *natural* or *artificial*.

FLYING *Army*. See ARMY.

FLYING *Bridge*. See BRIDGE.

FLYING *Camp*. See CAMP.

FLYING, *natural*, is that performed by an apparatus, or ſtructure of parts, concerted for that end by nature herſelf. Such is that of moſt birds and inſects, and of ſome fiſhes.

The parts of birds, &c. chiefly concerned in flying, are the wings and tail: by the firſt, the bird ſuſtains and wafts himſelf along; and by the ſecond, he is aſſiſted in aſcending and deſcending, to keep his body poiſed and upright, and to obviate the vacillations thereof.

It is by the largeneſs and ſtrength of the pectoral muſcle, that birds are ſo well diſpoſed for quick, ſtrong, and continued flying. Theſe muſcles which, in men, are ſcarcely a ſeventieth part of the muſcles of the body, in birds exceed and outweigh all the other muſcles taken together; upon which Mr. Willughby makes this reflection, that if it be poſſible for man to fly, his wings muſt be ſo contrived and adapted, that he may make uſe of his legs, and not his arms, in managing them.

The flying of birds is thus effected:

The bird firſt bends his legs, and ſprings with a violent leap from the ground; then opens, or expands the jointures of his wings, ſo as to make a right line, perpendicular to the ſides of his body: thus, as the wings with the feathers therein, conſtitute one continued lamina, being now raiſed a little, and vibrating the wings, with great force and velocity, perpendicularly againſt the air; the air, though a fluid, reſiſts thoſe ſuccuſſions, both from its natural inactivity, and from its elaſticity, which makes it reſtore itſelf after it has been compreſſed, and re-act as much as it has been acted on: by ſuch means is the whole body of the bird protruded. The ſagacity of nature is very remarkable in the opening and recovering of the wing for freſh ſtrokes. To do it directly, and perpendicularly, it muſt needs have a great reſiſtance to overcome; to avoid which, the bony part, or bend of the wing, into which the feathers are inſerted, moves ſideways with its ſharp end foremoſt, the feathers following it like a flag.

The reſiſtance the air makes to the withdrawing of the wings, and conſequently, the progreſs of the bird will be ſo much the greater, as the waft, or ſtroke, of the fan of the wing is the longer: but as the force of the wing is continually diminiſhed by this reſiſtance, when the two forces are come to be in equilibrio, the bird will remain ſuſpended in the ſame place; for the bird only aſcends ſo long as the arch of air the wing deſcribes makes a reſiſtance equal to the exceſs of the ſpecific gravity of the bird above the air: if the air, therefore, be ſo rare as to give way, with the ſame velocity as it is ſtruck withal, there will be no reſiſtance, and, conſequently, the bird can never mount.

Mr. Ray, Willughby, &c. have ſuppoſed the tail to do the office of a rudder, in ſteering and turning the body this way or that; but Borelli has ſhewn it to be unfit for any ſuch office. The flying of a bird, in effect, is quite a different motion from the ſailing of a ſhip: birds do not vibrate their wings towards the tail as oars are ſtruck towards the ſtern, but waft them downwards; nor does the tail of the bird cut the air at right angles, as the rudder does the water, but is diſpoſed horizontally, and preſerves the ſame ſituation what way ſoever the bird turns.

In effect, as a veſſel in the water is turned about on its centre of gravity to the right, by a briſk application of the oars to the left, ſo a bird, in beating the air with its right wing alone, towards its tail, its fore part will be turned to the left; as when in ſwimming, by only ſtriking out with the right arm and leg, we are driven to the left.

Add, that birds with long necks have another way of altering their courſe; for, by only inclining the head and neck towards this or that ſide, the centre of gravity of the whole being changed, the bird will proceed according to this new direction.

Birds never fly upwards in a perpendicular line, but always in a parabola, the line deſcribed by projectiles. In a direct aſcent, the natural and artificial tendency would oppoſe and deſtroy each other; ſo that the progreſs would be very ſlow. In a direct deſcent, they would aid one another, ſo that the fall would be too precipitate. Indeed the hawk we frequently find take that advantage in ſeizing of the partridge; but ordinarily birds keep their wings expanded, and at reſt, to retard their deſcent; and at the ſame time ſtretch out their legs.

FLYING, *Artificial*, is that attempted by men, by the aſſiſtance of mechanics.

The art of flying is one of the great deſiderata of mechanics: it has been attempted in divers ages: the diſcovery of it might prove of great ſervice, and alſo of great diſſervice to mankind.

Nobody ſeems to have bid ſo fair for that invention as our famous friar Bacon, who lived near ſix hundred years ago. He not only affirms the art feaſible, but aſſures us he himſelf knew how to make an engine, in which a man ſitting might be able to carry himſelf through the air like a bird; and affirms, that there was another perſon who had actually tried it with ſucceſs. See the article BACON.

The ſecret conſiſted in a couple of large thin hollow copper globes, exhauſted of air, which being much lighter than air, would ſuſtain a chair, whereon a perſon might ſit.

F. Franciſco Lana, in his Prodromo, propoſes the ſame thing, as his own thought. He computes, that a round veſſel of plate-braſs, fourteen feet diameter, weighing three ounces the ſquare foot, will only weigh 1848 ounces; whereas a quantity of air of the ſame bulk will weigh $2155\frac{2}{3}$ ounces; ſo that the globe will not only be ſuſtained in the air, but will carry with it a weight of $373\frac{2}{3}$ ounces; and by increaſing the bulk of the globe, without increaſing the thickneſs of the metal, he adds, a veſſel might be made to carry a much greater weight.

But the fallacy is obvious: a globe of the dimenſions he deſcribes, Dr. Hook ſhews, would not ſuſtain the preſſure of the air, but would be cruſhed inwards. Therefore, in whatever ratio the bulk of the globe were increaſed, in the ſame muſt the thickneſs of the metal be alſo, and conſequently the weight increaſed: ſo that there would be no advantage in ſuch augmentation.

The ſame author deſcribes an engine for flying, invented by the Sieur Beſnier, a ſmith of Sable, in the county of Maine. Vide Philoſoph. Collect. N° 1.

The famous biſhop Wilkins was ſo confident of ſucceſs in this art, that he ſeems to intimate, that, in future ages, it will be as uſual to hear a man call for his wings when he is going a journey, as it is now to call for his boots. See Math. Magic, b. ii. ch. 7. Diſcovery of a new World, prob. xiv. p. 135. Secret and Swift Meſſenger, ch. iv. See AEROSTATION.

FLYING *Buttreſs*, in *Pointed Architecture*. This is one of the boldeſt and moſt ſtriking features of the ſtyle of building in queſtion; being a prop of maſonry work, raiſed in the air, to ſupport ſome elevated part of a building which cannot be propped immediately from the ground. Flying buttreſſes are generally ſeen on the outſide of our ancient cathedrals, and other large magnificent churches, ſtretching over the ſide aiſles from the main exterior buttreſſes to the upper walls of the nave, to prevent them from ſpreading.

The geometrical principle on which they ſupport the walls and the buttreſſes, by means of the ſtraight ſloping line of their upper part, and are ſupported by them, by means of the arches beneath, is one proof, amongſt many others, of the ingenuity and ſcientific ſkill of the architects of the middle ages.

Flying *of Colours*, is uſed by painters to denote their want of durableneſs, which they expreſs by their *ſtanding*.

Flying-*fiſh*, in *Ichthyology*, a name given by the Engliſh writers to ſeveral ſpecies of fiſh, which by means of their long fins have a method of keeping themſelves out of water for ſome time. The flying-fiſh, moſt properly ſo called, is the exocœtus of the ancient authors, and of Artedi. (See Exocoetus.) See a minute and accurate deſcription of the *exocœtus volitans*, or flying-fiſh, in the Phil. Tranſ. vol. lxviii. part ii. p. 791.

Flying-*fiſh* is alſo a name of a fiſh of the gurnard kind. See Callyonimus *Lyra*.

Flying *Pinion*, is a part of a clock, having a fly or fan, whereby to gather air, and ſo bridle the rapidity of the clock's motion, when the weight deſcends in the ſtriking part. See Clock.

FO, or Foe, in *Mythology*, the object of religious veneration and worſhip in China, and alſo, under various other appellations, in different parts of India. Fo is ſuppoſed by ſir William Jones to be the Buddha of the Hindoos (ſee Boodh); and it has been generally ſuppoſed that the worſhip of this deity was introduced into China, together with a few of his votaries and fragments of the canonical books of the Indians, about the 65th year of the Chriſtian era; though ſome have referred this event to ſo late a period as the year 630. See under the article China, the account of the *Religion of the Chineſe*. The native place of this pretended god is unknown; nor can his origin and the etymology of his name be ſatisfactorily aſcertained. Some ſuppoſe that he lived about 600 years before Chriſt; and that he firſt appeared in the ſouthern part of India, among the nations ſituated on the borders of the Indian ocean, and thence diſſeminated his philoſophy, by means of his diſciples, to all India. It is related by his followers, that at the age of 19 he retired to a deſert accompanied by ſome philoſophers, to whoſe tuition he committed himſelf. At the age of 30, it is ſaid, he felt himſelf ſuddenly inſpired, and that he attained to the intuitive knowledge of the firſt principles of all things, from which time he took the name of Föe, which ſignifies "ſomething more than human." His myſtical philoſophy he is ſaid to have delivered to innumerable diſciples, under the veil of allegory; and the Japaneſe add, that in his contemplations, during which his body remained unmoved, and his ſenſes unaffected by any external object, he received divine revelations, which he communicated to his diſciples. As ſoon as he became a god, he thought of eſtabliſhing his doctrine, and of proving his celeſtial miſſion by performing miracles. The number of his diſciples was immenſe, and they ſoon ſpread his opinions through every part of India, and the higher extremities of Aſia. His prieſts are generally known by Europeans under the appellation of *Bonzes*. For an account of their character and office, we refer to that article.

Buddha, Xekias, or Föe, for by theſe and other names he is called, is ſaid to have had both an exoteric and eſoteric doctrine; in the former he taught the difference between good and evil; the immortality of the ſouls of men and brutes; different degrees of reward or puniſhment in a future world; and the final advancement of the wicked, after various tranſmigrations, to the habitations of the bleſſed. This doctrine of the tranſmigration of ſouls has given riſe to that multitude of idols, which are reverenced in every place, where the worſhip of Fo is eſtabliſhed. Quadrupeds, birds, reptiles, and the vileſt animals had temples, and became objects of public veneration, becauſe the ſoul of the god in his tranſmigrations and metamorphoſes might have inhabited their bodies. His followers alſo ſay, that the god Fo came upon earth to ſave mankind; that by him their ſins are expiated; and that he alone can procure for them happineſs in the life to come. They enjoin the ſtrict obſervance of five precepts; the firſt forbids the killing of any living creature; the ſecond, the taking away of the goods of another; the third forbids men to pollute themſelves by uncleanneſs; the fourth, to lie; and the fifth, to drink wine. They, above all, recommend the practice of certain acts of mercy; ſuch as, to treat their bonzes well, to build monaſteries and temples for them, and to ſupply them with every thing neceſſary, in order that they may be able, by the aſſiſtance of their prayers, and the penance which they impoſe, to merit forgiveneſs, and the remiſſion of all their ſins. The Bonzes pretend, that when Fo had attained to the age of 79, he perceived that his borrowed divinity could not prevent his paying the debt of nature like other men; and, therefore, he would not leave his diſciples without revealing to them the whole ſecret and hidden myſteries of his doctrine. Having called them together he declared that till that moment he had always thought proper to ſpeak to them in parables, and that for 40 years he had diſguiſed the truth under figurative and metaphorical expreſſions; but being about finally to leave them, he would unveil the whole myſtery of his wiſdom. "Learn then," ſaid he, "that there is no other principle of all things, but a vacuum and nothing; from nothing all things have ſprung, to nothing they muſt again return, and then all our hopes end." This is the ſum of his eſoteric or internal doctrine. To one of his favourite diſciples he committed his moſt ſecret thoughts, and him he entruſted with the charge of propagating his doctrine. He deſired him never to attempt to ſupport his tenets by proofs and long reaſoning, and commanded him to put only at the beginning of the books which he publiſhed; "Thus have I learned." In one of his works the ſame Fo mentioned another maſter more ancient than himſelf, whom the Chineſe name "O-mi-to," and the Japaneſe "Amida." The bonzes aſſure us, that the latter became ſo eminently holy, that it is at preſent ſufficient only to invoke him, in order to obtain immediate pardon for the greateſt crimes. The Chineſe, therefore, on almoſt every occaſion, have continually in their mouth theſe two names, "O-mi-to, Fo!"

FO-HI, one of the firſt and moſt celebrated legiſlators of China, and ſaid to be the founder of the Chineſe monarchy. (See China.) Little is known of the methods which this legiſlator adopted for civilizing the country: and the preciſe era of his eſtabliſhment is ſo ancient, that it cannot be aſcertained. An ancient book, called "Yekin," which is ſtill preſerved in China, is aſcribed to Fo-hi; but it is written in hieroglyphics; and no one has been able to give a ſatisfactory explanation of its contents. The moſt probable conjecture is that of Leibnitz, that it was intended to teach the art of numeration. Fo-hi was ſucceeded by ſeveral emperors, who carried forward the work of civilization, particularly by means of moral allegories, fables, and poems.

FOA, in *Geography*, one of the Hapaee iſlands, in the S. Pacific ocean, between Haano and Lefooga, to both which it is joined by a reef, hardly half a mile from either.

FOAL, in *Rural Economy*, is the common name of the young of the horſe kind. The male is termed a *colt* foal, and the female a *filly* foal. Foals, when they are of the valuable kind, ſhould always be kept as well as poſſible while they are growing, as without attention in this reſpect they ſeldom make good horſes. See Horse.

It is contended by ſome experienced horſe breeders, that it is not by any means difficult to aſcertain in the foal, what the form of it will be when grown to the full ſize, as it will carry the ſame ſhape at ſix years old that it carried during the firſt month, if it be not improperly managed in the keeping afterwards. And it will have the good or defective form accordingly. In judging of the height, the ſhin-bone ſhould be particularly regarded; where that is large, and long from the knee to the paſtern, it indicates a tall or full ſized horſe. And another method of judging is that of examining the ſpace between the knee and withers, which being doubled will moſtly give the height of the animal when full grown. The means of aſcertaining their probable goodneſs at this early period is more difficult, but it is commonly ſuppoſed that where they are active, ſtirring, not eaſily frightened, and anxiouſly ſtriving for maſtery, they will prove well mettled horſes in their full grown ſtate.

Foal-*foot*, a common name applied ſometimes to the troubleſome weed termed colt's foot. See Colt's-*foot*.

Foal-*teeth*, thoſe which are put forth during the firſt year of the animal's age. See *Age of the* Horse, and Horse.

FOALING, a term ſignifying the act of parturition or bringing forth in the mare. Great attention ſhould be paid to the animals about this period, as it not unfrequently happens that mares deſtroy their foals by becoming entangled in the ſtables or other places, by means of their halters, &c. or by the difficulty of bringing them forth. It is the beſt way to look to them frequently at ſuch times.

FOCA, in *Geography*, an iſland in the Atlantic, near the coaſt of Guinea, and the mouth of the Calbari, with a town of the ſame name, called by the Dutch *Wyndorp*.

FOCAGE, or Fuage, fire-money, hearth-money, or chimney-money. See Fuage.

FOCAI, in *Geography*, a town of Egypt; 20 miles N. of Abu-Girgé.

FOCARO, a mountain of Naples, in Otranto; 20 miles N.E. of Tarento.

FOCAS, a town of Japan, in the iſland of Niphon; 145 miles N.W. of Jedo.

FOCHABERS, a market-town of Scotland, in Banffſhire, conſiſting of one ſtreet, on the right hand of the Spey; 12 miles W. of Cullen and 9 E. of Elgin. Near it ſtands Gordon caſtle, a magnificent ſeat, in a very extenſive park, founded by George, ſecond earl of Huntley; originally called the caſtle of the Bog of Giht. A little below the common ferry acroſs the river is the ford, through which the duke of Cumberland marched his army in 1746, in the face of the rebels, who were advantageouſly poſted on a riſing ground. Thence to Elgin, the ſoil, for moſt part, is light, mooriſh, and barren. At the mouth of the Spey is Garmouth harbour, where great quantities of ſalmon, preſerved in ice, are ſhipped for London. From this port fir-timber of a good quality is exported. N. lat. 57° 36′. W. long. 3° 3′.

FO-CHAN, a famous village of China, 4 leagues from Canton, ſaid to be the largeſt and moſt populous in the world; it is called a village, becauſe it is not incloſed by walls, and has not a particular governor, although it carries on a great trade, and contains more houſes and inhabitants than even Canton itſelf. It is reckoned to be three leagues in circumference; and to contain a million of inhabitants.

FOCHEA, Foggia, or Phoggia, a ſea-port of Aſiatic Turkey, in Natolia, ſituated at the mouth of the Hermus, in the gulf of Smyrna, anciently called Phocæa; 28 miles N.W. of Smyrna. N. lat. 38° 44′. E. long. 26° 39′.

FOCHIA, a town of Boſnia; 75 miles S.S.W. of Belgrade.

FOESANI, a town of European Turkey, in Moldavia, on the Milcou; 54 miles W.N.W. of Galacz. N. lat. 44° 42′. E. long. 27° 13′.

FOCUS, in *Geometry*, and the *Conic Sections*, is applied to certain points in the *parabola*, *ellipſis*, and *hyperbola*; wherein the rays reflected from all parts of theſe curves do concur or meet.

The foci of an ellipſe are two points in the axis, on which, as centres, the figure is deſcribed; or two points in the longer axis, whence two right lines, being drawn to any point in the circumference, ſhall be together equal to the axis itſelf. Theſe are alſo called *umbilici*. See Conic *Sections* and Ellipse.

Focus *of the Hyperbola*. See Conic *Sections* and Hyperbola.

Focus *of a Parabola*, is a point in its axis, wherein the ſemi-ordinate is equal to the ſemi-parameter: or, a point in the axis diſtant from the vertex, by a fourth part of the parameter, or latus rectum. See Conic *Sections* and Parabola.

Focus, in *Optics*, is a point wherein ſeveral rays concur, and are collected; either after having undergone refraction, or reflection.

It is thus called, becauſe the rays being here brought together, and united, their force and effect are increaſed; ſo that they become able to burn; accordingly, it is in this point that bodies are placed to ſuſtain the force of burning-glaſſes, or mirrors.

It muſt be obſerved, that the focus is not, ſtrictly ſpeaking, a point; the rays are not all accurately collected into the ſame place: Huygens demonſtrates, that the focus of a lens, convex on both ſides, is $\frac{5}{8}$ths of the thickneſs of the lens.

Focus, in *Dioptrics*, is the point wherein refracted rays, rendered convergent by refraction, do concur or meet, and croſs the axis.

The ſame point is alſo called the *point of concourſe*, or *concurrence*.

Focus, *Virtual*, is the point from which refracted rays, when by refraction they are rendered divergent, do begin to diverge or recede from each other.

The ſame point is alſo called *punctum diſperſus*, or *point of divergency*, in oppoſition to the focus, which is called the point of concurrence. Suppoſe, *e. gr.* the concavity of a glaſs to be *a b c*, *Plate* V. *Optics*, *fig.* 1, and its axis *d e*; let *f g* be a ray of light falling on the glaſs parallel to the axis *d e*, and let *d* be the centre of the arch *a b c*. This ray *f g*, after it has paſſed the glaſs, at its emerſion at *g*, will not proceed directly to *b*, but will be refracted from the perpendicular *d g*, and become the ray *g k*. Draw then directly *g k*, ſo that it may croſs the axis in *e*. The point *e* ſo found, is called by Mr. Molyneux the virtual focus, or point of divergence.

The effect of convex glaſſes, or lenſes, is to render the rays, tranſmitted through them, convergent, and to bring them together into a focus, which will be nearer or farther off, as the lens is a portion of a greater or leſs ſphere.

The effect of concave lenſes is to render the rays tranſmitted through them divergent, or to diſperſe them from a virtual focus.

For the place, poſition, diſtance, &c. of the foci of rays refracted through plain, concave, and convex mediums of divers denſities, as air, water, glaſs, &c., ſee REFRACTION, LENS, &c.

The laws of the foci of glaſſes, and the methods of finding the ſame, being thoſe of moſt uſe and importance; we ſhall here ſubjoin them apart, as delivered and demonſtrated by Mr. Molyneux, in his "Dioptrica Nova."

1. The focus of a convex glaſs, *i. e.* the point wherein parallel rays tranſmitted through a convex glaſs, whoſe ſurface is the ſegment of a ſphere, do unite, is diſtant from the pole, or vertex of the glaſs, almoſt a diameter and half of the convexity.

2. In a plano-convex glaſs the focus of parallel rays, or the place where they unite with the axis, is diſtant from the pole of the glaſs a diameter of the convexity, provided the ſegment do not exceed thirty degrees.

The rule or canon in plano-convex glaſſes is as 107 : 193 : : ſo is the radius of the convexity : to the refracted ray taken to its concourſe with the axis; which in glaſſes of larger ſpheres is almoſt equal to the diſtance of the focus taken in the axis.

3. In double convex glaſſes of the ſame ſphere, the focus is diſtant from the pole of the glaſs about the radius of the convexity, if the ſegment be but thirty degrees.

But if the convexities be unequal, or if the two ſides be ſegments of different ſpheres, then the rule is,

As the ſum of the radii of both convexities : to the radius of either convexity alone : : ſo is the double radius of the other convexity : to the diſtance of the focus.

Here obſerve that the rays which fall nearer the axis of any glaſs are not united with it ſo near the pole of the glaſs as thoſe farther off: nor will the focal diſtance be ſo great in a plano-convex glaſs when the convex ſide is towards the object, as when the plain ſide is towards it.

Hence it is truly concluded, that, in viewing any object by a plano-convex glaſs, the convex ſide ſhould always be turned outward; as alſo in burning by ſuch a glaſs.

FOCUS, *for the virtual*, obſerve, 1. That in concave glaſſes, when a ray falls from air parallel to the axis, the virtual focus, by its firſt refraction, becomes at the diſtance of a diameter and a half of the concavity.

2. In plano-concave glaſſes, when the rays fall parallel to the axis, the virtual focus is diſtant from the glaſs the diameter of the concavity.

3. In plano-concave glaſſes, as 107 : 193 : : ſo is the radius of the concavity : to the diſtance of the virtual focus.

4. In double concaves of the ſame ſphere, the virtual focus of parallel rays is at the diſtance of the radius of the concavity.

But, whether the concavities be equal or unequal, the virtual focus, or point of divergency of the parallel rays, is determined by this rule:

As the ſum of the radii of both concavities : is to the radius of either concavity : : ſo is the double radius of the other concavity : to the diſtance of the virtual focus.

5. In concave-glaſſes, expoſed to converging rays, if the point to which the incident ray converges be diſtant from the glaſs farther than the virtual focus of parallel rays, the rule for finding the virtual focus of this ray is this:

As the difference between the diſtance of this point from the glaſs, and the diſtance of the virtual focus from the glaſs : is to the diſtance of the virtual focus : : ſo is the diſtance of this point of convergence from the glaſs : to the diſtance of the virtual focus of this converging ray.

6. In concave glaſſes, if the point to which the incident ray converges, be nearer to the glaſs than the virtual focus of parallel rays, the rule to find where it croſſes the axis is this:

As the exceſs of the virtual focus, more than this point of convergency : is to the virtual focus : : ſo the diſtance of this point of convergency from the glaſs : is to the diſtance of the point where this ray croſſes the axis.

Rules for finding the foci of glaſſes.—To find the focus of a convex ſpherical glaſs, being of a ſmall ſphere, apply it to the end of a ſcale of inches, and decimal parts, and expoſe it before the ſun; upon the ſcale you will have the bright interſection of the rays meaſured out: or, expoſe it in the hole of a dark chamber; and where a white paper receives the diſtinct repreſentation of diſtinct objects, there is the focus of the glaſs.

For a glaſs of a pretty long focus, obſerve ſome diſtant object through it, and recede from the glaſs till the eye perceives all in confuſion, or the object begins to appear inverted; here the eye is in the focus.

For a plano-convex glaſs: make it reflect the ſun againſt a wall; you will on the wall perceive two ſorts of light; one more bright within another more obſcure: withdraw the glaſs from the wall, till the bright image is in its leaſt dimenſions; the glaſs is then diſtant from the wall about a fourth part of its focal length.

For a double convex: expoſe each ſide to the ſun in like manner; and obſerve both the diſtances of the glaſs from the wall. The firſt diſtance is about half the radius of the convexity turned from the ſun; and the ſecond, about half the radius of the other convexity.

Thus we have the radii of the two convexities; whence the focus is found by this rule.

As the ſum of the radii of both convexities : is to the radius of either convexity : : ſo is the double radius of the other convexity : to the diſtance of the focus.

FOCUS, in *Catoptrics*, is a point wherein the rays reflected from the ſurface of a mirror, or ſpeculum, and by reflection rendered convergent, do concur, or meet.

The effect of concave mirrors is to collect the rays falling on the concave ſurface into a focus.

The effect of convex mirrors is to diſperſe the rays falling on them, or render them more divergent.

For the laws of the foci of rays reflected from mirrors, or ſpecula, ſee MIRRORS.

The foci of concave glaſſes are had by reflection: for, as a concave mirror burns at the diſtance of about half the radius of the concavity; ſo a concave glaſs, being ſuppoſed a reflecting ſpeculum, unites the rays of the ſun at the diſtance of about half the radius of the concavity.

To find the foci of all glaſſes geometrically.—Dr. Halley furniſhes us with a general method for finding the foci of ſpherical glaſſes of all kinds, both concave and convex; expoſed to any kinds of rays, either parallel, converging, or diverging ; under the following problem.

To find the focus of any parcel of rays diverging from, or converging to, a given point in the axis of a ſpherical lens, and inclined thereto under the ſame angle, the ratio of the ſines of refraction being given :

Suppoſe G L (*Plate* V. *Optics*, *fig.* 2.) a lens ; P a point in its ſurface ; V its pole ; C the centre of the ſphere whereof it is a ſegment ; O the object, or point in the axis, to or from which the rays do proceed ; and O P a given ray : and ſuppoſe the ratio of refraction to be as *r* to *s*. Then making C R to C O, as *s* to *r* for the immerſion of a ray ; or as *r* to *s* for the emerſion (*i. e.* as the ſines of the angles in the medium which the ray enters, to the correſponding ſines in the medium out of which it comes), and laying C R, from C towards O, the point R will be the ſame for all the rays of the point O. Laſtly, drawing the radius P C, if need be, continued ; with the centre R, and diſtance O P, ſtrike a piece of an arc, interſecting P C in Q. The line Q R, being drawn, ſhall be parallel to the reflected ray ; and P F, being made parallel thereto, ſhall interſect the axis in the point F ; the focus ſought.

Or, make it, as C Q : C P : : C R : C F ; then will C F be the diſtance of the focus from the centre of the ſphere.

This author gives a demonſtration of the method ; and adds various figures, exhibiting the various caſes of rays either diverging or converging as they enter, or emerge out of, the ſurface either of a convex or concave lens.

From this principle all the rules for the foci of rays parallel to the axis, as likewiſe for the principal focus where the rays neareſt the axis do unite, are deduced. As,

Hence, 1. If O P be equal to C R ; the points Q and C are coincident, and the rays O P, after refraction, run on parallel to the axis. 2. If the point Q fall on the ſame ſide of the axis, as is the point P ; then the beams after refraction do tend on, either diverging or converging, as before ; but if Q fall on the other ſide the axis, the diverging rays are made to converge by a convex, or the converging to diverge by a concave glaſs. 3. If O P do exceed C R, the focus is in all caſes on the ſame ſide of the glaſs, as is the centre of the ſphere C. But contrariwiſe if O P be leſs than C R, the focus falls on the other ſide of the glaſs beyond the vertex V. 4. An object may be ſo placed, that the rays next the axis of a convex glaſs ſhall have an imaginary focus tranſmitting diverging rays, when the more remote parts thereof ſhall make them converge to a real focus. 5. If O V, the diſtance of the object from the pole or vertex of the glaſs, be taken inſtead of O P, then will C Q be the difference of O V and C R ; and as that difference is to C R, ſo is the radius C V to C F, the diſtance of the principal focus from the centre of the ſphere, whereof the glaſs is a ſegment. Or elſe as C Q : O P or R Q : : P C : to V F, the focal diſtance from the pole of the glaſs. Whence follows a general rule for the foci of all glaſſes ; only according to Corol. 3. if O V do exceed C R, the focus is on the ſame ſide of the glaſs as the centre of the ſphere : but if C R be greater, then the focus is on the oppoſite ſide of the glaſs ; whence it will be determined whether the focus be real or imaginary.

What has been ſaid of one ſurface of the lens, is eaſily applicable to the other, taking F the focus for an object.

FODDER, in *Agriculture*, a term employed to ſignify all ſuch ſubſtances, as hay, ſtraw, haulm, &c. which are given to cattle with the view of feeding and keeping them. Theſe ſubſtances, when blended together, are in ſome diſtricts particularly called fodder. In the giving of fodder to all ſorts of animals, care ſhould be taken that waſte is not committed by their having too much given at a time ; and that it be well put into racks or cribs, which ſhould be ſufficiently numerous for the quantity of cattle. Where theſe points are not properly attended to, there muſt be great loſs, not only by the fodder being littered about the yard, but from many of the more weak cattle not getting the quantity of food that may be neceſſary for their ſupport. In reſpect to racks, thoſe of the ſtaddling and baſket kinds are beſt for foddering, if made ſtrong enough, that is, ſo as not to be overturned ; for theſe racks may be lifted up as the dung riſes in the yard, which thoſe fixed in the ground cannot be.

It may be obſerved that open winters make hay the deareſt, if a hard froſt and ſnow happen to come at the beginning of them ; for if once cattle come to fodder they muſt be held to it, or they will receive great damage. In wet or waſhy weather, all the hay that can be given to cattle will not make them thrive ſo well as in ſuch as is dry and froſty. Hence ſheds are highly uſeful, in order to ſhelter them in ſuch caſes.

At the beginning of winter, as the latter end of October and great part of November, while cattle ſtill continue out in the field at graſs, it is very neceſſary to fodder them early in the morning, while the hoar-froſt hangs on the graſs, which they will not eat kindly off till the ſun has warmed it, and diſſolved the hoary matter that hangs upon it.

It is a practice in many places to tie cattle up to racks to fodder. This may be done with great advantage with cows, where the fodder is good as hay, or very good ſtraw; but with young cattle, or ſuch as have ſtraw fodder only, it is unneceſſary. And as cattle eat their fodder when freſh thraſhed much better than when it has been thraſhed two or three days, eſpecially if the ſtraw be but indifferent : it is proper that this ſhould be attended to by the careful farmer.

As it is well known in general that little dependence can be placed on ſending cattle out of the foddering yard to graſs before the middle of May, the farmer ought always to be well provided with winter-fodder, for his cows and young ſtocks, for this and the preceding months, as he will otherwiſe be in great difficulty, and run much riſk in his ſtock.

In regard to the economy of cattle-buildings, it may be obſerved, that to have ſeveral diviſions over and above what is conſtantly uſed in the foddering-yards or back ſheds, or other out-houſes, has great conveniencies in it ; one of which is, that in them the farmer can diſpoſe of and ſeparate his two-yearling cows, or other cattle, at the time of bulling ; not only to keep them from the bull, but from the other beaſts alſo, that would be leaping ſuch cows, whereby they may hurt each other, &c. eſpecially as cows forward with calf are apt to warp by leaping bulling cows. It may therefore, in many caſes, prevent much injury to ſuch ſorts of live-ſtock.

FODDER, *Compreſſed*, a ſort of fodder formed by cutting, mixing together, and compreſſing, by means of proper machinery, various ſorts of coarſe ſubſtances, ſuch as the haulm of peas, beans, potatoes, and various other vegetables, as well as clover, hay, ſtraw, &c., ſo as to make them come into a narrow compaſs. The utility and advantages of this ſort of fodder have been ſhewn by Mr. Lawſon, in his Eſſay on mixed and compreſſed Cattle Fodder, to be very conſiderable, and ſuch as deſerve the notice of farmers in many ſituations.

FODDER, in the *Civil Law*, is uſed for a prerogative that the prince has, to be provided of corn, and other meat for his horſes, by the ſubjects, in his warlike expeditions.

FODDER *of Lead*, ſometimes called fudder, or fother, is 16 pieces, or 8 pigs; and at ſome of the cupolas or lead-ſmelting furnaces and ſlag-mills in Derbyſhire, is 23½ cwt. (of 120lb.) = 2820lb. avoirdupoiſe: in others it is 24 cwt. (of 112 lb.) = 2688; at Derby town, and at Wirkſworth, it is 22½ cwt. (of 112 lb.) = 2520 lb.; at Stockton on the Tees, 22 cwt. = 2464 lb.; at Skipton in Craven, 21½ cwt. (of 120 lb.) = 2460lb.; at Stockwith and Thorn on the Trent, 21½ cwt. (of 112 lb.) = 2408 lb.; at Cheſter on the Dee, 20 cwt. (of 120 lb.) = 2400 lb.; at Newcaſtle on the Tyne, 21 cwt. (of 112 lb.) = 2352 lb.; at Hull on the Humber, 19½ cwt. (of 120 lb.) = 2340 lb.; at London, with the plumbers, 19½ cwt. (of 112 lb.) = 2184 lb.; but at the cuſtom-houſe 20 cwt. (of 112 lb.) or the ton, = 2240 lb: while ſome authors have mentioned 2000 lb. as a fother of lead, &c.

Theſe many different weights for the fodder, by which lead in large quantities is always ſold in the country, are ſaid to have originated in the *decreaſe of weight*, at places more or leſs diſtant from the mines, at which the dealers and carriers were allowed to ſell their lead, *inſtead of raiſing its price!* It is ſurely high time, that a legiſlative regulation ſhould aboliſh practices ſo gothic and barbarous, and which are found ſo much to embarraſs the free and fair trader in this eſſential article of Britiſh produce, in different parts of her dominions. The London fodder or the ton would, perhaps, be the moſt proper, to ſuperſede all the others. It ſhould be further obſerved, that the *pieces* of lead are not made of any exact weight at the ſmelting-houſes, though they endeavour to come as near to the ſixteenth part of their fodder as they can, but of courſe, were they made ſo at firſt, they could not continue a 1-16th part of the various fodders of the places through which theſe pieces have to go, in their way to the conſumer.

FODDERING *of* CATTLE, the art or practice of giving them their food. In managing this buſineſs, great attention is neceſſary, as has been ſeen in ſpeaking of fodder, in order to prevent the waſte of thoſe articles that may be employed in this way, and in ſeeing that each individual is properly and regularly ſupplied with a ſuitable proportion of food of the fodder kind.

The principal circumſtances to be kept in view in the execution of this ſort of work, are thoſe of not letting the animals have too much at a time; the giving it in as freſh a ſtate as poſſible; and the protecting the weak ſtock from having their food taken from them by ſuch as are ſtronger.

In the foddering of ſoiled cattle, care will alſo be neceſſary to have the different ſoiling-crops cut in the proper ſtate, and freſh at the time of ſupplying the animals: to never let it remain ſo as to take on the leaſt heat, and to the having ſuitable floorings well littered over in the ſtalls, yards, or other places where the buſineſs is performed, in order to the raiſing of manure. See SOILING.

FODINA, a name ſome authors give to the *labyrinth* in the bone of the ear. See EAR.

FODUS, in *Geography*, a town of Poland, in the palatinate of Kaminiec; 54 miles N. of Kaminiec.

FODWAR, a town of Hungary, on the Danube, oppoſite to Colocza.

FŒCES. See FÆCES.

FŒCIALES. See FECIALES.

FŒCULA. See FECULA.

FŒCUNDITY. See FECUNDITY.

FOELO, NORD, in *Geography*, a ſmall iſland in the North ſea, near the coaſt of Lapland. N. lat. 69° 42′.

FOELO, *Suyer*, a ſmall iſland near the coaſt of Lapland. N. lat. 69° 32′.

FŒMUND's LAKE, a lake of Norway, 30 miles long, and from 2 to 5 wide; 130 miles N. of Chriſtiania.

FOEMUND's *River*, a river which riſes in a lake of the ſame name in Denmark, and runs into lake Wenner, near Carlſtadt, in Sweden.

FŒNICULUM, in *Botany*, probably a diminutive of *fœnum*, hay, in alluſion to the long ſlender leaves; but various other etymologies have been ſuggeſted Camer. Epit. 534 Gærtn. v. 1. 104. t. 23. f. 5. Tourn. t. 164. See ANETHUM.

FŒNUM-GRÆCUM. See TRIGONELLA.

FOENUM-SANCTUM. See SAINT-*Foin*.

FOE-PETOUNÉ-HOTUN, in *Geography*, a town of Chineſe Turkey; 16 miles N. of Petouné-Hotun.

FOESIUS, ANUTIUS, in *Biography*, a celebrated phyſician, was born at Mentz in 1528. He received the whole of his education at Paris, whither he was ſent at an early age. The members of the faculty of medicine of that city having been always diſtinguiſhed for their attachment to the works of the Greek phyſicians, the ſame taſte was early implanted in the mind of Foëſius, eſpecially by his preceptors Houllier and Goupile, who facilitated his progreſs in that courſe of ſtudy, by procuring books and MSS. for his peruſal; and under whoſe direction he copied ſome very ancient manuſcripts of Hippocrates from the library of Fontainbleau and the Vatican. His fortune being ſmall, he was unable to avail himſelf, to the full extent of his wiſhes, of the inſtructions of thoſe able maſters. He returned to Mentz about 1556 or 7, where his talents were ſoon recognized, his practice extended, and his reputation became ſo great, even in diſtant provinces, that ſeveral princes endeavoured, by promiſes of great honour and emolument, to draw him from his native place; but his attachment to it was immoveable.

The practice of his profeſſion, ſo far from diverting his attention from ſtudy, became the ſtimulus to a more profound peruſal of the works of Hippocrates, in which he diſcovered the moſt important obſervations relative to diſeaſes, and the moſt correct delineation of their nature and progreſs, made upwards of two thouſand years before. He publiſhed his firſt work at Baſil in 1650, entitled, "Hippocratis Coi Liber ſecundus de morbis vulgaribus, difficillimus et pulcherrimus: olim à Galeno Commentariis illuſtratus qui temporis injuriâ interciderunt; nunc vero pene in integrum reſtitutus Commentariis ſex, et Latinitate donatus," 8vo. In the following year he publiſhed a pharmacopœia, in order to fix the regular formulæ and the particular medicines to be uſed by the apothecaries of Mentz: its title was, "Pharmacopeia medicamentorum omnium, quæ hodie ad publica medentium munia in officinis extant, tractationem et uſum ex antiquorum Medicorum præſcripto continens," Baſileæ, 1561, 8vo. His conſtant meditations on the works of Hippocrates led him to arrange, in alphabetical order, all the terms which contributed to occaſion any doubt or obſcurity in the peruſal of this ancient writer, and to endeavour to elucidate the ſubject by collating the beſt manuſcripts, and by references to ſimilar paſſages of the other Greek phyſicians, eſpecially of Galen. The reſult of this laborious, but moſt uſeful reſearch, he publiſhed under the following title; "Œconomia Hippocratis alphabeti ſerie diſtincta, in qua dictionum apud Hippocratem omnium, præſertim obſcuriorum, uſus explicatur, et velut ex ampliſſimo penu depromitur: ita ut Lexicon Hippocraticum merito dici poſſit," Francofurti, 1588, folio: Genevæ, 1662, folio. This work acquired him the eſteem and friendſhip of all the learned; who hence inferred that he would be able to give a complete and correct edition of the whole works of Hippocrates. Accordingly, after the repeated requeſts of the moſt celebrated phyſicians of Europe, he undertook the taſk, and laboured with ſuch extraordinary zeal and induſtry, that in ſix years he completed this great work, which has ranked him among the ableſt interpreters of the ancients. It is entitled, "Magni Hippocratis, Medicorum omnium facile Principis, Opera omnia quæ extant, in octo ſectiones ex Erotiani mente diſtributa: nunc recens Latina interpretatione et annotationibus illuſtrata," folio, Francofurti, 1593, &c. Genevæ, 1657. Foeſius did not long ſurvive this laborious undertaking: he died in 1595; and his talents were inherited by his ſon and grandſon, who ſucceſſively filled his ſtation as phyſician at Metz.

FOETIDIA, in *Botany*, from the fetid odour of the wood. Commerſon in Juſſ. 325. Lamarck Dict. v. 2. 457. tab. 419. Willd. Sp. Pl. v. 2. 980. Claſs and order, *Icoſandria Monogynia.* Nat. Ord. *Myrti*, Juſſ.

Gen. Ch. *Cal.* Perianth ſuperior, in four equal, deep, ovate, acute, permanent, at length reflexed, ſegments. *Cor.* none. *Stam.* Filaments numerous, ſetaceous, ſhorter than the calyx, inſerted into its thick dilated margin; anthers very ſmall. *Piſt.* Germen inferior, turbinate, quadrangular; ſtyle ſolitary, ſimple, the length of the ſtamens; ſtigma in four ſhort, linear, equal, ſpreading ſegments. *Peric.* Capſule quadrangular, woody, truncate, crowned with the permanent coriaceous calyx, of four cells. *Seeds* one or two in each cell.

Eſſ. Ch. Calyx ſuperior, in four permanent ſegments. Corolla none. Capſule woody, of four cells, with one or two ſeeds in each.

1. F. *mauritiana.* Native of the iſles of Mauritius and Bourbon, where it is called *Bois puant.* A tree or ſhrub, ſmooth in every part. *Leaves* cluſtered at the ends of the branches, on ſhort ſtalks, elliptical, obtuſe, entire, coriaceous, ſingle-ribbed. *Flowers* ſolitary, on ſimple terminal ſtalks ſhorter than the leaves, above an inch in diameter; it is not quite certain that they are really deſtitute of petals, but none are found on Commerſon's ſpecimens. Juſſieu enquires whether this plant may be allied to his *Pirigara*, Aublet, t. 192, 193, the *Guſtavia* of Linnæus; but we ſee little to countenance ſuch a conjecture.

FŒTOR, in *Medicine*, ſtinking or fetid effluvia, proceeding from the body, or the parts thereof. See Effluvia.

Fœtors ariſe from ſtagnant, extravaſated, corrupted, or poiſoned humours: as alſo from any thing capable of attenuating and volatilizing the oils and ſalts; as abſtinence, heat, too much motion, acrimony of food, &c.

Foetor *Narium*, ſtench of the noſtrils; a ſort of diſeaſe ariſing from a deep ulcer withinſide the noſe, yielding a fetid ſmell.

Its cauſe, according to Galen, is a ſharp humour falling from the brain upon the mamillary proceſſes.

This is one of the cauſes for which marriage might formerly be annulled.

Foetor *Oris*, a term uſed by medical writers to expreſs that ill ſmell in the mouth, uſually, though often improperly, called by us a ſtinking breath. This is a malady ariſing in different caſes from very different cauſes; as from the ſcurvy, and particularly that ſpecies of it which affects the mouth, and is therefore called *ſtomacace*; from the French pox; from an ulceration, whether ſimple or fiſtulous, in the lungs, which is the caſe in conſumptions; from ulcers in the mouth; from caries or rottenneſs of the teeth, or from any other impurity of them; from crudities in the ſtomach ariſing from a bad digeſtion, and in particular from a weakneſs about the left orifice of the ſtomach, from which part the fetid vapours will often ariſe in very great abundance.

Method of cure.—According to the different cauſes of this diſorder, it requires a very different method of cure. In caſes where it depends on the ſcurvy, pox, or other diſeaſes, thoſe diſeaſes are to be attacked by the proper medicines, in order to its cure; when it ariſes from a carious tooth, there is no cure for it but drawing the tooth; when the impurities of the teeth occaſion it, the cleaning them proves a cure. Juncker's Conſp. Med. p. 607.

FŒTUS, in *Anatomy*, the child, while it is contained in the uterus, and after all its parts are developed. Before that time it is called an embryo. It is deſcribed in the article Embryo.

FOG, or Mist, in *Meteorology*, is the name given to a cloud, when it reſts on the ground, or when a ſpectator is enveloped in it. On moſt occaſions clouds are conſiderably elevated in the air; that is, from one quarter of a mile to one mile, and in warm countries and ſeaſons to two or three miles: but in all countries they are ſometimes found on the ſurface of the earth, cauſing a degree of opacity in the atmoſphere, which is greater or leſs according to circumſtances. That fogs and clouds conſiſt of minute drops or molecules of water, precipitated by cold, from the atmoſphere of ſteam or vapour diffuſed through the great maſs of air, ſeems highly probable. When a quantity of pure elaſtic ſteam is thrown into the air from a boiler, or the cylinder of a ſteam-engine, a cloud is inſtantly produced, occaſioned, no doubt, by the coldneſs of the air. An appearance of a much finer and more attenuated cloud is obſerved upon ſuddenly rarefying the air in the receiver of an air-pump; the cauſe is the ſame, namely, cold, or the reduction of temperature of the air, which, it ſhould ſeem from modern experience, is not leſs than 50° in the caſe juſt mentioned. Fogs are more frequent in winter than in ſummer, and in cold than in warm countries; this is moſt probably owing in part to the perpendicular range of the clouds being leſs in the former and greater in the latter caſe. When the thermometer on the earth's ſurface is below 32°, clouds of great denſity cannot be formed in high regions, becauſe the aqueous vapour is not ſufficiently copious: but when the thermometer is at 80° or upwards, clouds may be formed at the height of two or three miles. The temperature of the air in aſcending is known to diminiſh about 1° for each hundred yards of perpendicular aſcent; and the quantity of aqueous vapour in any region of the air is uſually not very much under the maximum for the temperature. Hence the vaſtly greater range for the ſtrata of clouds in warm than in cold weather, and the greater probability of the clouds being on the earth's ſurface in the latter inſtance. There is another reaſon for fogs being more frequent in winter than in ſummer, and more particularly on the ſea coaſts and in the vicinity of great rivers. Water is known to have a greater capacity for heat than land; conſequently, the former is more ſlowly brought to the temperature of the atmoſphere upon any change. Now in winter, ſometimes a ſudden cold is induced by a change of wind; the air then is coldeſt, next to it the land, and laſt the water, which is but ſlowly reduced in temperature, for the reaſon juſt mentioned. But the water being comparatively warm, will, from that circumſtance, be diſpoſed to give out a quantity of ſteam, which riſing into the cold air, is immediately condenſed into fog, and wafted along the earth's ſurface by the ſtream of air. Hence ariſe the fogs which mariners often find in approaching land in froſty weather, and which are ſo common in London and other places where the tide penetrates inland. The writer of this article lived ſome years near a river of 30 or 40 yards in breadth; on certain evenings in ſummer, after ſun-ſet, a denſe fog was found to accompany the courſe of the river; it was obſerved that this phenomenon never occurred but when the temperature of the water was at leaſt 10° above that of the air, and that it almoſt always occurred when a difference of temperature to that amount took place; but it is likely that a leſs difference of temperature would have been ſufficient if the river had been broader. Some philoſophers, particularly Sauſſure, maintain that fogs and clouds conſiſt of water in a veſicular ſtate; or that the molecules are ſurrounded with films of water: this opinion ſeems to require further confirmation. The effect of fogs in apparently magnifying diſtant objects is notorious; it is an optical deception: the fog diminiſhes the brightneſs of objects, and conſequently ſuggeſts a greater diſtance; but when the viſual angle remains the ſame, the greater the diſtance the greater is the magnitude: hence objects at a moderate diſtance appear to be magnified. See Cloud, Evaporation, &c.

Fog, or *Fogg*, in *Rural Economy*, is a term that properly ſignifies the fine ſoft graſs that immediately ſprings up after the hay crop has been taken from the ground; but which is ſometimes uſed for the long graſs remaining in the paſtures till the winter ſeaſon. See After-Grass.

FOGARAS, in *Geography*, a town of Tranſilvania, on the Alauta, the ſee of a Greek biſhop; 28 miles W. of Cronſtadt. N. lat. 46°. E. long. 24° 34'.

FOGBARRY, a town of Bengal, on the borders of Bootan.

FOGELN, a ſmall iſland on the W. ſide of the gulf of Bothnia. N. lat. 60° 38'. E. long. 17° 44'.

FOGGAGE, a term applied to coarſe or rank graſs not eaten down in the ſummer or autumnal ſeaſon by any ſort of live ſtock. The practice of fogging graſs lands for the winter ſupport of ſtock has, it is ſaid, been found highly uſeful in different ſituations. See Grass-*Land*.

FOGGI, in *Geography*, a town on the E. coaſt of the iſland of Bourro. N. lat. 3° 28'. E. long. 126° 24'.

FOGGIA, Francesco, in *Biography*, was a native of Rome, a diſciple of Paolo Agoſtini, and an eminent muſical compoſer, who flouriſhed from 1645 to 1681. In his youth he was ſeveral years in the ſervice of the court of Bavaria, and the arch-duke Leopold, afterwards emperor; but returning to Rome, he was appointed maeſtro di capella to the church of St. John Lateran, to Santa Maria Maggiore, to San Lorenzo in Damaſo, and other great churches in that city. Antimo Liberati calls him the prop and father of muſic and true eccleſiaſtical harmony: and ſays, that in his printed and manuſcript productions he had manifeſted ſuch a variety in his manner of writing as was ſeldom found in the works of one man, being equally excellent in the grand, the learned, the noble, the refined, the ſimple, and the pleaſing ſtyle. And in examining his works, this panegyric does not ſeem overcharged, as far as muſic then went, which was not arrived at melody, grace, or expreſſion. He lived to upwards of eighty, is celebrated by Kircher in his "Muſurgia;" and P. Martini has illuſtrated his doctrine in the "Saggio di Contrappunto," with two admirable motets from his eighth opera, in which there is much ingenuity, and a greater variety of meaſure than uſual in church muſic of a century, where a movement in triple time had ſeldom admiſſion.

Foggia, in *Geography*, a town of Naples, in Capitanata, without walls, citadel, or gates; though a principal town of the province. It is neatly built of white ſtone, and has two or three good ſtreets; the cuſtom-houſe is a handſome edifice. The old town having been ruined by an earthquake in 1732, its place was ſupplied by the preſent town, which was built with greater neatneſs and regularity. In ſummer the air is inſalubrious; and many of the inhabitants remove during the hot months; in winter it is ſuppoſed to contain about 20,000 perſons, including ſtrangers. Underneath all the large ſtreets and ſquares are granaries, in which corn is preſerved ſound from year to year; the orifices being cloſed with boards and earth, and the ſides within faced with ſtone. The importance of this town, both in ancient and modern times, has been owing to its being a ſtaple for corn and wool, and to a tax or regiſter office, called "Tribunale della dogana della mena della puore di Puglia," *i. e.* "The cuſtom-houſe for the toll of ſheep that paſs to and from Puglia." It is under the management of a governor, auditor, and two advocates, and has the diſtribution of a fixed aſſeſſment upon all ſheep that deſcend in autumn from the mountains of Abruzzo into the warm plains of Puglia, where they yean, and in May they return to the high country; 16 miles S. W. of Manfredonia. N. lat. 41° 25'. E. long. 15° 38'.

Foggia. See Fochea.

FOGGING, a term made uſe of to ſignify a particular practice in the management of graſs-lands, which has been chiefly confined to South Wales, and ſome diſtricts in its vicinity. It is ſaid by Mr. Young to conſiſt in keeping the whole growth of the graſs, in meadows of the upland kind, free from both the ſcythe and live ſtock during the ſummer and autumn, and eating it off in the winter. It is added that he many years ago knew a Suffolk clergyman who was in the regular habit of this ſingular practice, and who ſpoke of it as a moſt profitable one. He farther ſtates that he has himſelf tried it three times, and conſtantly with ſucceſs. It is found that it thickens the herbage greatly, and yields far more valuable winter and ſpring food than any perſon would expect who never tried it. But it is ſuggeſted that it ſhould only be practiſed on dry land, or ſuch as is in a tolerably dry ſtate.

The advantages of this ſyſtem of graſs huſbandry have not however been ſhewn by any correct ſtatements; and it muſt be evident that conſiderable loſs muſt be ſuſtained in ſuch a full body of graſs remaining upon the ground for ſuch a great length of time.

FOGGY Island, in *Geography*, an iſland ſo called by Beering, in the N. Pacific ocean, near the weſt coaſt of America, about nine leagues in compaſs. N. lat. 56° 10'. E. long. 202° 45'.

Foggy, *Cape*, the north-eaſt extreme point of the above-named iſland. N. lat. 56° 31'. E. long. 202° 46'.

FOGLIA, a river of Urbino, which runs into the Adriatic, at Peſaro.

FOGLIANESE, a town of Naples, in Principato Ultra; 7 miles W. of Benevento.

FOGLIANO, a lake of the Campagna di Roma, near the ſea, with which it communicates.

FOGLIETTA, Uberto, in *Biography*, was deſcended from an ancient and noble family in Genoa. He was born in the year 1518, and was brought up for the profeſſion of the law, which, however, he did not purſue, but ſpent much of his early life in travelling from place to place, and at Rome, where he reſided ſome time, he made himſelf known by ſeveral elegant treatiſes and orations. From ſome paſſages in the latter, he is ſuppoſed to have been in prieſt's orders, though there are no other facts that go to prove the circumſtance. In 1559 he publiſhed his work, entitled "Della Republica di Genova," for which he was proſecuted, his property confiſcated, and himſelf baniſhed. The cauſe of theſe harſh proceedings was the freedom which he exerciſed on the conduct of the nobles and great men of the country. He had, however, the good fortune not to be wholly deſerted; he found a liberal patron in cardinal Hippolite d'Eſte, who received him into his houſe upon terms of intimate friendſhip, and he was likewiſe held in conſiderable eſtimation by ſeveral other perſons of rank. To divert his ſolitary hours in exile, he employed himſelf in writing a general hiſtory of his own times, beginning from the war of the emperor Charles V. againſt the proteſtants. He was the author of many other pieces of a miſcellaneous nature: but the laſt was the hiſtory of his own country, of which he lived to finiſh twelve books, from the foundation of Genoa to the year 1527. He died in the year 1581 at the age of ſixty-three. The hiſtory of Genoa was publiſhed by his brother Paul, who was himſelf a man of learning, and a good Italian poet.

FOGLOE, or Fuelöe, in *Geography*, the moſt eaſterly of the Faroer iſlands, towards the North. N. lat. 62° 3′.

FOGO, a ſmall iſland near the eaſt coaſt of Newfoundland. N. lat. 50″ 2′. W. long. 54° 10′.

Fogo. See Fuego.

FOHR, or Fora, an iſland of Denmark, near the coaſt of Sleſwick, in the German ocean, about twelve miles in circumference, with a ſmall ſea port, and a ſafe road for ſhips; the ſoil is fertile, and the iſland contains 3 pariſhes. N. lat. 54° 44′. E. long. 8° 31′.

FOHRAG, a town of Perſia, in Farſiſtan; 18 miles S. of Yeſd.

Fohrag, or *Fohraj*, a town of Perſia, in the province of Mecran; 260 miles W.N.W. of Kidge. N. lat. 23°. W. long. 58° 20′.

FOHRN-See, a lake of Carinthia; 10 miles S.E. of Saxenburg.

FOIANO, a town of Naples, in the Capitanata; 12 miles S.W. of Manfredonia.

FOIBLE, a French term, frequently uſed alſo in our language.

It literally ſignifies *weak*; and in that ſenſe is applied to the body of animals, and the parts thereof; as foible reins, foible ſight, &c. being derived from the Italian *fievole*, of the Latin *flebilis*, to be lamented, pitied.

But it is chiefly uſed with us ſubſtantively, to denote a defect or flaw in a perſon, or thing. Thus we ſay, every perſon has his foible; and the great ſecret conſiſts in hiding it artfully; princes are gained by flattery, that is their foible: the foible of young people is pleaſure; the foible of old men is avarice; the foible of the great and learned is vanity; the foible of women and girls, coquetry, and an affectation of having gallants.

It is a term alſo uſed in *Fencing*, to denote the weakeſt or third part of a blade, or that part of the farther extremity next the point; in oppoſition to the fort which is the ſtrongeſt.

Foible, Fr. *feeble*, as *tems foible*, the unaccented part of a bar. See Time, and Accent.

FOIL, in *Fencing*, denotes a blunt ſword, or one that has a button at the end covered with leather, uſed in learning the art of fencing. The amateurs and teachers of fencing caution the learner never to fence in aſſaults with ſhort foils, but preſcribe them of a proper length, meaſuring from one extremity to the other three feet two inches; which will enable him to keep a regular diſtance, and execute his movements with a greater degree of juſtneſs and dexterity: and beſides, this mode of practice will preclude erroneous habits which perſons are apt to contract by fencing with ſhort foils. See Sword.

Foil, among *Jewellers*, a thin leaf of metal, placed under a precious ſtone, in order to make it look tranſparent to improve the colour, or to give it an agreeable different colour, either deep or pale. Thus the effect of giving luſtre is produced by the poliſh of the ſurface of the foil, which is colourleſs; but if a ſtone is wanted to be of a pale colour, a foil of that colour muſt be put under it. If deep, a dark one muſt be laid under it.

Theſe foils are made either of copper, tin, gold, or gold and ſilver together: the copper foils are generally known by the name of Nuremberg or German foils. They are prepared as follows:

Procure the thinneſt copper-plates that can be got; beat theſe plates gently upon a well-poliſhed anvil, with a poliſhed hammer, as thin as writing paper; or paſs them between a pair of fine ſteel rollers, very cloſe ſet; and placing them between two iron plates, as thin as poſſible, heat them in the fire, then boil the foils in a pipkin, with equal quantities of tartar and ſalt, conſtantly ſtirring them, until by boiling they become white; after which, taking them out and drying them, give them another hammering, until they are fit for uſe. Care however muſt be taken not to give the foils too much heat, for fear of melting; neither muſt they be too long boiled for fear of attracting too much ſalt.

The manner of poliſhing theſe foils is as follows; take a plate of the beſt copper, one foot long, and about five or ſix inches wide, poliſhed to the greateſt perfection: bend this to a long convex, faſten it upon half a roll, and fix it to a bench or table: then take ſome chalk, waſhed as clean as poſſible, and filtered through a fine linen cloth, until it be as fine as can be made; having laid ſome of this upon the roll, and wetted the copper all over, lay the foils upon it, and with a poliſhed ſtone and the chalk, poliſh them till they are as bright as a looking-glaſs. After this they muſt be dried and laid up ſecure from duſt.

The beſt method of preparing foils, ſo as to give to colourleſs ſtones, as cryſtals, pebbles or paſte, the luſtre and play of diamonds, is as follows:

Take leaves of tin, prepared in the ſame manner as for ſilvering looking-glaſſes, and cut them into ſmall pieces, of ſuch ſize as to cover the ſurface of the ſocket of the ſtones that are to be ſet; lay three of theſe one upon another, and having moiſtened the inſide of the ſocket with thin gum water, and ſuffered it to dry, that only a ſlight thickneſs may remain, put the three pieces of leaves lying on each other into it, and adapt them to the ſurface in as even a manner as poſſible. When this is done, heat the ſocket, and fill it with warm quickſilver, which muſt be left in it for three or four minutes, and then gently poured out. The ſtone muſt then be thruſt into the ſocket, and cloſed with it; care having been previouſly taken that it may enter the ſocket without ſlipping off the tin and quickſilver from any part of the ſurface. The work ſhould be well cloſed round the ſtone, to prevent the tin and quickſilver contained in the ſocket from being ſhaken out by any violence. The luſtre of ſtones ſet in this manner will continue longer than when they are ſet in the common way.

When colouring foils are wanted, thoſe of copper, above deſcribed, may be either tinged with ſmoke, or ſtained, or painted with ſome pigment or other colouring ſubſtance. The colours uſed for this purpoſe may be tempered with oil, gummed or ſized water, or varniſh; for red, in imitation of ruby, carmine, with a little lake uſed in iſinglaſs ſize, or ſhell-lac varniſh, or bright lake in oil, ſhould be employed: for the garnet-red, dragon's blood, diſſolved in ſeed-lac varniſh, may be uſed; and for the vinegar garnet, orange lake, tempered with ſhell-lac varniſh. For the amethyſt, lake, with a little Pruſſian blue, uſed with oil for blue: where the effect of ſapphire is wanted, Pruſſian blue in oil, and ſpread on the foil more or leſs thinly, according to the lightneſs or deepneſs of the colour required; for the eagle marine, common verdigris with a little Pruſſian blue, tempered in ſhell-lac varniſh, ſhould be uſed; for a full yellow, yellow lacquer; and for the ſlighter colour of topazes, the burniſh and foil itſelf will ſerve, without any addition. For a deep green, the cryſtal of verdigris, tempered in ſhell-lac varniſh; but for the emerald, a little yellow lacquer ſhould be added. See Doublets. Handmaid to the Arts, vol. ii. p. 333, &c.

Foil, or *Foyle*, among *Looking-glaſs Grinders*, a ſheet of tin, with quickſilver, or the like, laid on the back-ſide of a looking-glaſs, to make it reflect. See Foliating. The word is formed of the Latin *folium*, *leaf*.

FOILING, among *Hunters*, the footing and treading of deer, which remains on the graſs, but ſcarcely viſible.

FOISSEN, in *Rural Economy*, is a term ſometimes uſed to ſignify the natural juice or moiſture of graſs, or other herbage.

FOIST, a term uſed to ſignify a muſty ſort of ſmell among hay, ſtraw, grain, and other farm products.

FOISTY, having a muſty diſagreeable ſmell.

FOIX, in *Geography*, a ſmall province of France, before the revolution, including Dounezan and the valley of Andôrre, bounded on the N. and E. by Languedoc, on the S. by Rouſillon and the Pyrenées, and on the W. by Gaſcogne; lying between 42° 25′ and 43° 20′ N. lat., and between 1° 15′ and 2° 40′ E. long.; ſixty miles from N. to S., and towards the ſouthern boundary thirty miles from W. to E., but more northward its breadth is from 15 to 20 miles. This province is traverſed by the river Arriége. It was anciently governed by its own counts, and united to the crown of France in the year 1607. It is divided into Upper and Lower; the former, being mountainous and barren, produces wood and paſturage; the latter, more level and tolerably fertile, yields grains, fruits, and wine, and both abound in mines, mineral waters, and natural curioſities.

Foix, a town of France, formerly the capital of the above deſcribed province, and now the principal place of a diſtrict, in the department of the Arriége, is an ancient ſmall town, at the foot of the Pyrenées, on the left bank of the Arriége, with a caſtle on a rock commanded by two adjacent hills; 15 leagues S.S.E. of Toulouſe. The place contains 3,600, and the canton 13,322 inhabitants, on a territory of 292½ kiliometres, in 24 communes. N. lat. 42° 58′. E. long 1° 40′.

FO-KIEN, a ſmall but flouriſhing province of China, bounded on the N. by the province of Tche-kiang, on the W. by that of Kiang-ſi, on the S. by Quang-tong, and on the E. by the Chineſe ſea. It has few plains, but induſtry fertilizes even the mountains, which are diſpoſed in the form of amphitheatres, and arranged in terraces one above another. The valleys are watered by rivers and ſprings, which deſcend from the mountains, and which the Chineſe huſbandman contrives to diſtribute ſo as to favour the culture and growth of his rice; he raiſes the water even to the ſummits of the mountains, and conveys it in different directions by means of bamboo pipes. The mountains are covered with trees fit for naval architecture, and the province furniſhes muſk in abundance, precious ſtones, quickſilver, iron, and tin. Tools of ſteel of various kinds, ſtuffs of ſilk, and cloths of ſurpriſing fineneſs and beauty are made in this province. It is alſo ſaid to contain gold and ſilver mines; which the inhabitants are prohibited to open under pain of death. In the bays, and on the coaſts guarded by fortreſſes, great quantities of fiſh are taken, which being dried and ſalted, are carried into the interior provinces of the empire. This part of China acquires great opulence from the trade which its inhabitants carry on with Japan, the Philippines, Java, Camboya, Siam, and the iſland of Formoſa, and they alſo import from other countries aloes, cinnamon, pepper, ſandal-wood, amber, coral, and other ſimilar commodities. Fo-kien contains nine *fou*, or cities of the firſt claſs, and ſixty *hien*, or cities of the third claſs. Its capital is Fou-tcheon-fou. Each city has its own peculiar dialect; but the language of the Mandarins is ſpoken every where; few in this province underſtand it; nevertheleſs, it produces a great number of literati. The climate is hot, but the air is pure and ſalubrious. The number of inhabitants, according to the eſtimate of ſir George Staunton, is fifteen millions.

FOLARD, Charles, *Chevalier de*, in *Biography*, was born at Avignon in 1669. He received the rudiments of claſſical learning, and by reading Cæſar's Commentaries, became exceedingly deſirous of entering the military ſervice of his country. His deſigns were at firſt thwarted by his father, till at length, finding oppoſition of no avail, he allowed him to follow the bent of his inclination. He ſerved during the war of 1688, and was made aid-de-camp to the duke de Vendome in 1702. In theſe campaigns he not only diſtinguiſhed himſelf as a ſoldier, but acquired an exact knowledge of the country in which the battles were fought, and drew maps and plans of every thing which he ſaw, and which was calculated to be ſerviceable to him in his future purſuits. At the battle of Caſſano he was thrice wounded; and afterwards, at the battle of Malplaquet, he was wounded and taken priſoner. In 1714 he went to Malta, in order to aſſiſt in defending that iſland againſt the Turks. After this he viſited Sweden, and was entruſted by Charles XII. with negociating a plan, with the court of France, for a projected invaſion of Scotland, for the reſtoration of king James II. This ſcheme having failed he returned to Sweden, and followed the emperor to Fredericſhall, where that heroic prince was killed by a cannon ſhot. (See Charles XII.) Folard ſerved his laſt campaign in 1719 under the duke of Berwick, and from this period he devoted himſelf to the ſtudy of military tactics. In 1727 he publiſhed his great work, entitled "Commentaries on Polybius," in ſix volumes 4to. which was, in fact, a depoſitary of his military reflections and inventions, and though it was not diſtinguiſhed for the neatneſs of its ſtyle, and was moreover defective in method and order, yet it was highly eſteemed as containing much uſeful matter. Folard wrote a piece, entitled "New diſcoveries reſpecting War," and ſome other treatiſes on military ſubjects. In 1749 he was elected a fellow of the Royal Society of London, and in 1752 he died at Avignon at the age of eighty-three. He was a man of great worth and integrity, and was entruſted during the laſt forty years of his life with the government of Bourbourg: he would probably have riſen to much higher honours and more important duties in the ſtate, had he not been a zealous defender of the miracles of the Abbé Paris, which gave offence to cardinal Fleury. A more elaborate account has been given of this diſtinguiſhed ſoldier in a work entitled "Memoires pour ſervir a l'Hiſtoire de M. le Chevalier de Folard." Moreri.

FOLD, in *Rural Economy*, a ſmall incloſed ſpace formed for confining any ſort of live ſtock, &c. Folds are of ſeveral different kinds, according to the objects they have in view; and are eſſential in many caſes where a number of animals are to be kept. See FARM-*yard*.

FOLD *Garth*, the old term employed to ſignify a farm-yard or incloſed place in which cattle are confined. See FARM-*yard*.

FOLD-*net*, among *Sportſmen*, a ſort of net with which ſmall birds are taken in the night: there are two ſizes of it; the leaſt may be managed by one man, but the largeſt muſt be carried by two, and uſed thus: let the net be fixed on both ſides to two ſtrong poles about twelve feet long, each man holding one of them; let a third carry lights behind them, at the diſtance of two yards: the net ſhould be carried between the wind and the birds, which rooſt on their perches with their breaſts againſt the wind: another perſon who beats the buſhes on the other ſide of the hedge, will drive out the birds towards the light.

FOLD-*ſoca*, in *Law*. See FALDAGE.

FOLD-*yard*, in *Rural Economy*, the yard where cattle of different ſorts are confined and fed during the winter ſeaſon. Yards of this nature ſhould be properly fitted up with convenient ſheds and racks for the animals to eat their fodder from, and have ſuitable diviſions for containing different denominations of cattle, or other live ſtock. See FARM-*yard*.

FOLD, *Sheep*, the yard or incloſure in which ſheep are confined during the nights in the winter months. Yards of this kind are not by any means ſo common as their great advantages and utility would ſeem to demand. They are capable of being made the means of raiſing great quantities of excellent manure, at the ſame time that they contribute greatly to the health and preſervation of the ſheep. Theſe folds are of two kinds, as erections of the houſe or ſhed ſort conſtructed for the purpoſe adjoining to the farm-yards, or ſuch as are moveable and formed by art by means of hurdles in the fields. In the former, which is ſtill the common practice in France, Flanders, &c., the floors of the ſheds or houſes are occaſionally covered with ſtraw, ſand, or other light dry earthy matters, by which a large quantity of valuable manure is obtained; which, when applied to cold wettiſh ſoils, is highly advantageous in producing abundant crops. It is obſerved, however, by the author of Modern Agriculture, that, ſince a ſpirit for incloſing, planting, and improvements in general has been introduced, the original breeds of ſheep have been baniſhed to the mountainous diſtricts in the northern parts of the iſland, where cultivation has hitherto been deemed impracticable. Within theſe few years, indeed, ſome valuable breeds of ſheep have been brought from the ſouthern parts of the kingdom, but they are generally kept in gentlemens' parks, and are never penned or houſed; ſo that he thinks the quantity of ſheep dung applied to tillage lands in the ancient manner is very trifling compared to what it was formerly; that practice exiſting in thoſe parts of the country only which ſeparate the lands that are generally or cloſely cultivated from the mountainous diſtricts, where ſheep-huſbandry, on a large ſcale, and under a regular ſyſtem, is eſtabliſhed and kept up.

Moveable houſes have been found in many diſtricts extremely beneficial in the management of ſheep. See SHEEP-HOUSE.

The farmers of Hertfordſhire, as ſtated in the agricultural account of that county, find much advantage from the raiſing of manure in theſe ſorts of folds. At the Grove the earl of Clarendon is ſaid to have a yard that contains good room for three hundred ſheep, the number which is uſually kept in it. It is ſurrounded by an open ſhed, except on one ſide, where a barn is the fence; the outſide of the ſhed is formed of wattled hurdle-work, without ſtraw or other materials, for coolneſs, leſt a greater cloſeneſs ſhould make the yard too hot. The whole is kept well littered with ſtubble, and yields from the above number of ſheep eighty large cart-loads of manure. And the ſyſtem is found to agree perfectly well with the ſheep, keeping them more healthy than when they were left in the fields in the common manner. His lordſhip has likewiſe another yard for lambing, which has alſo a ſhed connected with it. Mr. Bevan of Norfolk is ſtated by Mr. Young to have been attentive to this uſeful practice ſo early as the year 1792, having then a yard well fenced in for a ſtanding fold, in ſight of the ſhepherd's windows, calculated for littering and folding in bad weather. And that in 1802 he found him continuing the practice, and to be well perſuaded of the great advantage of it; he indeed conſiders it now as indiſpenſable, and intends in future to have his flock in for yeaning, whether the ſeaſon be good or bad; having conſtantly fifteen or twenty loads of hay ſtacked up in it, for the ſheep to help themſelves at: he is ſaid to find this not attended with any waſte. It is difficult, however, to conceive that a number of ſheep can continue pulling hay from a large ſtack daily, without trampling much of it under their feet, and in that way cauſing waſte of the fodder. It is a much better method to have the hay preſſed tightly into racks formed for the purpoſe with the ſtaves near together, and placed upon low wheels ſo as to be conveniently moved.

In various other diſtricts of the kingdom, the ſyſtem of folding ſheep in covered ~~folds~~ conſtructed for the purpoſe, has been found a highly beneficial method by thoſe individuals who have had recourſe to it; and where it is well followed up during the months of November, December, January, February, March and April, with a ſufficient ſupply of litter, a dung heap of at leaſt from ſixty to ſeventy loads of very good ſtuff, may be produced from not more than a hundred ſheep; which will be capable of manuring two acres of land in a very perfect manner. But the ſame number of ſheep, when folded in the field, where the graſs land is even dry enough for the purpoſe, will not in the ſame time manure in an equal degree much more than one acre of ground. This fully ſhews the great ſuperiority of the yard method over that of the field.

The latter method, which is now the moſt common, is to pen or fold the ſheep themſelves upon the land, which on dry friable ſoils in particular is found to produce beneficial effects. They are ſometimes, however, folded on old paſtures, but more frequently on lands in tillage, eſpecially on fallows, as a preparation for a ſucceeding crop of wheat, and on light ſoils, by way of top-dreſſing after the grain is ſown, or on fields of turnips. This laſt method is moſt generally adopted in the incloſed and beſt improved diſtricts of the kingdom. The hurdles or rails which form the fold are commonly about four feet ſix inches long, and three feet ſix inches high, made for the moſt part of either hazle or willow. About fourteen or fifteen dozen of hurdles are ſufficient to incloſe a ſtatute acre. They are tied to ſtakes fixed in the ground at regular diſtances, with ſmall branches of trees twiſted when green for the purpoſe. An acre is conſidered as a ſpace ſufficient for folding from twelve to thirteen hundred ſheep. The ſheep ſhould never be allowed to lie above one night on the ſame ſpot of ground: and of courſe twelve or thirteen hundred will manure an acre of land daily. By thus connecting ſheep-huſbandry with the improvement of arable land, much may in many caſes be effected, eſpecially upon the more dry and light ſorts of ſoil, where it is capable of being carried to the greateſt extent, and where the quantity of graſs land either in common or otherwiſe is alſo conſiderable.

FOLDAGE and Folk-Course. See Faldage.

FOLDEREID, in *Geography*, a town of Norway, in the dioceſe of Drontheim; 114 miles N.N.E. of Drontheim.

FOLDING Doors, in *Architecture*, are thoſe that are made in two parts, each part hung to each jamb, and their other vertical edges meet each other, lapping the rebates together when the door is ſhut. See article Doors.

Folding *Sheep*, the practice of confining them upon arable or other lands, by hurdles or other means, ſo as to ameliorate and improve them. This is a method that is much reſorted to by all open-field farmers as a preparation for wheat, and their chief dependance is upon this ſpecies of top-dreſſing, where the quantity of farm-yard dung is inſufficient for their purpoſe. This mode of manuring is peculiarly adapted to farms where there is a conſiderable extent of hill or common paſture, or graſs lands that never come under the plough. In ſuch farms, by bringing the ſheep in the evening to the fold a conſiderable quantity of manure will be made that would otherwiſe be loſt. If the paſture upon which the ſheep feed through the day be good, they may be folded without much detriment to the animal for a great part of the year; but where the paſture is ſcanty this cannot well be done, for the ſheep will not be able to pick up a ſufficiency of food through the day to enable them to bear the fatigue of travelling to and from the fold and faſting all night; and unleſs the ſheep have turnips or hay during the winter their dung will be of ſmall value. It is a bad practice to crowd more ſheep into a fold than can lie down at their eaſe, and it is equally bad to confine young and old, ſtrong and weak, in the ſame fold. It is far better to afford them room enough, and, in particular caſes, to let them remain on the ſame ſpot two or three nights till it is ſufficiently manured. Feeding ſheep in a fold can only be practiſed upon light dry ſoils. Here it is ſtill more neceſſary neither to crowd the ſtock nor to put in the weak with the ſtrong, for they will tread down and waſte the food, and in the contention for it the ſtrong will deprive the weak of their proper ſhare. On ſuch light dry ſoils ſheep will do good by giving it coheſion with much treading; but on clays or ſtrong loams this does much injury to the lands; turnips or other green crops cannot therefore be fed off in ſuch ſoils, except in dry ſeaſons, but muſt be pulled and eaten upon a dry ſtubble or paſture. Upon farms entirely arable, where artificial graſſes make a ſmall part of the rotation, to bring the flock from the paſture to fold it upon a fallow, is ſuppoſed by ſome to be only enriching one part of the farm at the expence of another: or, as Mr. Bakewell always called folding, *robbing Peter to pay Paul.* It is well known that heaths and ſheep-walks that have been fed time out of mind, but the ſheep conſtantly folding on other lands, continue as miſerably poor as they ever were at any former period. But beſides this, lambs and ewes are damaged by folding, to the amount probably of at leaſt 1*s.* a-head. Now the benefit ariſing from their dung is eſtimated at about 1*s.* 6*d.* a-head, which leaves only 6*d.* each for the advantage of this practice. But there is ſtill another deduction to be made on the number kept, and loſſes on ſtock. Divide one thouſand ſheep into ten flocks of one hundred each, by means of incloſures, and twelve hundred would be kept eaſier than a thouſand were before; and as to many of the diſtempers and accidents to which flocks are liable, ſome of which are contagious, they reſult very much from this practice of folding the ſheep.

It may be farther obſerved, that if folding be ſuppoſed neceſſary on account of the manure, where farm-yard dung is not made in ſufficient quantity, and other manure is not readily to be obtained, a greater ſtock of muck might be raiſed by littering a dry part of the yard, or a warm corner of ſome paſture with leaves, ſtraw, fern, or whatever litter could be had in the greateſt plenty, penning the ſheep and feeding them there in hard weather, and letting them run into the adjoining paſture only during the day in fine weather. A great quantity of manure might thus be raiſed in winter from a flock; and provided they had ample room in the pen, and were to be well ſupplied with dry litter, the ſheep might ſuſtain leſs injury in thus lying warm and dry, than from being folded on naked ground, often wet, and in an open expoſure. However, where other good effects are to be produced on land, beſides thoſe that ariſe from the dung and urine of the ſheep, ſuch as their treading, and a certain warmth communicated to the ſoil by their breath, their perſpiration, and the natural heat of their bodies, folding may be the moſt adviſeable means for obtaining them that can be adopted.

Methods of folding.—Mr. Young has obſerved on this practice, that a very great change has lately taken place in it on incloſed farms, eſpecially with the beſt farmers in the county of Norfolk. They are now, he aſſerts, fully convinced that it is an unprofitable ſyſtem of management, except where the openneſs of down and common fields renders it neceſſary for the purpoſe of confinement. It is contended, that the number of ſheep that may be kept on a farm without folding, is much greater than that which can be ſupported with it. This is a moſt eſſential point; and there is a deduction from the farmer's profit in the injury done to both ewes and lambs by folding, which is ſtated to have been eſtimated by the moſt experienced judges, at from 2*s.* 6*d.* to 4*s.* *per* ewe; ſo that a farmer ſhould conſider well before he determines to follow a practice, which, from a multitude of obſervations, is pronounced unprofitable. Mr. Bakewell conſidered it as ſtated above. And the arguments now urged in its defence are not, it is contended, ſatisfactory: it is maintained, that if ſheep be not folded they will draw under the hedges and other places for ſhelter in bad weather; if ſo, they ought to be allowed to do it, for more would be loſt in ſuch caſes by forcing the ſheep from ſhelter, than the value of their fold. Where this practice takes place, good ſhepherds will, in caſe of rain, get up in the night and let their flocks out of the fold, knowing the conſequence of confinement on arable land in wet weather. The inſtinct of theſe animals will, it is ſuppoſed, conduct them much better than our reaſon, not only where to fly for ſhelter, but alſo for chooſing their own time to go to reſt, and to feed in the morning. Theſe they vary according to ſeaſons and weather; but folding prevents it, and forces them to a regularity never called for by the weather, nor perhaps the economy of the animals. It is added, that when he began firſt to entertain doubts of the propriety of folding ſheep, on any farms, in which they can be kept to certain fields in the night without that practice, he earneſtly deſired to try ſome experiments that might throw more light upon the queſtion than it was poſſible for reaſon to do; but to effect this comparatively was very difficult, as the trial wiſhed for was ſuch as ſhould carry ſome poſitive conviction with it. But though he has not been able to effect this fully, the trials which he has made may not be found deſtitute of power to throw ſome light on this intereſting queſtion. The writer is perfectly perſuaded that it would have been impoſſible for him to have kept on the ſame land nearly ſuch a ſtock in one parcel with folding. It is not ſuppoſed that the fields would have carried three-fourths, ſo managed. Four drivings in a day make them trample much food, diſquiet the ſheep, and transfer the choice of their hours of feeding and reſt from themſelves to the ſhepherd and his boy. While lambs are young they are injured by this, and the ewes are liable to be hurried and heated; all which are objects that ſhould weigh in the queſtion. When ſheep are kept in numerous parcels, it is not only driving to and from fold that affects them, but it is aſſerted, that they are in fact driving about in a ſort of march all day long, when the ſtrongeſt have too great an advantage, and the flock divides into the head and the tail of it, by which means one part of the ſheep muſt trample the food to be eaten by the other. All this, it is conceived, points the very reverſe of their remaining perfectly quiet in ſmall parcels.

It is, however, ſuppoſed, that the queſtion chiefly turns on the benefit to be reaped by the fold; for if that be great enough to compenſate for the loſs by ſuch circumſtances, the practice may not be condemned. It is conceived that the reaſon why farmers are ſuch warm advocates for folding, ariſes from the power it gives them of ſacrificing the graſs lands of a farm to the arable part of it. Their object is corn, by which they can carry off a farm whatever improvement they bring to it. Graſs improved is profit to the landlord in future, and tenants are too apt to think that this is done at their expence. They do not at all regard impoveriſhing a graſs field in order to improve a ploughed one; and it need not be obſerved, that every ſort of ſheep-walk is thus impoveriſhed; ſo that ancient walks which have been ſheep-paſtured perhaps for five centuries, are no better at preſent than they were before; whereas moſt fields ſheep-fed, without folding from them, are in a conſtant ſtate of amelioration; this, it is ſaid, leads him to remark the effects he obſerved on ſeveral of his own fields. He carefully attended, during the courſe of a ſummer, many gentlemen over the fields, with a view to examine whether the ſheep had ſeemed to have reſted only on ſpots to the too great manuring of ſuch, or on the contrary, to have diſtributed themſelves more equally: and it was a pleaſure to find, that they ſeemed generally to have ſpread in every part, if not quite equally, at leaſt nearly ſo. The further circumſtance of ſeveral old leys fed in the ſame manner, when examined in autumn, convinced him, as well as his bailiff, that the ground had been unqueſtionably conſiderably improved. Thoſe fields had carried a very bad appearance for ſome years, but they were, after ſheep-feeding, of a rich verdure, and as full of worm-caſts as if they had been dunged. They were heavily rolled in November, but they ſoon became rough again by worms, and demanded much rolling in the ſpring. And they had afterwards a greener and more fertile appearance by far than ever they were before. It is added, that the whole of this circumſtance, the value of which he ſhall be able to appreciate in the trials of future years, belongs to this method of dividing flocks, to the excluſion of folding. The fold is valuable, but ſo is the improvement of the graſs land, and may, for what he knows, nearly equal it when in addition however, the greater number of ſheep that can be kept is included, and the favour done to them by letting them alone, there remains in his mind no further doubt of the fact. It is remarked as common to hear ſtock-farmers in open countries ſay, they have not the power to manage ſo. This may be very true, it is ſuppoſed, upon the major part of the farms, but ſuch have often many incloſures in which this management might be applied without difficulty. But ſuppoſing folding to be the ſyſtem purſued, it may be remarked that the farmers in thoſe parts of the kingdom which underſtand it beſt do not extend it ſo far as they might: they give over folding in November or December, whereas it may certainly be carried on through the whole winter with profit; even ſuppoſing that the practice is neceſſary. On thoſe farms which have a perfectly dry gravelly paſture or two, it is adviſeable to fold all winter on ſuch dry graſs land. It muſt not be attempted on moiſt arable land, nor on moiſt graſs land, but on dry paſtures. The ſafety to the ſheep is greater and the benefit to the graſs an object.

And it is ſtated that there is another method of gaining all the benefit of folding quite through the winter, and on all ſoils, which is that of confining the ſheep in the night in proper yards, well and regularly littered with ſtraw, ſtubble, or fern; by which means the ſtock is kept warm and healthy in bad ſeaſons, and, at the ſame time, a ſurpriſing quantity of dung raiſed: ſo great a quantity, if there be plenty of litter, that the profit will be better than by folding on the land. And a great improvement in this method would be giving the ſheep all their food, except their paſture, in ſuch yards, as hay, turnips, &c.: for which purpoſe they may be brought up, not only at night, but alſo at noon, to be baited; but if their paſture be at a diſtance, they ſhould then, inſtead of baiting at noon, come to the yards earlier in the evening, and go out later in the morning. This is a practice which cannot be too much commended; for ſo warm a lodging is a great matter to young lambs, and will tend much to forward their growth; the ſheep will alſo be kept in good health; and, what is a point of conſequence to all farms, the quantity of dung raiſed will be very great, as has been already ſhewn.

It has been remarked by the author of the Synopſis of Huſbandry, that the horned or weſt-country ſheep are to be preferred by the farmer, whoſe chief intention in maintaining a flock is to improve and fertilize his arable land; and that in this reſpect the ſheep forms a very material part of the huſbandman's riches: for to ſo high a degree may land be improved by a proper management of theſe animals, that, with reſpect to light ſoils eſpecially, it is, he contends, ſcarcely an hyperbole to affirm, that wherever a ſheep hath ſet its foot, ſome benefit hath accrued to the owner. The virtues of the fold are well known; beſides which, the keeping of corn cloſe trodden in the ſpring, and thereby counteracting the ill effects of the worm, is a matter of ſuch material import to the renter of thin ſoils, as to be a ſufficient inducement to this practice. Theſe facts are ſo univerſally known and acknowledged, that in Hertfordſhire, where every farmer is in a greater or leſs degree a maintainer of ſheep, it is, he aſſerts, an eſtabliſhed maxim to date the good or ill ſucceſs of a tenant from the extent of his fold. Whilſt the flock is kept up to its original number, and the ſale of fat ſheep replaced by an equal tale of lean ſtock, the owner is ſuppoſed to be in thriving and proſperous circumſtances. On the contrary, when the flock is ſold off without being renovated by a freſh ſupply, the fate of ſuch a renter is anticipated by his neighbours, and too often verifies the truth of their prediction, by a rapid declenſion towards bankruptcy and ruin. Such being the ſtate of the caſe, it may be no unprofitable inquiry, he thinks, to trace out the ſeveral different modes of conducting this buſineſs. There are ſeveral ways of conducting this economical plan on an arable farm: firſt, by the maintenance of a folding flock; and this is either of ewes or wethers. In the former inſtance, the lambs are bred on the farm, and weaned for the purpoſe of keeping up the flock, as the old ewes become fit for the butcher. In the latter, a proportionable number of ſtone wethers muſt be yearly purchaſed, to make up the deficiency of thoſe which are fattened, or ſold to the feeding grazier for that purpoſe. But if the farm is not ſufficiently extenſive to admit of the practice of folding, or the local ſituation be ſuch as to decide in preference of a feeding flock, the turnips and ſown graſſes may be appropriated towards the purpoſe of fattening wethers, or the raiſing lambs for the butcher, either in pens or in the field; the one diſtinguiſhed by the name of houſe, and the other by that of graſs lambs. Whichever of theſe methods is purſued, it is obvious that a proportionable quantity of ground muſt be yearly allotted for turnips, tares, rye, clover, &c.; without which it would be a vain attempt to ſet about the maintaining a flock of ſheep. But ſince it is generally in the option of the farmer, with proper management, to raiſe a quantity of food equal to the ſupport of his ſheep, we will ſuppoſe that theſe matters have been properly attended to, and now proceed to enlarge on each of the methods above enumerated. And firſt, of an ewe flock kept for the purpoſe of folding. In order to conduct this plan of huſbandry to advantage, a large tract of ground ſeems to be required. In farms where a due proportion of paſture is united with the arable land, and theſe paſtures lie contiguous to the uplands, to wean lambs for the purpoſe of folding is a very judicious method. But where there is neither meadow nor paſture land attached to the farm, the buſineſs of an ewe-fold cannot be ſo conveniently practiſed. On many farms in the neighbourhood of Graveſend, in Kent, this plan is obſerved to be very advantageouſly purſued, from the circumſtance of each of theſe farms having a quantity of marſh land annexed to it, at the rate of fifty acres of marſh to one hundred and fifty of the arable. The method which theſe farmers purſue is to buy in a number of ewes, equal to the ſize of their farms. If this purchaſe is made at the Michaelmas fairs, the ewes are then pregnant; if they are bought at the ſpring markets, they probably have lambs by their ſides, which may go to fold with their dams, and the ewes be turned to the ram in the autumn. In order to obtain lambs at a proper ſeaſon, let the rams be turned among the flock in October, at the rate of one ram to fifty ewes. Here they are to remain for a month, by which time the greateſt part of the flock will be impregnated: and to aſcertain this fact, it is a cuſtom with many people to beſmear the fore bows of the ram with tar and ochre, which eaſily leads to a diſcovery. The breeding ewes may continue to go to fold every night, till towards the third month of geſtation. But it is to be obſerved, that in folding either ewes or wethers, but more eſpecially the former, a field of turnips ſhould be provided near the cloſe where they are to lodge in the winter nights, that the flock may not have too long a drift; for theſe animals are but ſorry travellers at beſt: and in the winter time, when the roads are become deep and miry, and the ewes begin to be heavy in lamb, a long drift would be highly prejudicial to them. Where ſuch a turnip field does not lie handy to the fallow, it will be improper to proſecute this buſineſs with an ewe flock, after the wheats have been ſown in November. When the folding is diſcontinued, the ewes ſhould be driven into a paſture, where they may be quiet and undiſturbed, and be often viſited by the owner, to watch with a careful eye any accident that may befall them; for ſheep, at all times an helpleſs race, are liable to a variety of misfortunes in the time of geſtation, peculiar to that condition. Towards the latter end of February, the ewes will be come near their time for lambing, and ſhould then be removed from the marſhes or low paſtures, and driven into the turnip field, or turned on a piece of dry upland paſture. If the farm hath produced a quantity of turnips ſufficient to fatten the wethers, a portion of which will be yearly turned out of the fold, in this mode of conducting buſineſs, the ewes, for four or five weeks previous to the time of lambing, may be lodged on that part which the fattening ſheep have gone over, where they will find an ample ſuſtenance from the ſhells which were left by their predeceſſors; as theſe females do not require ſo full an allowance of meat as will be neceſſary for them after they ſhall have yeaned; and too great a plenty would be very detrimental to them. But this is to he obſerved, that proper care ſhould be taken to prevent the wethers from breaking into the part deſtined for the ewes, which at this period require the moſt diligent attendance from the ſhepherd, not only to watch the diſorders and accidents which may befall them, but to maintain the fences in good repair, and to ſee that the hurdles are kept tight in the ground; and to prevent the inroads of ſwine or dogs, both of which would be apt to ſeize the lambs as they fall.

Summer folding.—This ſhould commence early in the ſpring ſeaſon, and as ſoon as the lambs are in a ſtate fit for it. The lambing ſeaſon generally commences about the firſt week in March, when the ſhepherd will find ample ſcope to exert his ſkill and diligence. As the weather at this ſeaſon of the year is generally unſettled, and the cold often more ſevere than in any former part of the winter, the lambs, as well as ewes, frequently periſh through the inclemency of the ſeaſon. As the ewes have lambed down, it will be proper to remove them, with their lambs, into a piece of turnips, fenced off for the purpoſe, where they may neither be annoyed by the lambing ewes, the fatting wethers, or the ſtore ſheep, if there are any in the ſame field; and which, as has before been obſerved, ſhould be kept ſeparate from the ewes. In this field, with the daily allowance of a ſmall portion of turnips, the ewes will continue to yield abundance of milk; and, in conſequence thereof, the lambs will grow fat, eſpecially if the weather ſhall prove warm and ſunny. When the lambs become ten days or a fortnight old, the hurdles ſhould be placed in ſuch a manner as to leave a vacancy at bottom, in different parts of the drift, where the lambs may creep through, and take their range among the ſtanding turnips. By this management they will enjoy a free air, and a licence to nibble on the turnip tops; both which circumſtances will greatly contribute towards their future growth. When the ſheep and lambs ſhew by their bleating and uneaſineſs that they require a change of food, which they will pine after when the turnips have advanced far in growth, and the ſtalks are become ſapleſs, and the bottoms void of nouriſhment, they ſhould no longer be confined on the turnip field. In forward ſprings, the turnips will be found to be of little uſe for couples (ſheep and lambs) after the middle of April, at which time the lambs will be ſix weeks old: let them, therefore, be removed out of the turnip field, and driven on the rye, a few acres of which ſhould, in every autumn, be ſown on farms where there is maintained a large flock of ſheep. Indeed the rye often affords a good bite early in the month of February, in which caſe the blade ſhould be eaten down, and a ſecond crop will have ſprung up at the time he is now ſpeaking of. Let this rye be parted into diviſions of two or three acres each; obſerving the ſame caution, with reſpect to the openings at the foot of the hurdles, as was mentioned in the feeding of the turnips. In very backward ſprings, it frequently happens that the turnips are all eaten off, as well as the firſt bite of rye, before the graſs has made an effort to ſhoot, and the farmer is under the neceſſity of turning his couples into the marſhes by the latter end of March. In order to be provided with a remedy againſt this untoward event, it is a prudent meaſure to lay in a piece of graſs in the autumn, wherein there is a large quantity of old *tare*, and to ſuffer it to be ſtocked during the winter: by this regulation, the young graſs will ſhoot much earlier in the ſpring among this old *rowett*, than in thoſe marſhes that have been taken off more cloſely by the ſcythe, or depaſturing, and will in all probability afford an early bite for the ewes and lambs, when the winter feed of the uplands ſhall be exhauſted: and as a ſhift of wind and change of weather may ſhortly be expected, this will cauſe the rye to ſend forth a freſh ſhoot, and furniſh a variety in the paſture, which, with occaſional ſhiftings into the marſhes, and perhaps on a piece of forward wheat, will generally lengthen out a ſupply of food for the couples, and maintain them in tolerably good heart, even in thoſe ſprings which are the moſt backward, till the winter tares become fit for their reception. In a kindly time, the graſs in the marſhes will have attained to a decent length, ſo as to afford a good bite for the ſheep by the firſt week in April, to which time the turnips and rye will have been competent to the maintenance of the ewes and lambs. Towards the latter end of April, or beginning of May, or perhaps the middle of that month, as the ſeaſon has been more or leſs favourable, the winter tares will have got to a ſufficient height for feeding. Thoſe who have been accuſtomed to this mode of huſbandry will eaſily conceive the neceſſity of ſuffering the tares to grow to the period when they ſhall be nearly fit for the ſcythe, before they be fed off; namely, that at this time they yield the greateſt and moſt laſting quantity of paſture. To this end, the field ſhould be parted with hurdles according to its ſize, and the number of ſheep to be grazed thereon: and let the ewes and lambs be brought out of the marſh when their bellies are full, and driven into the tares; obſerving that this be not done at a time when there is any moiſture hanging on the haulm, either from dew or rain; for, as the paſture ariſing from theſe pulſe is exceedingly ſucculent, the ſheep would run great hazard in feeding on it when replete with moiſture, as he has more than once experienced to his coſt: this animal, like all others of the ruminating tribe, being very ſubject to a diſorder from repletion, termed *hoving*: and on this account, likewiſe, the folding flock, when firſt driven on the tares, ought to go thither with full bellies, to prevent their feeding on them with too great eagerneſs and avidity. At this time, the lambs will have gained ſufficient ſtrength to admit of their being folded with their dams, if it ſhould be found neceſſary to the farmer's occaſions to purſue this method. But in this caſe, it is to be ſuppoſed that the field which is to have this dreſſing be at no great diſtance removed from the cloſe of tares; otherwiſe the drift will prove highly prejudicial both to the ewes and lambs. The ſummer fold is generally pitched on a fallow, intended to be ſown with turnips in the courſe of the ſeaſon; and this buſineſs uſually commences in May. A fold for three hundred ewes and lambs may be made to incloſe eight rods of ground; and if the *trundles* ſhall not ſeem to be dropped ſufficiently thick from one night's dreſſing, the ſheep may lie a ſecond night in the ſame place, rather than incur the hazard of injuring the health of the couples by confining them in too narrow a compaſs. The time when the ſheep and lambs ſhould go to fold is about eight o'clock in the evening, and to be releaſed at five in the morning. Such wether lambs as are intended to be fattened, or double couples, where the ewes do not give a quantity of milk equal to the demand of the lambs, or any others which may be obſerved to ſink in fleſh, may, with their dams, be taken out of the fold, and maintained in a ſeparate paſture, where the graſs has attained a ſufficient head: and ſuch of the folding ewes as appear to be weakly, or diſtempered, may, from time to time, be removed to the ſame paſtures above mentioned, and ſuffered to lie in quiet, till they are judged able to return again to the fold.

It is added, that as it is likely that there will be ſome dry ſheep in the farm, conſiſting of the two yearling wethers and tags, theſe are to be kept on more ordinary paſture than the ewes and lambs; and as they have hitherto followed them in the turnips, ſo they muſt likewiſe ſucceed them on the clover and tares. The couples are to be allowed the firſt bite, and the ſtore ſheep are then to be turned into the field. In the marſhes likewiſe the ſame method ſhould be taken, of reſerving the moſt forward growths for this part of the folding-ſtock: by ſuch management there will be two folds at work in the ſame inſtant, and the ſhepherd will find ample employment throughout the day.

After the tares are eaten off, the clovers and trefoil will be ready to receive the flock, and here the ſheep and lambs are to precede the dry ſtock; and the fields, if extenſive, ſhould be parted with hurdles, that the ſheep may not *ſtaunch* the whole piece before they have eaten half the field, which would inevitably be the conſequence if they were permitted to range over a large cloſe; for it is the nature of this animal, when turned at firſt into a field, to take a range over the whole ſuperficies before it will ſettle on its feed. It follows, therefore, that a diviſion of large paſtures will lengthen out their abode in them; ſmall incloſures do not require it, which, by the bye, ſhews the advantage of theſe contracted pieces over thoſe of wider extent; for in theſe ſmall fields the ſheep lie much warmer in the winter, and a conſiderable expence is ſaved in hurdles, which in great fields are required in great abundance, beſides the labour of ſetting them, and the neceſſary delay of time where the horſes muſt be taken off from other work to draw them to and fro. For theſe reaſons, ſmall fields, to a farmer who places much dependence on his flock, are far more commodious than large ones; but for corn the preference is to be given to thoſe of wider domain. A good ſhepherd will be careful that his flock be driven late to fold in an evening, and releaſed early in the morning from their confinement, in order that they may enjoy the cooleſt parts of the day on the food. He will be cautious that they are allowed a ſufficient time to graze in the uplands previous to their being driven into the fold, that they may retire to reſt with their bellies full, by which the quantity of dung and urine will be conſiderably augmented. He will likewiſe be careful in reviewing the hurdles, and provide that theſe are fixed tight in the ground, leſt by any accident they ſhould be thrown down during the night, and the flock by theſe means get into miſchief, or intermix with other ſheep; he will count his ſheep regularly every evening when he drives them to fold, and take a freſh *tale* in the morning when he turns them to their feed; he will, previous to diſmiſſing them from the fold, worry them gently round the ſame, in order to cauſe them to dung and ſtale plentifully, that the manure may be left in the field, otherwiſe the greateſt part of the trundles will be dropt on the road, or carried on to the marſh, where, lying thin, this dreſſing can do but little ſervice, and where it is not wanted in any degree.

After the ſheep have been ſhorn, as they are very tender for ſome little time, it will be adviſeable to keep the flock out of the fold for a week, and, during that time, not to turn them on any paſture where there are thiſtles or other annoyances. If the weather ſhould prove hot and dry at this ſeaſon of the year, the natural graſſes and clovers are generally ſhort, and the farmer is at a loſs for a baiting-place whereon to turn his flock previous to their going into the fold, unleſs he hath had the foreſight to raiſe a piece of ſpring tares for this uſe. At this time, likewiſe, the fallow ground works like aſhes, and, by the heat of the ſun, a great part of the invigorating juices ariſing from the dung and urine of the ſheep is evaporated, ſo that it may be well queſtioned whether it be productive of any material advantage to fold the ſheep at this ſeaſon. That the ſheep are greatly injured from being folded under theſe circumſtances, eſpecially if their drift is at any diſtance, with the intervention of a duſty turnpike-road, for a quarter of a mile or more between the marſh and the fold, as is frequently the caſe, he is fully convinced: it would, therefore, perhaps, be prudent to diſcontinue the folding till the rains about Midſummer, when a day's work may be ploughed, on a lay intended to be ſown with wheat in November, and the fold immediately ſet on that part, and ſo to proceed on the ploughed ground; and thus the folded ſurface, although the ſun ſhould ſtill continue hot, and quickly exhale the moiſture of the dung and urine, will nevertheleſs enjoy an excluſive benefit of being cloſely preſſed by the tread of the ſheep, which will prove of infinite ſervice, and which could have been of no uſe on the turnip fallows, where the fold had hitherto been ſet. After weaning the lambs, by continuing the fold at work on the lays in the manner before noted till November, a flock of two or three hundred ſheep will have dreſſed a conſiderable breadth of new lay ground, and the wheat may then be harrowed in. But now commences a method of folding, which is of more importance than any which has preceded it. This is, to fold on the wheat when ſown, the method of which is as follows: firſt, ſow a day's work on a lay that has been ploughed ever ſince the Midſummer rains, and the ſeed being harrowed in, pitch the fold, and let the ſheep lie on the new ſown furrows; and ſo continue every night till the whole is completed, unleſs there ſhould fall ſo heavy a glut of rain as to make it unadviſeable to lodge the ſheep on the damp ground; otherwiſe there will be no fear of treading the ſurface too cloſe after ſowing; for on light ſoils, a firm texture is abſolutely neceſſary towards the future welfare of a wheaten crop, eſpecially when this grain is ſown on lays, which, if not well trodden, is ſubject to be much eaten by the worm; but there need be no doubt of the corn forcing its blade through the hardened ſurface, although from its appearance a perſon unacquainted with this buſineſs would deem it impracticable. When the fold ſhall have gone over this firſt drift, let another day's work be ploughed, ſown, and harrowed in, and the fold continue to run over the ſame in like manner as before directed, and ſo proceed till the wheat ſeaſon is finiſhed, and the corn begins to germinate, when it will be proper to diſcontinue this practice as quickly as poſſible, as injury would be done to the crop.

Winter folding.—At this period the flock may commence their winter folding, the manner of which is thus explained. And firſt, it is ſuppoſed that the farmer has taken care to provide a due allowance of meat for his ſheep on the uplands, as likewiſe a ſufficient ſtock of hay or pea-ſtraw for them to browſe on whilſt in the fold, during the long brumal nights; for at this ſeaſon they will require ſome ſuſtenance in the night, which at the ſummer folding was not neceſſary to be given to them. Let the fold be then pitched on a ſtubble, intended to be ploughed up in the ſpring for a fallow, and let it be made conſiderably larger than the ſummer folds. A flock of three hundred ſheep ought not to be limited to a leſs ſpace of ground than forty rods, which is a quarter of an acre, in which there ſhould be placed a ſufficient number of racks, filled with hay or pea-ſtraw; and in this fold they may lie two or three nights, at the option of the owner. Whilſt the weather continues mild and open, and is not attended with too conſiderable a proportion of moiſture, the ſheep may run in the marſhes during the day-time, and be baited in the uplands, on a piece of young clover or other ſucculent food towards the evening, previouſly to their going into the fold: but when the weather becomes cold and wet, with ſharp winds, they muſt no longer be driven into the marſh, but be maintained altogether on turnips near to the field where the folding is carried on; and if it does not ſuit the farmer to apportion any of his winter food for his folding flock, the buſineſs muſt be altogether relinquiſhed, ſince it would be highly improper that the ſheep ſhould have ſo long a drift in the depth of winter. Whilſt the buſineſs of the fold is going forward on the ſtubble in the night, as before mentioned, the ſheep may be employed during the day in treading the wheat, a practice of great utility both in the autumn and ſpring, and which in ſome degree anſwers the end of the fold, to that part of the land which had not partaken of this advantage. In the winter folding, the lambs ought not to ſhare in any degree, though they are ſometimes penned in the fold with the ſheep after weaning-time. Towards Chriſtmas, it will be proper to diſcontinue the ewe fold entirely, as the ewes then get heavy in lamb, and might be greatly injured through a longer continuance of this practice. At this time, therefore, the breeding ewes ſhould be turned into the marſhes, to lie quietly during the time of geſtation; and if the folding be any longer continued, let it be with the young wethers and ewe tags, which are the leaſt liable to injury by it.

Thus the winter folding being finiſhed, ſuppoſe the feeding wethers to be on turnips, and the lambs and young ſheep on the *grattens*, with occaſional ſhiftings on the ſhells of the turnips, left by the fattening ſheep, and the breeding ewes quietly lodged in the marſhes or low paſture lands.

We now come to the method of conducting a folding flock of wethers, which is generally adopted by thoſe farmers only who poſſeſs not the advantage of breeding land, as from what has been mentioned on that head, and what remains to be ſaid on this, it will appear, on a compariſon, that the balance is much in favour of the breeder, where the ſituation of the farm will allow of the practice. But in order to maintain a folding flock where there is no marſh land or natural graſs attached to the farm, it will be neceſſary that the arable land be ſufficiently extenſive to admit of raiſing annually a quantity of turnips, rye, tares, clover, and trefoil, in proportion to the exigencies of the flock; and if the farm lies in the neighbourhood of an extenſive common, the buſineſs of folding may be carried on to a much greater advantage. The ſheep which are beſt adapted to this purpoſe are thoſe of the large Wiltſhire or Hampſhire breeds. But theſe are not calculated for the purchaſe of the farmer who wiſhes to profit by his fold, and afterwards to fatten his flock on turnips ; ſince it is great odds if he will be able to provide them with meat, equal to maintaining them in the condition wherein he bought them, and by conſequence he muſt either diſcontinue his fold, or be content to ſee his flock dwindle, and become of leſs value the longer they are kept on the farm. But where the purchaſe is made with a view of penning them immediately on turnips, to fatten for the butcher, ſuch large wethers may be very proper. Hampſhire wethers are ſomewhat leſs than thoſe of Wiltſhire, and either theſe, or the inferior kind of Wiltſhire, are beſt adapted for folding.

It is added that wethers are purchaſed by the huſbandman at different ages, according as the economy of his farm may direct his views. If lambs are preferred, theſe are to be bought at the autumnal fairs, and will require to be kept a twelvemonth before much benefit can be expected from them, as the folding them at this early age, during the winter, might prove highly prejudicial to their growth. Four-tooth ſheep, or two-yearlings, are likewiſe laid in at the autumn, and will come into work immediately. As to the ſix-tooth, or three-yearlings, and full-mouthed-ſheep, theſe are rarely if ever bought with a view to keep as ſtores ; for being arrived at their full growth, the profit to be expected from them, except for immediate fattening, will not be conſiderable ; and when ſold off in the ſucceeding winter, the owner muſt again have recourſe to the like expedient of renewing his fold, which would occaſion a conſiderable drain of ready money, and not fully anſwer his purpoſe. Whereas, by purchaſing young ſtock, either lambs or tags, the original price is lower, and the loſs of thoſe which die by caſualty will conſequently be leſs ſeverely felt : beſides that theſe ſheep, having been inured to the ſoil, will be found to go through their work with greater facility, and the hazard of their dying will be leſſened in proportion to the time they have been reſident on the farm. For theſe reaſons, the farmer who keeps a wether flock ſhould make purchaſe either of lambs or tags. Theſe tags, or two-tooths, are to be met with at the ſpring fairs, and may be folded after having reſted a few nights to recover themſelves from the fatigue of the duſt. A good ſhepherd is equally uſeful to a perſon who keeps a wether fold at work, as to the breeding farmer.

And now ſuppoſing the winter fold to commence at Michaelmas, the ſheep at this time are to be driven to and from the fold, at the ſame hours as was directed for the ewes, and when releaſed in the morning ſhould be turned to graze on the common, where they are to continue till two or three hours before the time of folding, when they are to be brought home and baited on a piece of clover or other paſture, where there is plenty of herbage, that they may enter the fold with full bellies. As the graſs on the common falls off, it will be proper to relinquiſh this paſture, and take the flock into the incloſures ; ſuch as old lays, clovers, &c. of which by proper management, there will be always great ſtore remaining on farms of any extent, where this mode of huſbandry is purſued ; and where there is not a large tract of arable land, that ſheep feed may be yearly raiſed in abundance, it will be uſeleſs to attempt it. Theſe paſtures then, by favour of the autumnal rains, we will ſuppoſe, have thrown out a tolerable bite of graſs by the time the flock is taken off the common ; and from hence the ſheep may be folded, till the ſtate of the weather renders it neceſſary to remove them on the turnips, of which the writer likewiſe preſumes there is no deficiency. From the turnip field they may be driven every night into fold, till the further progreſs of the winter renders it neceſſary to diſcontinue this buſineſs. In folding wethers, it is prudent to take in a large compaſs of ground in the winter time, as hath been before obſerved in ſpeaking of the ewe fold. Racks filled with hay and pea haulm ſhould be ſtanding at this ſeaſon within the fold. As there will be annually a number of the full-mouthed ſheep drafted off for fattening, and as ſuch forward wethers will have been ſome time at turnips before it is neceſſary to turn on the ſtore ſheep, theſe latter may ſucceed the former wethers, and be made to eat up the hulls which they had left behind. As to the lambs, theſe ſhould be always kept to a good and plentiful diet during the winter ; by which management they will probably gain a larger ſize than they could have poſſibly reached if they had not been allowed a great plenty of meat whilſt they were young. The ſame rule holds with colts, calves, and other young animals, which, if ſtinted in aliment during their growth, will always carry with them ſufficient marks to denote this improper management throughout the remaining part of their lives. This being the caſe, it is evident that ſome of the beſt paſture and moſt prolific grattens ſhould be allowed for the lambs till the turnips are ready for feeding, when this young ſtock ought to come in for their ſhare of that root. By this mode of treatment they will make large tags in the next year, and prove a valuable addition to the fold. In buying lambs, which are hereafter intended to compoſe a folding flock, the purchaſer will do well to be directed more by the ſize of the young creature than by its corpulency. As the ſpring advances, the fat ſheep will continue to be ſold off, which will enlarge the circuit for the ſtone wethers, ſo that on land in any degree kindly for the cultivation of turnips, a ſufficient quantity of this root may be raiſed for the winter ſupport of the folding flock. As to thoſe ſheep which are intended to be fattened, it muſt never be permitted for them to entrench too far on the proviſion of the flock ; therefore, when the turnips are ſlight, it is found to anſwer better the intereſt of the farmer to ſell the full-mouthed wethers out of the fold at Michaelmas, than to ſuffer them, on the expectation of bringing in ſome ready money towards the ſpring, to devour the meat which ought to have been reſerved for the flock, and without which the ſtore ſheep will ſink in fleſh, and the farmer in the end will be conſiderably out of pocket in the proſecution of this ſcheme. When the turnips are eaten off, the flock may be turned on the rye ; or if this feed hath got to a good bite in the month of February, which frequently happens in mild winters, and on land that is in tolerably good heart, the folding wethers may be occaſionally ſhifted from the turnips to the rye field, and when they have eaten down this latter, be removed back on the turnips, and afterwards driven again on the rye when the blade ſhall have ariſen to a ſecond bite ; obſerving that this food ſhould never be allowed to ſtand till it begins to be on the ſpindle, for after that time it ſoon loſes its ſucculency, and becomes unfit for this uſe. It is therefore in the early part of the ſpring, only whilſt it continues in its herbaceous ſtate, that rye is for any uſe for ſheep feed ; as in a forward ſpring it forms its ſpindle towards the beginning of April, it ſhould ſeem that no material benefit can be derived from it after thoſe winters which have been attended with a conſiderable length of froſt, ſo as to prevent it from growing to a head for ſheep feed in the months of February and March ; for it is in theſe two months when rye is of the greateſt advantage. In very backward ſprings, however, rye may continue to be fed much later than the period here mentioned, and be found very uſeful at ſuch times, when, from the ungenial weather in theſe late ſprings, the tare and clover fields are ſluggiſh in their vegetation and growth.

The whole of the fields of rye and turnips having been fed off, the rye graſs will by this time have formed a ſhoot, and will afford a wholeſome food, on which, with alternate removals to the old lays and young clovers, the flock will find ſufficient paſturage till the time advances for turning them on the common, when the ſummer folding will commence. The lambs which were bought in at the laſt ſpring fairs are now become tags or two-tooths, and thoſe which were bought in tags at Michaelmas are become four-tooths, or two-yearlings. Theſe will now all of them go to the fold together, and feed in the ſame paſture, that is, on the common during the day time, and in the evening, previous to the time of folding, are to be baited on the clover, &c. that they may go into the fold with full bellies. At the ſpring fairs tags may be bought to ſupply the place of thoſe old ſheep which were ſold off, and theſe may conveniently go to fold with the reſt; and if at Michaelmas it ſhould be found neceſſary to increaſe the number, either lambs or two-yearlings may then be purchaſed, at the option of the farmer; and by this management, if the maſter is cautious in laying out his money, and the ſhepherd diligent in his office, a wether ſtock may be maintained to great advantage on thoſe farms where there is a conſiderable tract of land, and an adjoining common. And thus by obſerving to lay down the moſt ſterile part of the land, and that which is at the fartheſt diſtance from home, with rye-graſs, and when worn out to plough it up, and after having reaped one crop of corn, to ſow it again with rye graſs, and by folding on ſuch part of the land as will admit of being kept in tillage, with alternate growths of clover, trefoil, &c. the pooreſt ſoils may be made to anſwer the purpoſes of the huſbandman. And it is by the proſecution of this mode of agriculture alone, that ſuch poor, thin, and hungry ground can be cultivated to any good account; for if the renter, either from want of money, or through ignorance, ſhould neglect to keep a folding flock on theſe barren farms, and place his whole dependence on the plough and the ſeed-crop, a few years would convince him of his error, and, unleſs his reſources were very ample, bankruptcy and ruin would inevitably enſue.

It has long ſince been remarked in the third volume of his "Eſſays on Agriculture and Rural Affairs," that much amelioration and improvement may frequently be effected in bringing waſte land into cultivation by the folding of ſheep, provided it be conducted with proper attention to the ſeaſon, the nature of the land, the courſe of crops, and the having a ſufficient number of folds, according to the extent and ſituation of the land.

FOLDS, in the *Manufactures*. See CLOTH, &c.

FOLDS *of the Drapery*, in *Painting*. See DRAPERY.

FOLENGIO, or FOLENGIUS, JOHN BAPTIST, in *Biography*, was born at Mantua in the year 1490, and at the age of ſixteen he entered into a Benedictine monaſtery in his native city, where his talents and induſtry obtained for him a high reputation for proficiency in literature, and ſacred criticiſm, while the excellence of his diſpoſition rendered him an object of general eſteem. He was ſelected to fill the moſt important and diſtinguiſhed ſtations in his order, and he was afterwards choſen by pope Paul IV. as viſitor of the Benedictine foundations in Spain. When he had performed this taſk he had returned to his native country, and devoted himſelf almoſt wholly to theological ſtudies. His mind was liberal, and he was deſirous of reforming the church, and of uniting Catholics and Proteſtants in one communion. After a life ſpent in the ſervice of his fellow creatures, he died in 1559, in his ſeventieth year. He left behind him many theological works, of which the principal were "Commentaries upon the Epiſtles of St. James, St. Peter, and the firſt epiſtle of St. John," publiſhed in 1555 in 8vo.; alſo, a "Commentary upon the Pſalms." Theſe works were diſtinguiſhed for erudition, piety, and liberality, and were ſoon prohibited by the church of which he was an ornament. The latter was reprinted at Rome by order of pope Gregory XIII. in 1585, being firſt reviſed, and curtailed of ſome offenſive paſſages. Dupin, ſpeaking of the labours of Folengio, ſays, that he "writes purely and nobly, and Thuanus had reaſon to ſay, that no man will ever repent the reading of his commentaries." Moreri.

FOLENGO, THEOPHILUS, known in the poetical world by the name of "Merlin Coccaye," is celebrated for the ſpecies of poetry called macaronic. He was born at Cipada, near the lake of Mantua, about the year 1491. He was, in early life, initiated in the ſtudies of polite literature and philoſophy, and at the age of ſixteen entered the order of St. Benedict, and changed his name of Jerome to that of Theophilus; but his paſſions were ill adapted to the confined limits of a monaſtery, and he paſſed eleven years, after he quitted the cloiſter, in a rambling kind of life, during which he compoſed and publiſhed at Venice his macaronic verſes. This mode of writing, which has not very frequently been imitated with ſucceſs, conſiſts in interweaving with Latin verſe a number of words and phraſes in the vernacular tongue, thrown in at random, and made to fit the metre by Latin terminations. Folengo, if not the inventor of macaronic verſe, was the firſt who brought it into vogue. He was, however, capable of a higher ſpecies of compoſition, and would probably have excelled in pure and elegant poetry, had not the love of novelty led him into this extravagance. The late learned Dr. Geddes, the tranſlator of the early books of the ſcriptures, wrote, about the year 1790, two or three macaronic poems, which he circulated among his friends. Folengo returned to a religious life in the year 1526, and publiſhed the "Chaos del Triperuno," which is deſcriptive of the various incidents of his life, ending with his converſion. He then retired to a ſmall monaſtery, where he endeavoured to expiate the fault of his looſer writings, by compoſing a poem entitled "La Umanita del Figlio di Dio." After this, we find him at Palermo, where he compoſed a kind of drama repreſenting the creation, the fall, &c., and ſome religious tragedies. He died in 1544, in the monaſtery of S. Croce de Campeſe, in Padua, and was interred with great pomp. The eſtimation in which he was held was exhibited in the erection of a magnificent tomb, on which were inſcribed ſeveral epitaphs in various languages. Moreri.

FOLEYKUNDA, in *Geography*, a town of Africa, in the country of Kantor.

FOLIA, in *Botany*, is uſed for the leaves of plants, and alſo of flowers, but particularly the former; the leaves of flowers being more properly called *petala*.

FOLIACEUM EXPANSUM, in *Anatomy*, is that extreme of the Fallopian tube next the ovary; and which is expanded like the mouth of a trumpet, and environed with a ſort of fringe.

FOLIAGE, a cluſter or aſſemblage of flowers, branches, leaves, &c.

FOLIAGE is generally uſed for repreſentations of ſuch flowers, leaves, branches, rinds, &c. whether natural or artificial; uſed as enrichments on *capitals*, *freezes*, *pediments*, &c.

FOLIANUS, LUDIVICUS, of Modena, in *Biography*, a writer on the theory of muſic, publiſhed a Latin treatiſe, in 1529, at Venice, folio, with the following title; "Muſica Theorica, Ludovici Foliani Mutinienſis: docte ſimul ac dilucide pertractata: in qua quamplures de Harmonicis intervallis, non prius tentata, continentur ſpeculationes." "The theory of muſic by Luigi Fogliani of Modena, in which are contained and learnedly elucidated many harmonic ſpeculations relative to the intervals of muſic, never before attempted." This work is divided into three ſections: in the firſt the author treats of muſical proportions: in the ſecond of conſonances; and in the third of the diviſion of the monochord. In the ſecond ſection a foundation ſeems to have been laid for a muſical controverſy, which was afterwards agitated with great warmth; this author, contending for the doctrine of Boethius, from whom two-thirds of his book are taken, for the diſtinction of *greater* and *leſs tone* in the diatonic tetrachord. The title of one of his chapters being, "De utilitate toni majoris et minoris." Harmony now began to be felt, and was improving and refining, and as there was no melody till the lyric theatre was eſtabliſhed, and ſolo ſongs, fine voices, and refined ſinging were cultivated, it alike occupied profeſſors and dilettanti, philoſophers and mathematicians. We know not what rank Fogliano held in ſociety; if he was a profeſſor, he adhered too excluſively perhaps to mathematics, and the ſcience of harmonics, to be much uſed to practical muſic; and if a mere mathematician, the real beauties and refinements of the art muſt be unknown to him. However, to Fogliano is aſcribed the firſt idea of introducing a *temperament* into modern harmony. Boethius, Guido, and Franchinus, were ſilent on the ſubject. The organ was tuned in ſuch a manner as rendered a few keys perfect at the expence of all the reſt. There was no inſtrument that could make occaſional temperaments but the violin, and that was wholly unknown in concerts at the beginning of the 16th century. Wind inſtruments, and all keyed and ſtringed inſtruments, in which one note was obliged to ſerve different purpoſes, were forced to ſubmit to falſe intonation, and the excluſion of all tempered keys, till temperament gained ground, and the doctrines of Didymus and Ptolemy were adopted, which were in favour of major and minor tones, and ſemi-tones; and thoſe who enjoy the harmony of thirds, which, without temperament are intolerable, owe their pleaſure to Foglianus for recommending them, and to Zarlino for ſeconding his endeavours. See Didymus, Ptolemy, and Temperament.

FOLIATE, in the *Higher Geometry*, a name given by ſome to a curve of the ſecond order, expreſſed by the equation $x^3 + y^3 = a\,x\,y$, being one ſpecies of defective hyperbolas, with one aſymptote, and conſiſting of two infinite legs croſſing one another, and forming a ſort of leaf.

FOLIATING *of Looking-glaſſes*, is the ſpreading a compoſition of ſomething which will firmly adhere to the back of the glaſs, and there reflect the image.

This compoſition is called the *foil*, and is uſually made with quickſilver, mixed with tin, and ſome other ingredients. For the method of foliating looking-glaſſes, both plain and globular, ſee Looking-glass.

FOLIATION, in *Botany*, &c. is uſed by Dr. Grew to expreſs the aſſemblage of the *folia*, or *petala* of a flower.

The foliation is the moſt conſpicuous part of flowers, being that collection of fugaceous coloured leaves, which conſtitutes the compaſs, or body of the flower.

It is of great uſe in the generation and preſervation of the young fruit, or ſeed; it filtrates a fine juice, to nouriſh it in the uterus or piſtil.

In ſome ſpecies, as apricots, cherries, &c. it likewiſe ſerves to guard the young tender fruit from the violence of wind, weather, &c. For this being of a very tender and pulpous body, and coming forth in the colder times of the ſpring, would be often injured by the extremities of weather, if it were not thus protected, and lodged within the flowers.

Before the flowers open, the foliation is curiouſly and artfully folded up in the calyx or perianthium.

Dr. Grew enumerates ſeveral varieties of theſe foldings, *viz.* the *cloſe couch*, as in roſes; the *concave couch*, as in the blattaria flore albo; the *ſingle-plait*, as in pea-bloſſoms; the *couch* and *plait*, as in marigolds; and the *rowl*, as in the ladies bower.

FOLIES, Fr. *Follia*, Ital. a Spaniſh dance, formerly in high favour. It is compoſed on a ground with variations, and danced by a ſingle perſon *a pas ſeul.* Corelli's twelfth ſolo, conſiſting of 24 variations on a tune called "Farinel's ground," which is ſaid to have been compoſed at Hanover on purpoſe for Corelli to exerciſe his fancy upon, by a German muſician of the name of Farinel; but unluckily, Corelli never was at Hanover, and this ground, on which he worked, was an old Spaniſh dance, long before Corelli was born.

FOLIGNO, or Fuligno, in *Geography*, a town of Italy, in the province of Umbria, the ſee of a biſhop: built on the ruins of the ancient *Forum Flaminii.* According to its old conſtitution, it was governed by ſeven magiſtrates, called "Septemviri," who are changed every two months. It contains eight churches, and many convents, and though it has ſome good ſtreets, it has neither ſquares nor town-houſes: its chief buſineſs is confectionary, paper making, and manufacture of ſilk. In 1796 it was taken by the French; 10 miles N. N. W. of Spoleto. N. lat. 42° 55′. E. long. 12° 36′.

FOLINGRE, a town of Sweden, in Jamtland; 30 miles N. of Oſterſund.

FOLIO, or rather *Folium*, in books of account, &c. ſignifies page.

Thus folio 7, written abridgedly F° 7, denotes the ſeventh page, &c.

Folio recto, or F° R°, expreſſes the firſt ſide or page of a leaf.

Folio verſo, or F° V°, the ſecond or back-ſide of the leaf.

The word is Italian, and literally ſignifies *leaf.*

Folio, among *Bookſellers*, a book in folio, or ſimply a folio, is that where the ſheet is only folded in two, each leaf making half a ſheet.

Beneath the folio are the quarto, octavo, duodecimo, ſixteens, twenty-fours, &c.

FOLIS, or Follis, anciently ſignified a little bag or purſe; whence it came to be uſed for a ſum of money, and very different ſums were called by that name: thus the ſcholiaſt, on the Baſilics, mentions a follis of copper which was worth but the twenty-fourth part of the miliarenſis; the gloſſæ nomicæ, quoted by Gronovius and others, one of a hundred and twenty-five miliarenſes, and another of 250 denarii, which was the ancient ſeſtertium; and three different ſums of eight, four, and two pounds of gold, were each called follis. According to the account of the ſcholiaſt, the ounce of ſilver, which contained five miliarenſes of ſixty in the pound, was worth a hundred and twenty folles of copper. The gloſſographer, deſcribing a follis of two hundred and fifty denarii, ſays it was equal to three hundred and twelve pounds ſix ounces of copper; and as the denarius of that age was the eighth part of an ounce, an ounce of ſilver muſt have been worth a hundred and twenty ounces of copper; and, therefore, the ſcholiaſt's follis was an ounce of copper, and equal to the gloſſographer's *nummus.* But as Conſtantine's copper money weighed a quarter of a Roman ounce, the ſcholiaſt's follis and the gloſſographer's nummus contained four of them, as the ancient nummus contained four aſſes. See Phil. Tranſ. vol. lxi. p. ii. p. 515, &c.

FOLIUM, in *Botany* and *Vegetable Phyſiology.* See Leaf.

Folium *Branchiarum, the leaf of the gills,* a term uſed by ſome of the ichthyologiſts, to expreſs that part of the gills which looks red and fringed. The gills of fiſh are compoſed of certain bony circles, which are formed on the convex ſide with a great number of laminæ; theſe ſerve to receive the ramifications of the arteries, and are called the folium or leaf of the gills. The aorta or great artery reaches no farther than this part in fiſh. It has no deſcending trunk, but every part of the body is ſupplied by a large venal trunk, formed by the joining of the ſeveral ſmaller trunks of the ſeveral circles of the gills.

Folium *Indicum,* or *Indum,* called alſo tamalapatra, and malabathrum; a leaf brought from the Indies, growing chiefly about Cambaye, produced by a tree not unlike the lemon-tree; uſed in the compoſition of Venice-treacle.

FOLKES, Martin, in *Biography,* an eminent philoſopher and antiquarian, was born in Weſtminſter in the year 1690. He was educated under Mr. Cappel, formerly Hebrew profeſſor at Saumur, but at the age of 17 he was ſent to Clare-hall, Cambridge, where he purſued the ſtudies peculiar to that univerſity with ſo much aſſiduity and ſucceſs, that he was elected member of the Royal Society before he had completed his twenty-third year. His communications to this learned body were ſo much eſteemed, and his underſtanding ſo highly appreciated, that he was frequently choſen into its council. He was in habits of friendſhip with the illuſtrious Newton, at that period preſident of the ſociety, and by his influence Mr. Folkes was elected one of the vice-preſidents in 1723; and at the death of that great man in 1727, he was candidate for the vacant chair, but the ſuperior intereſt of Sir Hans Sloane rendered his application unavailing. The conteſt was probably carried on without that bitterneſs and animoſity which occur too frequently on occaſions of this ſort, for we find Mr. Folkes ſtill in the council, and vice-preſident till the year 1733. During this and the two following years he reſided for the moſt part in Italy, improving himſelf in the knowledge of claſſical antiquities. Here he laid the foundation of his works on ancient and modern coins, having by his ſituation ample opportunities of aſcertaining their weight and value; the reſult of which he laid before the Royal Society on his return from the continent. He likewiſe read before the ſame body memoirs upon the meaſurements of Trajan's and Antonine's pillars, together with other remains of antiquity. A table of all the Engliſh gold coins, drawn up by Mr. Folkes, was afterwards printed at the requeſt of the Royal Society, before whom he laid his "Remarks on the Standard Meaſure preſerved in the Capitol of Rome," and a model of an ancient ſphere preſerved in the Farneſian palace. A repreſentation of this ſphere was publiſhed in Dr. Bentley's edition of Manilius. Mr. Folkes viſited Paris in 1739, where he was received with great reſpect, and was introduced to the company, and obtained the friendſhip of the moſt eminent literary characters in that metropolis. On the reſignation of Sir Hans Sloane in 1741, he was elected to the honourable office of preſident of the Royal Society, and in a very ſhort time he was nominated to ſucceed Dr. Halley as one of the eight foreign members of the Royal Academy of Sciences at Paris. In 1745 he publiſhed in a thin quarto volume, printed at the expence of the ſociety of antiquaries, his very valuable "Table of Engliſh ſilver coins, from the Norman conqueſt to the preſent time, with their weights, intrinſic values, and ſome remarks on the ſeveral pieces." In an appendix to this work we have an account of the "Coins minted in Scotland ſince the Union of the two Crowns:" and "A table of Engliſh gold coins from the eighteenth year of king Edward III. when gold was firſt coined in England, to the preſent time." He intended to have illuſtrated theſe with plates, which he had prepared, but which he did not live long enough to publiſh. They were, however, purchaſed by the Antiquarian Society, and publiſhed ſome years after his death. Mr. Folkes, in addition to his many other honours, had conferred on him the title of doctor of laws by both univerſities, and he was alſo choſen preſident of the Antiquarian ſociety. He died in the year 1754. Dr. Birch collected materials for a life, which are preſerved in the anecdotes of Bowyer. He was a man of very extenſive and accurate knowledge, and he was diſtinguiſhed in private life for politeneſs, generoſity, and friendſhip. Biog. Brit.

FOLKINGHAM, in *Geography,* though a market town in the hundred of Aveland and diviſion of Keſteven, in the county of Lincoln, diſtant from London 107 miles, is but a ſmall place, ſituated on the ſide of a hill, abounding in ſprings, containing 99 houſes, and a population of 531. The church is a well built ſtructure, having at the weſt end a handſome lofty tower ſurmounted by eight elegant light crocketted pinnacles. The ſeſſions-houſe has lately been rebuilt, and the houſes in general have a commanding view over the extenſive adjacent fens. It poſſeſſes little trade, and the ſmall market is held weekly on Thurſdays. Folkingham was included in the *one hundred and thirty-one* manors in the county of Lincoln only, which formed part of the immenſe poſſeſſions belonging to Gilbert de Gaunt, who accompanied the conqueror from Normandy, and afterwards it was granted, in the reign of Edward I. to Henry de Bellamonte, or Beaumont, who it is ſuppoſed erected the caſtle, which having been defended for king Charles I. was deſtroyed by Cromwell. In this vicinity are the remains of the monaſtery of Sempringham, remarkable for having been the firſt *double houſe* in England, for the ſingular and ridiculous order of recluſe that comprized both monks and nuns under the ſame roof, called, from their founder, Gilbertines. Gough's Camden's Britannia, and Beauties of England and Wales.

FOLK-LAND, a term which in the ancient Saxon cuſtoms ſignified *copyhold land.* And in oppoſition to theſe, charter lands were denominated *book* or *boc lands.*

FOLKMOTE, Folcmote, or Folkesmote, among our Saxon anceſtors, ſignified any popular or public meeting of all the folk or people of a place, diſtrict, or the like; *e. gr.* of all the tenants at a court-leet, or court-baron; or of all the freemen of the county; or of all the barons of a kingdom.

The word, ſays Stow, is ſtill in uſe among the Londoners, and ſignifies "celebrem ex omni civitate conventum," an aſſembly of all the citizens. Manwood ſays, it is the court holden in London, wherein all the folk and people of the city did complain of the mayor and aldermen for any miſgovernment.

Somner, in his Saxon dictionary, makes folcmote to denote a general aſſembly of the people, for doing fealty to the king, and conſidering and ordering matters of the common-wealth; whence ſome date the origin of parliaments.

“ Omnes proceres regni, & milites & liberi homines univerſi totius regni Britanniæ, facere debent in pleno folcmote fidelitatem domino regi, coram epiſcopis regni. In Leg. Edw. Confeſſ. cap. 33. Et amplius non ſit in huſtinga, miſkenninga, *i. e.* ſpeaking amiſs; neque in folkeſmote, neque in aliis placitis infra civitatem.” Charta H. I. pro London. Du-Cange.

When ſuch aſſembly is made in a city it may be called a *burghmote*: when in the county, a *ſhiregemote*.

“ Cum aliquid vero inopinatum & malum contra regnum vel contra coronam regis emerſerit, ſtatim debent, pulſatis campanis, quod Anglice vocatur motbel, convocare omnes & univerſos, quod Anglici vocant folkmote, &c.” Leg. Alfred.

FOLKSTONE, in *Geography*, a town of England, in the county of Kent, ſituated in the Engliſh channel, and a member of the Cinque port of Dover, irregularly built along the cliff, nearly oppoſite to Boulogne. It was formerly a large town, containing five pariſh churches (now only one); but the greater part of it has been carried off by the ſea. There was an ancient ſtation on Caſtle-hill, which is a ſmall oval of about two acres, double-ditched on the eaſt, and triple on the north and weſt. Some veſtiges of walls remain, and Roman bricks have been found. This town is a corporation, governed by a mayor, 12 jurats, and 24 commoners. It is populous, and contained, in 1801, 3257 inhabitants, who chiefly ſubſiſt by fiſhing, and employ a great number of ſmacks in this trade. Before the town there is good anchorage in 8 or 10 fathoms' water. Two hoys ſail alternately every other week to London, when wind and weather permit. It is diſtant ſeven miles S.W. from Dover, and 72 E.S.E. from London, N. lat. 51° 5′. E. long. 1° 10′. To the weſtward of the town is Sandgate-caſtle, built by Henry VIII.

FOLLICLE, Folliculus, in *Botany*, a kind of pericarp or ſeed-veſſel, conſiſting of one valve and one cell, burſting longitudinally, and bearing the ſeeds on or near its edges, or on a receptacle parallel therewith. Its ſubſtance is uſually coriaceous and tough, in ſome inſtances approaching to woody. Examples of this ſort of fruit are found in the Peony, Periwinkle, *Sterculia*, and ſome others. Linnæus eſteemed the follicle diſtinct from a capſule, but Gærtner, more properly perhaps, comprehends it under his idea of the latter. (See Capsule.) The capſules of *Helleborus*, *Delphinium*, *Aconitum*, &c. come very near the idea of a follicle, except that they appear to be formed of two valves, but this is rather in appearance than reality, and if true, would, on the other hand, bring them to the definition of a *legume*; but the latter is always ſolitary, which the ſaid capſules are not, except in the anomalous inſtances of ſome ſpecies of *Delphinium*, in which their true nature is nevertheleſs evident from analogy.

FOLLICULUS, in *Anatomy*, a name ſometimes given to ſmall glandular bodies; it means a little bag. The parts deſcribed under this name have an opening in their centre, through which the ſecreted fluid is diſcharged. They are frequently termed mucous follicles, as they generally produce a mucous ſecretion.

FOLLINUS, Herman, in *Biography*, was born at Friſon, and during ſeveral years was phyſician to the chief magiſtrate of Bois-le-Duc, until he was elected profeſſor of medicine at Cologne, where he was equally diſtinguiſhed as a public teacher and as a practical phyſician. He died of the plague near the middle of the ſeventeenth century, and left ſome works of repute. The titles of theſe are, 1. “ De Luis peſtiferæ fugâ, deque remediis ejuſdem, libri duo, &c.” Autwerpiæ, 1618, 8vo. 2. “ Orationes duæ; de natura et curatione Febris peticularis; de ſtudiis chymicis conjungendis cum Hippocraticis,” Coloniæ, 1622, 8vo. His ſon John, born at Bois le Duc, was alſo diſtinguiſhed by his practice and his writings.

FOLLIUS, Cæcilius, was born at Modena in 1615, after the death of his father, and was educated at Venice, under the care of his uncle, who held a diſtinguiſhed ſtation among the phyſicians of the council of health. His medical education was completed at Padua, where he received the degree of doctor in phyſic. He returned to Venice, where his talents were rewarded by the ſenate with the honour of knighthood, and an appointment to the profeſſorſhip of anatomy, which he long held. He publiſhed the following works. 1. “ Sanguinis à dextro in ſiniſtrum cordis ventriculum defluentis, facilis reperta via,” Venetiis, 1639, 4to. He erroneouſly ſuppoſed that a communication between the cavities of the heart ſubſiſted through life, by means of little collateral apertures which ſupplied the place of the foramen ovale, as ſoon as it was cloſed after birth. 2. “ Della generatione e uſo della pinguedine,” Veniſe, 1644, 4to. 3. “ Novæ auris internæ delineatio,” Venetiis, 1645, 1647, 4to. This little work of ſix pages is eſteemed on account of the accuracy of the figures.

Another author, Francis Follius, publiſhed a work at Florence in 1665, under the title of “ Recreatio Phyſica, in qua de ſanguinis et omnium viventium analogá circulatione differitur,” 8vo.

FOLLOWERS, in *Rural Economy*, is a term employed to ſignify ſuch lean or ſtore cattle and ſheep as follow the fattening bullocks or other live ſtock in the paſtures or other graſs lands. It is only in this way that ſuch lands can be fed down in the moſt effectual manner, and with the greateſt profit to the grazing farmer.

FOLLOWFIELD, in *Geography*, a townſhip of America, in Waſhington county, Pennſylvania; containing 1635 inhabitants.—Alſo, E. and W. Followfield, are two townſhips in Cheſter county, Pennſylvania, the former having 1622, and the latter 839 inhabitants.

FOLLY, according to Mr. Locke, conſiſts in the drawing of falſe concluſions from juſt principles; by which it is diſtinguiſhed from madneſs, which draws juſt concluſions from falſe principles.

But this ſeems too confined a definition; folly, in its moſt general acceptation, denoting a weakneſs of intellect or apprehenſion, or ſome partial abſurdity in ſentiment or conduct.

FOLPAGO, in *Geography*, a town of Italy, in the Treviſan; ſix miles N. W. of Trevigio.

FOLSELLI, a town of Africa, in the country of Barca; 18 miles S. E. of Derna.

FOMAHANT, or Fomalhaut, in *Aſtronomy*, a ſtar of the firſt magnitude, in the conſtellation Aquarius. See Aquarius.

FOMANO, in *Geography*, a river of Naples, which runs into the Adriatic. N. lat. 42° 40′. E. long. 14° 5′.

FOMENTATION, a liquid medicine, applied to any diſeaſed part, to reſolve, diſcuſs, ſoften, aſſuage, fortify, or conſtringe the ſame.

Fomentations are either *ſimple* or *compound*.

Fomentations, *Compound*, are decoctions of roots, leaves, flowers, and ſeeds, made in common water, or other proper liquor, to which are ſometimes added ſalts, axungiæ, oils, &c.

To uſe, or apply them, they dip a hot linen cloth, or flannel, in the liquor, and ſpread it on the part affected. There are alſo fomentations made another way, *viz.* by boiling certain drugs in linen bags, and then applying them, bags and all, on the part.

There is alſo a ſort of dry fomentations, being bags filled with medicines, but not boiled, only ſometimes ſprinkled with a little wine or brandy.

Fomentations, *Simple*, are thoſe made with luke-warm water, milk, oil, oxycrate, or the like liquors.

Fomentations are alſo called *local baths*, or partial bathings; becauſe, being applied on a diſeaſed part, they have much the ſame effect as a bath, or half-bath, has on the whole body.

Fomentations have different names, according to the preparations of which they conſiſt, and the uſes to which they are applied. Thus, the anodyne fomentation, uſed for relieving acute pain, is compoſed of white poppy-heads, two ounces; elder flowers, half an ounce; which are boiled in three pints of water till one pint is evaporated, and then the liquor is ſtrained out: the aromatic fomentation is prepared by boiling half an ounce of Jamaica pepper, in a pint of red wine for a little while, and ſtraining out the liquor: this is uſed both for external and internal complaints. Colics and diſorders of the bowels are often abated by fomenting the abdomen and region of the ſtomach with this warm liquor. The common fomentation is made by ſlightly boiling the dried tops of wormwood and camomile flowers, of each two ounces, in two quarts of water, and pouring off the liquor; to which may be added ſuch quantities of brandy or ſpirit of wine as the particular caſe may require. The emollient fomentation conſiſts of one ounce of camomile flowers; elder flowers, and ſweet-fennel ſeeds, of each half an ounce; boiled for a little while in two quarts of water, and ſtrained, with the addition of ſpirit of wine, &c. The ſtrengthening fomentation is prepared of oak-bark, one ounce; granate-peel, half an ounce; alum, two drams; and ſmith's forge-water, three pints: the water is boiled with the bark and peel till one third is conſumed, and in the remaining decoction, ſtrained, the alum is to be diſſolved. This aſtringent liquor may be applied to foment weak parts, and alſo uſed internally.

Fomentations, in *Veterinary Science*, are commonly made by boiling wormwood, ſouthernwood, camomile flowers, and bay-leaves in water, ſo as to make a ſtrong decoction, which, being ſtrained off, are be applied as hot as poſſible, without giving pain to the animal, by means of large flannel cloths. The efficacy of fomentations depends in great meaſure on their uſe, being continued for a conſiderable time, and their being frequently repeated.

FOM-HOAM-TOUKA, in *Geography*, a town of Chineſe Tartary, near a mountain of the ſame name; ſeven miles N. W. of Tam-ſan.

FOMHIO, a town of Italy, in the department of the Adda; 15 miles S. S. E. of Lodi.

FOM-UL-SICH, a town of the Arabian Irak, on the Tigris; 20 miles N. of Vaſit.

FONAMI, a town of Japan, in the iſland of Ximo; eight miles S. of Taifero.

FONCEAU, in the *Manege*, is the bottom or end of a cannon-bitt mouth; that is, the part of the bitt that joins it to the banquet. See Bitt and Chaperon.

FONCQUEVILLERS, in *Geography*, a town of France, in the department of the ſtraits of Calais; 12 miles W. of Bapaume.

Fond de l'Isles de Vache, a town of the iſland of Hiſpaniola; 80 miles W. of Jaquemel.

Fond *des Negres* a town on the S. coaſt of Hiſpaniola; 40 miles W. of Jaquemel.

Fond, *le Petit*, a town of the iſland of Hiſpaniola; near the W. coaſt; 15 miles N. E. of St. Mark.

FONDAMENTALE, *Fr.* See Basse Fondamentale, where the hiſtory of this term has been given; but the abbé Feytou having prohibited the calling any baſe fundamental except the generator of a common chord with a ſharp third, has awakened new reflections on the ſubject.

In teaching thorough-baſe, or counterpoint, the rule, that every baſe carrying a common chord or chord of the ſeventh, with a major or minor third, was the fundamental of ſuch chord in every ſtage or inverſion, was clear, comprehenſive, and eaſily retained; but when a ſtudent is told that F is the fundamental baſe to the chord of A minor, it proves that the term fundamental, though uſeful in harmonics, is not admiſſible in practice without occaſioning confuſion. The term principal, as *baſſo principale*, uſed by the Italians, from the time of Zarlino to that of Padre Martini, would be more clear and leſs liable to objections, and to this uſe we ſhall continue in practice to apply the term fundamental baſe.

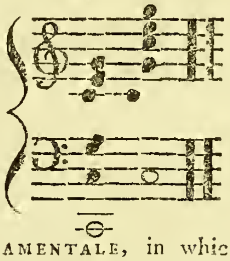
The ſyſtem of *la baſſe fondamentale*, which Rameau propoſed in his "Nouveau Syſtême de Muſique Theorique," in 1726, he preſented to the Academie des Sciences in 1737, under the title of "Generation Harmonique." The members of the academy appointed to examine it, report that "the work is founded on a phyſical hypotheſis, of which the firſt idea was reported in the Hiſtory of the Academy by M. Micran, in 1720, upon a known experiment, that every ſounding body, when ſtruck, produces, beſides the principal ſound, the octave, its fifth, and the tierce above the double octave," &c. But this M. Rameau had forgotten; though that early period was more than 100 years ſubſequent to Galileo's diſcovery.

In 1752, Rameau's ſyſtem was thought ſo great a diſcovery, that mathematicians, as well as muſicians, intereſted themſelves in its general adoption. M. d'Alembert, at the height of his fame as a geometrician, undertook to arrange and explain it; and "thoſe (ſays Rouſſeau in his Dict. de Muſ. art. *Syſtême*) who wiſh to ſee the ſyſtem of Rameau, ſo obſcure and diffuſed in his own numerous writings, exhibited with a clearneſs of which it was not thought ſuſceptible, will have recourſe to the "Elemens de Muſique" of M. d'Alembert.

In 1757, d'Alembert gave offence to Rameau, by ſome doubts of the validity of his ſyſtem; for ſome parts of which d'Alembert himſelf had been attacked by the great geometrician Dan. Bernouilli in the Mem. de l'Acad. de Berlin 1753. And d'Alembert, in 1762, publiſhed a new edition of his Elements, in which he pointed out ſeveral defects in Rameau's ſyſtem, changed the chord from which he had derived the minor mode, and threw out ſeveral reflections on his pretending to have *demonſtrated* the principle of harmony. This occaſioned a breach between Rameau and his commentator, that was never repaired. And at the end of his "Code de Muſique," 1760, he inſerted a letter to d'Alembert, full of aſperity and complaint. Upon which the great geometrician made ſeveral alterations in his Elements, which were now hoſtile to many of Rameau's principles, and in the notes, defended his alterations, as well as himſelf, againſt the reflections of Rameau in the letter which he had addreſſed to him.

Rameau defended his ſyſtem (as Fontenelle did the Tourbillons of Deſcartes) to the end of his life, in 1767; and had eſtabliſhed it in France almoſt univerſally; but ſince his death, Italian and German muſic growing into favour, and by degrees ſuperſeding his operas, which had been the delight and pride of France during 30 years, the nation began to find that Gluck, Piccini, and Sacchini, could produce good muſic without the aſſiſtance of his baſſe fondamentale: his ſyſtem has at preſent but few abettors.

Such is the hiſtory of this famous ſyſtem of the fundamental baſe.



See Basse Fondamentale, in which article we have explained a curious diſcovery in natural philoſophy, and the uſe that has been made of it in practical harmony. Though M. Rameau's ſyſtem will not alone enable a ſtudent to compoſe good muſic, it will help to facilitate his ſtudies, give him the etymology of chords, and of innumerable paſſages in melody, and regulate his harmony on a ſure foundation. And though it would be dull muſic indeed that had no other baſe than the fundamental, as the harmony and modulation of no muſic is ſo ſimple as to be wholly confined to common chords; the fundamental baſe will therefore teach their warrantable ſucceſſion, perhaps ſuggeſt a melody, or at leaſt guide its progreſs.

Nothing more ſeemed neceſſary to be ſaid on this ſubject; but in looking into the Encyclopedie Methodique, we find that it has furniſhed matter for an article of ſuch enormous length, as to occupy 30 4to. pages, 26 of which have been ſcientifically filled by M. l'Abbé Feytou, with an elaborate attempt at confuting all that has been ſaid by previous writers on the ſubject. We have heretofore frankly confeſſed, that after frequent peruſals and conſultations of Rameau's theoretical works, and a long acquaintance with the writings of his learned commentator d'Alembert, and panegyriſts the Abbé Rouſſier, M. de la Borde, &c. if any one were to aſk us to point out what was the *diſcovery* or *invention* upon which his ſyſtem was founded, we ſhould find it a difficult taſk.

The baſe to a common chord has been known ever ſince the firſt attempts at counterpoint; and it only ſeems as if Rameau had given new names to old and well-known combinations, when he calls the key-note, with $^{5}_{3}$, generateur, baſſe-fondamentale. But the Italians, ever ſince the time of Zarlino, have diſtinguiſhed this loweſt ſound by calling it the *firſt baſe*, 1mo. *baſſo*; and the other parts of the chord, when made the baſe, *baſſo rivoltato*, or *2do. baſſo*. But Broſſard in his Muſical Dictionary, publiſhed 1702, in defining Trias harmonica, or the three ſounds of a common chord in its firſt ſtate, calls the under-note *baſſe*, or *ſon fondamental*; and afterwards remarks that among the three ſounds that compoſe the Triade harmonique, the graveſt is called *baſis*, or *ſonus fundamentalis*. And what has Rameau told us more, except that the *harmoniques* produced by a ſtring or pipe, which he does not pretend to have firſt diſcovered, are preciſely the third and fifth in queſtion. This is the practical principle of the fundamental baſe; the theoretic was ſurely known, of harmonical, arithmetical, and geometrical proportion and ratios of ſound, with which ſo many books have been oſtentatiouſly filled ever ſince the time of Boethius.

The Abbé Rouſſier, his moſt learned apoſtle and able champion, candidly confeſſed in his firſt work, that "the ſyſtem of a fundamental baſe ought not to be regarded as one of thoſe principles which precedes the conſequences to be deduced from it." "Le mérite de cette découverte conſiſte, à avoir réduit en un ſyſtême ſimple, commode, et facile à ſaiſir, toutes les opérations des grands maitres de l'harmonie." Traite des Accords, 1764.

Rameau's ſyſtem, as compreſſed and arranged by d'Alembert, is perhaps the ſhorteſt, cleareſt, and beſt digeſted, that is extant; and yet, from the geometric preciſion with which it has been drawn up by that able mathematician, many explanatory notes and examples are wanting to render Rameau's doctrine intelligible to muſical ſtudents, in the firſt ſtages of their application; and even after that, the work, to be rendered a *complete theory*, would require many additions of late diſcoveries and improvements, both in the theory and practice of harmony.

About the year 1760, the Syſtem of a Fundamental Baſe, by Rameau, gave occaſion to much diſcuſſion in Germany. By ſome it was adopted there as well as in Italy, by others diſputed. It ſeems, however, as if this ſyſtem, ingenious as it is, were ſomewhat over-rated by French theoriſts, who would perſuade the world that all muſic not compoſed on Rameau's principles ſhould be thrown into the flames—"Juſqu' à mon ſyſteme," ſays Rameau himſelf; and M. de la Borde ſays, that "Muſic, ſince the revival of arts, was abandoned to the ear, caprice, and conjecture of compoſers, and was equally in want of unerring rules in theory and practice—Rameau appeared, and chaos was no more. He was at once Deſcartes and Newton, having been of as much uſe to muſic as both thoſe great men to philoſophy." But were Corelli, Geminiani, Handel, Bach, the Scarlattis, Leo, Caldara, Durante, Jomelli, Perez, &c. ſuch incorrect harmoniſts as to merit annihilation, becauſe they never heard of Rameau or his ſyſtem? Indeed, it may be further aſked, what good muſic has been compoſed, even in France, in conſequence of Rameau giving a new name to the baſe of a common chord, or chord of the ſeventh? The Italians ſtill call the loweſt ſound of muſic in parts the *baſe*, whether fundamental or derivative; but do the French imagine that the great compoſers above-mentioned, and the little compoſers who need not be mentioned, were ignorant whence every ſuppoſed baſe was derived? The great harmoniſts of the ſixteenth century ſeldom uſed any other than fundamental baſes. And the fundamental baſe to the hexachords has always been the key-note, and the fifth above and fifth below, juſt as Rameau has given it in his theoretic tracts.

The rules, however, which Rameau has given, with d'Alembert's commentary, were tolerably clear for compoſing according to his ſyſtem; but are now "explained till all men doubt them;" and the editor of the long article, or rather treatiſe on the ſubject, ſeems only to have puzzled the cauſe. The definitions and nice diſtinctions in this article appear to us more ingenious and ſubtle than uſeful, at leaſt in practice. The nature of our harmony, like the nature of man, is ſo imperfect, that all the calculation and reaſoning which enable us to diſcover their imperfections, can never ſupply us with the means of cure.

If by ſtudy and labour we can ſomewhat diminiſh theſe imperfections, and approximate that perfection at which we aſpire, it is all that our nature and the nature of things will allow. We can only counterfeit perfection, as a painter or ſculptor can counterfeit a man. On our keyed inſtruments we can have but one key or mode perfectly in tune; and on wind inſtruments not even that. Temperament, and a deviation from the laws of nature, which our modulation and mixture of keys require, give our auricular organ pleaſure, as it accommodates itſelf to the ſlight bearings and imperfections

imperfections in our intervals and ſcales. Many think the character and beauty of keys depend on theſe falſe intervals in the old temperament.

We ſhall not here give our readers all the problems to ſolve, or metaphyſics to ſtudy, on the fundamental baſe, with which the New Encyclopedie abounds; but where it is ſaid, p. 150, that the fundamental baſe produces the diatonic genus only as long as it confines its movements to the octaves, 5ths, and 4ths: when it moves by 3ds it gives the chromatic genus; and the enharmonic genus when it moves diatonically; to the two firſt aſſumptions we can readily ſubſcribe, but deny the laſt. A fundamental baſe, moving diatonically, would only produce major 17ths to all the ſounds; that is, the notes in the ſtop of the organ called the tierce, moving in the key of E major, while the baſe moves in C♮. See *Plate* VI. *Muſic*, N° II.

It is very perplexing to young contrapuntiſts to find theory and practice ſo frequently at ſtrife: they are told that though the fundamental baſe may riſe diatonically, that is, two baſes, carrying common chords by contrary motion, it never muſt *deſcend.* The ſtudent, however, if he has read much muſic, muſt recollect, that in Corelli's XIIth ſolo, called "La Follia," on Farinel's ground, or better known by the firſt line of a ſong written to the melody, "All Joy to great Cæſar," bar the 4th, the modulation is from D minor to C major; and the effect, which at firſt ſurprizes, from being ſo uncommon, is pleaſing. In the ſecond bar of Pergoleſi's "Stabat Mater," the fundamental baſe moves diatonically, from F to E♭. How is a *tiro* to reconcile theſe contradictions? Nature gives harmonics to every ſound, which are never heard but from very low and very ſlow notes, and are we never to have a moving baſe, or an elegant paſſage in melody, becauſe every ſound has latent harmonics, which, though we cannot *hear*, (any more than with the naked eye we can *ſee* the ſatellites of Jupiter,) who but the utterly ignorant doubt of their exiſtence!

Let us now forget that practical muſic is wholly a work of art. We are very proud to find that there ſubſiſts in nature any thing on which to build our theory. It is true that with great difficulty we can diſcover from the reſonance of a ſingle ſtring, or great bell, the ſounds of a common chord riſe in the following ſucceſſion: 8th to the principal ſound, 5th to the 8th, and major 3d to the 15th or double octave, as trebles to the fundamental ſound. But theſe are mere indications, of which none but cultivated, curious, and nice ears, can ever be convinced. The ſyſtem built on theſe phenomena is very defective; it extends our ideas of nature, but contracts thoſe of art. Whatever melody or harmony has been found, or may be found, that is grateful and pleaſing to the ear, may ſurely be admitted in practice, though not conſonant to mathematical demonſtration, or the ſpeculations of mere theoriſts. The philoſopher, Euler, ſays that time, in muſic, is a ſilent arithmetic; and we may add, that harmonic intervals are an auricular geometry, beſt meaſured by a ſtrong hand and good ear.

M. l'Abbe Feytou, who has furniſhed ſo many ſcientific articles in muſic to the Encyclopedie Methodique, thinks ſo differently from all other writers on every muſical article which he treats, that his readers have every thing to learn, which they knew tolerably well before. He neither gives the ſtudents, nor their maſters, credit for knowledge of any kind. And when in the new edition of the Encyclopedie, he takes up an article after the editors who have preceded him, it is not to explain more clearly what they have advanced, but totally to overſet their reaſoning, and neutralize their precepts and opinions. He ſeems to ſpeak like the firſt inventor of every thing pertaining to the muſical ſcience. Of practical muſic he knows but little, and ſeems to feel leſs.

He ſets off, in ſpeaking of the fundamental baſe of Rameau, and the third ſound of Tartini (ſee TERZA *Suona*,) by ſaying, that "their inventors were ignorant of the nature, the product, and movements of the ſounding bodies or fundamental ſounds; they did not know the law of preparing, reſolving, ſyncopating, &c.; nor the principle of meaſure, nor that of the pauſe at an harmonic phraſe, nor the character of a mode or key in general, nor the diſtinction of different keys, nor the origin of chords, nor the formation of different parts, nor the difference between a continued and fundamental baſe; and that they have ſubſtituted, without neceſſity, numberleſs abſtract relations to thoſe experiments which the vibrations of the ſounding body offered to their inveſtigation." And yet theſe were the greateſt compoſers of their time in France and Italy: the one for the opera, and the other for the violin!

The Abbé F. gives ſome amuſing experiments in harmonics in confirmation of Galileo's diſcovery, who is, however, never mentioned in a French book on the ſubject of muſic, except by Merſennus. The experiments given by the Abbé are ingenious and curious illuſtrations of Nature's propenſity to give a *perfect* chord to every ſingle ſound; but in compoſing muſic for imperfect inſtruments, till better are invented, we muſt content ourſelves with ſuch an approximation to perfect harmony as we can acquire by tuning and perfect execution; the reſt, we fear, is impracticable.

The Abbé ſhews the imperfection of our intervals and keys, when every fixed ſound in the courſe of modulation muſt neceſſarily ſerve for two or three purpoſes. This had been very clearly and ingeniouſly done in our own country twenty years ago, in a tract called "An Eſſay on Tune." The diſeaſe has been long diſcovered; but where, with our preſent inſtruments, is the cure? See HARMONICS.

Still diſputing the principles of Rameau and Tartini, M. Feytou clearly ſhews, what had been long known by ſpeculative muſicians before, that we have no true baſe to the ſcale or octave of C: but this accounts for the Italians ſinging in their ſolfeggii only the hexachords of each key. (See SOLFEGGIO and HEXACHORD.) Of the two tetrachords in C, whether we ſuppoſe the firſt in F, as the Abbé has done, or in C, as in practice, there ſtill muſt be two fundamental baſes riſing diatonically, as

CD EF | GABC | or CDEF | GABC
FB♭CF | CDGC | CACF | CFGC

But as there is no neceſſity for theſe fundamental baſes in practice, which can be avoided by innumerable expedients, why regard them as ſuch evils? In fact, the octave, as the Abbé obſerves of the key of C, has three generators, or fundamental baſes, F C G, or C F G. It is only the violin and its kindred that can give every ſound its true intonation in all keys; as D♭ and C♯, D♯ and E♭, &c.

We are obliged to mitigate theſe wants by temperament, which makes all keys imperfect to a certain degree; though the ſuffering is not great, when the muſic and execution are perfect. And, till new inſtruments are invented, what can we do? Muſt we burn the old, drive muſic from the company of the fine arts, nor longer allow her to rank in the circle of the ſciences till perfectibility in all inſtruments is attained? which will probably be when that perfectibility of man is acquired that ſhall exempt him from all the infirmities "which fleſh is heir to," and enable him, "unleſs he chuſe it," to eſcape death itſelf.

M. l' Abbé deduces every thing of importance in practical muſic from the fundamental baſe. Not only the moſt perfect chord in harmony, the moſt pleaſing notes in melody, but cloſes, meaſure, genera, preparation and reſolution of diſcords, keys, and modulation. The only thing in which he allows Rameau to be right in explaining his own ſyſtem, is the terming the fundamental baſe the magnet, compaſs, ſovereign guide of the ear.

The making the F. B. the regulatrix of time in muſic is new and fanciful; but, we fear, viſionary and impracticable in the unbridled range of modern muſic, which is ſo deſultory, wild, and often capricious, comic, and whimſical, as well as ſolemn and pathetic, that if regulated in its meaſures and phraſeology by any new reſtraints, there would be an outcry againſt the invaſion of a muſician's rights, and "la liberté de la muſique:" a ſubject which M. d' Alembert has treated with great gravity. See d' Alembert.

Beſides the *experiments* in harmonics, we have muſical *problems*, which manifeſt much ingenuity and meditation. In ſpeaking of the *genera*, the learned Abbé was naturally led to the ſubject of Greek muſic. He regards the notes of the hypaton, or loweſt tetrachord, B C D E, as the original four ſtrings of the Mercurian lyre; and gives Ptolemy's ratios of thoſe ſounds. He has nothing new on this ſubject, except that it is not a ſubject of diſpute. He therefore gives the ratios of the three genera from the Greek writers in Meibomius, which others have often done before. But that the fundamental baſe may have a ſhare in the honour of Greek inventions, he informs us that the ſcale of the conjoint tetrachord in the diatonic genus is derived from the F. B. of two keys, C and F, and the modern octave ſcale from three. (See Tetrachords and Scale.) But we have long obſerved, that there is no aſcending more than three notes gradually without a change of key.

Notwithſtanding the extreme length and labour of this article in the Encycl. Meth. the Abbé F. has left many of its conſtituent parts where he found them, with reſpect to practice: ſuch as the ſcale, cadences, meaſure, modulation, enharmonic, &c. (which ſee under their ſeveral heads.) He neither allows Rameau nor Tartini to know the gammut; he diſputes with them the intervals of the ſcale, and the baſe to thoſe intervals. Indeed nothing has ever been advanced by a muſical writer, that has fallen in his way, of which he does not ſet about the refutation. To have a new gammut to learn, new technica, and to accuſtom the ear to new ſounds, is a taſk to which great muſicians will not ſubmit, and the little ones will follow them, not the advice of ſpeculative theoriſts, which indeed they are not likely to read.

We cannot help ſuppoſing that the ears of modern muſicians are as well organized by nature, and as highly poliſhed by art, as thoſe of the ancients; and that the preſent gammut, and laws of harmony, are as perfect and refined as the preſent conſtruction of our inſtruments will allow: and if ever better ſhould be invented, that they will ſoon be univerſally adopted, piano fortes being preferred now to harpſichords, as harpſichords were to ſpinets, and ſpinets to virginals. But till the improvement and refinements in our ſcales, intervals, and conſonances are rendered practicable by new inſtruments or corrections of the old, muſic will not be bettered by theſe ſpeculations, though they may point out incurable evils to the ignorant, and make them more unwilling to be pleaſed than before they were told of theſe, and which they never could have found out or ſuſpected. And after the bold aſſertions concerning the ignorance of two men of ſuch great profeſſional abilities as Rameau and Tartini, we had a right to expect the abbé Feytou's rules to be illuſtrated by examples of compoſition on his own principles, or at leaſt rendered ſo evident, that all muſicians, and the public ear would be benefitted by them; but alas! after ſhaking the ſtudent's faith in the rules which ſo long guided him to the means of delighting the muſical world by what were then thought admirable productions; it appears, according to this learned Abbé, that we are all in the wrong, to be pleaſed; for all the muſic hitherto compoſed has proceeded from falſe principles: neither the ſcale, melody, nor harmony, with which we have been delighted, was genuine and pure; concords nor diſcords properly treated, accents rightly placed, nor meaſure correct. The nice diſtinctions, refinements, and ſcientific parade, with which they are laid down, give them an impoſing appearance; but when examined, and we conſider what *has* been done, and is *ſtill doing* without them, and that nothing has yet been atchieved *with* them; that many are unintelligible, and others impracticable; it ſeems as if we had better e'en go on in explaining the old eſtabliſhed rules upon which Corelli, Handel, Vinci, Pergoleſi, Jomelli, Piccini, Sacchini, the Bachs, Haydn, and Mozart, have been formed; nor till we are ſure of the effect, can we conſcientiouſly recommend young ſubjects to be inoculated by matter taken from this learned and elaborate article.

Fondamentalis, *Sonus*, Lat. is the principal ſound of the harmonic triad. Walther.

FONDAMENTS, Ital; *Fondament*, French; *Fundamentum*, Lat. is the loweſt and moſt important note in the harmony of the common chord, the *ground* or foundation upon which the chords in thorough baſe are built. Walther. See Baſſe Fondamentale.

FONDE, Isles de, in *Geography*, three ſmall iſlands in the Southern Indian ocean, near the S. coaſt of Kerguelen's land. S. lat. 49° 51'. E. long. 68° 39'.

FONDEROY, a town of America, in Virginia, ſituated on the Rappahanock; ten miles S.E. of Leeds. N. lat. 38° 2'. W. long. 76° 54'.

FONDI, a town of Naples, in Lavora, near a lake to which it gives name; the ſee of a biſhop, ſuffragan of Capua. This was anciently a municipal town, and afterwards a prefecture; which ſtood on the Appian way. At the extremity of the town is a caſtle, of no great ſtrength. It was erected by Ferdinand, king of Naples, into a dukedom, in favour of Proſper Colonna. In 1534, Barbaroſſa, the famous corſair, wiſhing to ſeize the beautiful Julia of Gonzaga, widow of the ſon of Colonna, for the purpoſe of carrying her off, and preſenting her to the Grand Signior, but diſappointed by her eſcape, took vengeance on the town, which, as well as the inhabitants, he treated with the utmoſt barbarity. The ſtory of the havock, which he committed, is painted in the church of the Annunciade. Fondi is ſituated on a plain, ſurrounded on one ſide with hills, having the appearance of an amphitheatre; moſt of theſe hills are covered with olive-trees, and the whole plain is interſperſed with orange, lemon, and other fruit-trees, the verdure of which forms a perpetual ſpring; 56 miles E. of Rome. N. lat. 41° 20'. E. long. 13° 30'.

FONDO, or Scoglio Fondo, a ſmall iſland in the gulf of Venice, near the coaſt of Iſtria. N. lat. 45° 14'. E. long. 13° 40'.

FONG, the name of ſeveral towns of China; one in Quang-tong; another in Hou-quang; and a third in Kiang-nan.

FONG-CHAN, a town in the iſland of Formoſa; 25 miles S. of Tay-ouan.

FONG-CHANG, a town of Corea; 11 miles S. of Hoang-tcheou.

FONG-HOA, a town of China, in the province of Tche-kiang; 11 miles S.S.W. of Ning-po.

FONG-HOA-TCHING, a large and commercial town of Chineſe Tartary, in the province of Chen-yang, on the borders of Corea; the chief manufacture is paper of cotton, which is white and tranſparent, and uſed for windows inſtead of glaſs. N. lat. 40° 31′. E. long. 123° 42′.

The adjacent country contains many mountains, ſome of which abound with metals and wood fit for building; the land is in general fertile, and produces wheat, millet, leguminous plants, and cotton. Immenſe herds of oxen, and flocks of ſheep feed in the vallies. The inhabitants ſow little rice; but fruit-trees of almoſt every kind are found here.

FONG-KIEOU, a town of China, of the third rank, in Honan.

FONG-SIN, a town of China, of the third rank, in Kiang-ſi.

FONG-TCHING, a town of China, of the third rank, in Pe-tcheli.

FONG-TCHUEN, a town of Corea; 57 miles W.S.W. of Hoang-tcheou.—Alſo, a town of China, of the third rank, in Quang-tong.

FONG-TEN, a town of Corea; 24 miles N.N.W. of King-ki-tao.

FONG-TSIANG, a city of China, of the firſt rank, in Chan-ſi. N. lat. 34° 36′. E. long. 107°.

FONG-YANG, a city of China, of the firſt rank, in the province of Kiang-nan; ſituated on a mountain, which hangs over the Yellow river, and incloſing within its walls ſeveral fertile little hills. Its juriſdiction is extenſive; comprehending 18 cities. This was the birth-place of the emperor Hong-vou, who formed a deſign of rendering it a famous and magnificent city, as the ſeat of empire. After having expelled the Weſtern Tartars, who had taken poſſeſſion of China, he transferred his court hither, and named the city Fong-yang, *i.e.* the place of the eagle's ſplendour. But ſeveral objections occurring in the further view of the ſituation, he abandoned his deſign, and eſtabliſhed his court at Nan-king. Of his deſign three monuments were executed, which, now remaining, ſufficiently ſhew how magnificent the city would have been, if the emperor's plan had been completed. The firſt of theſe monuments is the tomb of the father of Hong-vou, called "Hoang-lin," or the Royal tomb. The ſecond is a tower built in the middle of the city, of an oblong form, 100 feet high, and ſaid to be the moſt lofty in China. The third is a magnificent temple erected to the god Fo. This was at firſt a pagoda, to which Hong-vou entered when he had loſt his parents, and where he found an aſylum in his diſtreſs; but after he had been elevated to the throne, in conſequence of a ſucceſſion of viciſſitudes, he cauſed this temple to be conſtructed, in teſtimony of his gratitude to the Bonzes; aſſigning them a revenue ſufficient for 300 perſons, under a chief of their own ſect, whom he conſtituted a mandarin. At preſent here are only about 20 prieſts, who being neglected are almoſt reduced to beggary.

FONGA, a town of Japan, in the iſland of Niphon; 65 miles S.E. of Meaco.

FONIA, a kingdom of Africa, on the borders of the river Gambia, near the ſea.

FON-JUN, a town of China, of the third rank, in Pe-tche-li.

FONS Pulsatilis, in *Anatomy*, a name given to the fontanel, in conſequence of the pulſation felt there, which ariſes from the influx of blood into the arteries of the brain.

Fons, in *Geography*, a town of France, in the department of the Lot; 12 miles S. of St. Cére. N. lat. 44° 40′. E. long. 2° 2′.

Fons, *Cape*, a cape on the S. coaſt of Minorca. N. lat. 39° 40′. E. long. 4° 10′.

FONSECA Bay. See Amapalla.

Fonseca, Peter de, in *Biography*, a learned Jeſuit, was born about the year 1528. He entered the ſociety at the age of twenty, and became diſtinguiſhed by his talents, learning, and addreſs. He was the firſt who was appointed profeſſor of philoſophy in the univerſity of Coimbra; afterwards he undertook the profeſſorſhip of theology in the univerſity of Evora, where he was admitted to the degree of doctor, in the year 1570. From this period he filled, with high reputation, ſeveral very conſiderable poſts belonging to his order. He was alſo in high favour with Philip II. king of Spain and Portugal, and with pope Gregory XIII.; by both of whom he was employed in different important negociations. He died at Liſbon, in the year 1599, at the age of 71. He was author of many publications, chiefly philoſophical, which have been printed in three volumes, folio. Moreri.

Fonseca, Gabriel de, was born at Lamego, in Portugal, and became a public teacher of philoſophy at Piſa, and of medicine at Rome, where he was appointed phyſician to Innocent X. He ſurvived that pope, and died in 1668, under the pontificate of Clement IX. He left ſome writings under the titles of "Œconomia Medici;" "Conſultationes;" "Convivia Medicinalia." It is believed that he was likewiſe the author of ſome of the works, which bibliographers have attributed to his couſin Roderic.

Fonseca, Roderic de, was a native of Liſbon, and the reputation which he had obtained in that city, by the practice of his profeſſion, induced the univerſity of Piſa to invite him to the chair of profeſſor of medicine. He accepted the invitation, and filled the office with conſiderable diſtinction for a number of years; but at length relinquiſhed it, in 1615, in order to become the principal of the faculty of Padua: an office which he adorned by his talents until the period of his death, in 1622. The following are the titles of the numerous works which are attributed to him: 1. "In Hippocratis Legem Commentarius," Romæ, 1586, 4to.; 2. "De Remediis Calculorum qui in Renibus et Veſica gignuntur," ibid. 1586, 4to.; 3. "De Venenis eorumque Curatione," ibid. 1587, 4to.; 4. "In Hippocratis Aphoriſmorum Libros Commentaria," Florent. 1591, Venet. 1596, &c. 4to.; 5. "Opuſculum quo Adoleſcentes ad Medicinam facile capeſſendam inſtruuntur," Florent. 1596, 4to.; 6. "In Hippocratis Prognoſtica Commentaria," Patavii, 1597, 4to.; 7. "De tuendâ Valetudine et producendâ Vitâ Liber ſingularis," Florentiæ, 1602, &c.; 8. "De Hominis Excrementis Libellus," Piſis, 1613, 4to.; 9. "Conſultationes Medicæ, quibus acceſſit de conſultandi Ratione," Venetiis, 1618, and 1620, folio; afterwards publiſhed at Franckfort, in 2 vols. 8vo. with, 10. a treatiſe, "De Virginum Morbis qui intra Clauſuram curari nequeunt," 1625; 11. "Tractatus de Febrium acutarum et peſtilentium Remediis Dieteticis, Chirurgicis, et Pharmaceuticis," Venet. 1621, 4to. Eloy, Dict. Hiſt.

FONSOMME, in *Geography*, a town of France, in the department of the Aiſne, near the ſource of the Somme; 5 miles N.E. of St. Quintin.

FONSSAY, a town of France, in the department of the Vendée; 6 miles N.E. of Fontenay le Comte.

FONT, in *Eccleſiaſtical Hiſtory*, is now applied to deſignate the veſſel uſed in churches to hold the water conſecrated for the purpoſes of baptiſm. The term font was early adopted among the fathers of the primitive church. It was originally applied to the lake, river, or ſtream, where perſons, in the dawn of Chriſtianity, received initiation into the congregation of Chriſt, by the ceremony of immerſion. At that period, it was a matter of indifference, as Tertullian ſtates, whether a perſon were baptized in the ſea, or a lake, in ſtagnant or running water; and the validity of the ordinance was alike acknowledged in thoſe who had received it at the hands of St. Peter in the Tiber, and in Jordan by St. John. As the goſpel was extended, and the number of converts increaſed, this practice, from local circumſtances, muſt in a variety of inſtances ceaſe; and an artificial fountain, or baſin of water, be adopted in place of the natural ſtream. During the firſt period of the church, and while Chriſtians laboured under the diſadvantages of perſecution, the ſacraments could be performed in no ſtated place; but when once eſtabliſhed, and places of public worſhip erected and ſanctioned by law, it is reaſonable to ſuppoſe that ſome proper place would be choſen, and an appropriate ſtructure built for the performance of the baptiſmal rites. This was a principal building among what were termed the *exedræ* of the early churches. Euſebius, deſcribing the church of Paulinus at Tyre, ſays, when that curious artiſt had finiſhed his famous ſtructure, and completed the internal decorations, he then commenced the exedræ, or buildings annexed to the church, and which, he obſerves, were chiefly for the uſe of ſuch perſons as needed purgation by ablution of water, and the Holy Ghoſt, *viz.* the *baptiſtery.* Hence it is evident, contrary to the opinion of Dr. Beveridge, and other learned writers, this building was a diſtinct place from the church; and that the font, or lavatory, was not originally placed in the narthecium, or weſtern part of the church, as at preſent; but in a place peculiarly appropriated for its reception. This opinion is ſupported by poſitive evidence. Paulinus, biſhop of Nola, diſplaying the great munificence of his friend Severus, obſerves, that he erected two churches, and a baptiſtery between them. And Cyril, biſhop of Jeruſalem, in deſcribing one, repreſents it as a ſeparate building, which had firſt its προαυλιον οικον, porch or ante-room, where the catechumens or noviciates delivered their renunciation of Satan, and confeſſion of faith; and its εσωτερον οικον, or inner apartment, where the ſacrament of baptiſm was performed. Sidonius Apollinaris alſo ſpeaks of it as a ſeparate building; and St. Auguſtin intimates that there were diſtinct apartments for the accommodation of male and female converts. Theſe baptiſteries were anciently very capacious, becauſe, as Dr. Cave juſtly obſerves, the ſtated times of baptiſm but ſeldom occurring, immenſe multitudes uſually attended at the appointed ſeaſon; and the manner of baptizing by immerſion, and many of the ſubjects adults, rendered it requiſite to have a very large reſervoir or font for water. Accordingly Venantius Fortunatus ſtyles the baptiſtery "aula baptiſmatis," the grand hall of baptiſm. So capacious indeed were ſome of them, that it is reported councils have held their ſittings in ſuch ſtructures; as Du Freſne clearly evinces from the acts of the council which ſat at Chalcedon. Suicerus alſo mentions, that in the acts of the council of Carthage, a recapitulation is made of tranſactions which occurred in one, held in the baptiſtery of Conſtantinople. Theſe anſwered the purpoſes of ſchools alſo, where the catechumens received inſtruction previous to their being baptized; and from this circumſtance, and the conſequent illumination derived from the ſacrament, the baptiſtery alſo obtained the appellation of Φωτιστηριον, or place of divine illumination. The diſtinction, then, between the baptiſtery and the font is now apparent; the one comprehending the whole building, dreſſing rooms, and other apartments; and the other, the receptacle for the water uſed in the ſolemn rite. The latter, in Greek writers, is uſually denominated Κολυμβηθρα, in the Latin *piſcina,* and is frequently diſtinguiſhed from the baptiſtery, as a part from a whole; for Socrates expreſsly ſtyles font the baptiſmal pool. The Greek name, Dr. Beveridge ſuppoſes, was given to the font in alluſion to the ſalutiferous pool of Betheſda; and Optatus furniſhes a more myſtical reaſon for the Latin appellation. He obſerves it was called piſcina, in alluſion to our Saviour's name, more technica, ιχθυς, an acroſtic compoſed of the initial letters of his ſeveral titles, Jeſus Chriſt, the Son of God, our Saviour. But theſe are remarks unworthy of criticiſm, and derogatory to the dignity of antiquarian reſearch. Both terms are common names for fountains, pools, or baths, in Greek and Latin authors. And the font appears to have been originally, in theſe baptiſteries, a kind of bath in a ſeparate room from that where the veſtments were depoſited, while the ceremony was performed: for Cyril deſcribes the catechumens as being unclothed in an inner apartment, and thence conducted to the laver of regeneration, where, after having made a profeſſion of their faith, they were immerſed three times in the water, in alluſion to the doctrine of the trinity.

Reſpecting the form of the ancient baptiſteries, little can be collected from early writers. Leo III. who, according to Du Pin, was elected pope A.D. 795, is ſtated to have erected one, probably agreeable to the ancient model, which is thus deſcribed: "Iſdem præſul a fundamentis ipſum baptiſterium in rotundum, ampla largitate conſtruens in meliorem ſtatum, atque ſacrum fontem in medio largiori ſpatio fundavit." What was the form of the font, or of what materials conſtructed, little ſatisfaction can be obtained. In a canon of the council at Lerida it is obſerved, the font ſhould be *lapideus,* made of ſtone. What Damaſus relates, in the pontifical, of a font made of porphyritic marble, richly ornamented with gold and ſilver imagery, and other elegant decorations, in which the emperor Conſtantine was baptized, and by him preſented to the church of St. Sophia at Conſtantinople, is a mere fabulous legend, unworthy of the ſmalleſt credit.

Thus did the uſe of baptiſteries, as ſtructures diſtinct from the church, continue till about the ſixth century: though Moſheim obſerves, "baptiſmal fonts were now, (in the fourth century,) erected in the porch of each church, for the more commodious adminiſtration of that initiatory ſacrament." But in this obſervation he is only borne out by the brief hint of Du Pin, in his remarks on the life and writings of Athanaſius. "As to what concerns diſcipline in his time, one may obſerve in his works that there were fonts in churches, and that oil, wine, and bread for offerings were kept for the uſe of the font." Stavely, in his Hiſtory of Churches, obſerves the firſt fonts were ſet up in private houſes, and after thoſe profeſſing Chriſtianity had recovered from perſecution, they were placed in more conſpicuous ſituations at a ſmall diſtance from the church; afterwards they were removed into the church porch; and ſubſequently into that part of the nave where they uſually ſtand at preſent. The learned are generally agreed that anciently there was but one baptiſtery in a city, and that at or near the biſhop's church; which uſage Durandus informs us was continued down to his time at Piſa, Bononia, Orvieta, Parma, and Florence, in Italy. And the church of St. Jean le Rond at Paris was the place for the general baptiſtery of that city. In theſe, which were called baptiſmal churches, baptiſm was adminiſtered during the vigils of Eaſter and Whitſuntide, with lighted tapers burning, by the biſhop, and the preſbyters by him commiſſioned for that purpoſe; and it was only in caſes of extreme urgency that a faculty could be obtained for the adminiſtration of this ſacrament, but at theſe two ſolemn ſeaſons of its adminiſtration. In after ages, however, the inconveniences were found ſo great from this reſtriction, that baptiſteries were allowed to be ſet up in many parochial churches. For in the council of Auxerre, baptizing in villages, by allowance from the ordinary, is formally recognized. This privilege, however, was not granted to every place, but only to thoſe the biſhop appointed; and where the neceſſity of the caſe ſeemed to require ſuch extenſion; whence the churches at ſuch places obtained the diſtinction of *mother*-churches, becauſe the reſt depended upon them for receiving the ceremony of regeneration, as they had previouſly done on the epiſcopal church. After the eſtabliſhment of Chriſtianity in ſtates, ſubjects following the example of their ſovereigns, almoſt univerſally became profeſſing Chriſtians; and as they would early devote their offspring to a participation of the ſame faith, adult baptiſm would ſeldom be found neceſſary. For notwithſtanding the unſupported aſſertion of Mr. Robinſon in his hiſtory, that infant baptiſm did not become an eſtabliſhed cuſtom till the fourteenth century; yet Bingham and Wall have incontrovertibly proved that it was a practice generally prevalent in the latter end of the firſt, or beginning of the ſecond centuries. Indeed the exiſtence ſtill of fonts only calculated for the immerſion of infants, made ſo early as the Saxon period of our own annals, would be ſufficient to refute the allegation.

On increaſing the number of baptiſmal churches, the general adoption of infant baptiſm, and the neceſſity of a capacious bath for the immerſion of adults no longer exiſting; a large baſin of ſtone was ſubſtituted for the ſpacious bath, and the baptiſtery exchanged for the Lapidean font: which afterwards retained the original appellation.

Reſpecting fonts in England, they are mentioned by Bede in his Eccleſiaſtical Hiſtory, under the name of Lavacra: for he mentions king Edward having received the "lavacrum ſanctæ regenerationis:" and obſerves, that in the year 689, "Rex Cadwalla venit Romam ut ad limina beatorum apoſtolorum fonte baptiſmali ablueretur." Though the privilege was early extended to certain parochial churches, yet the erection and uſe of fonts, in conventual churches, occaſioned as ſtrong contentions as the ſetting up conventual mills under the feodal ſyſtem. An author in the Gentleman's Magazine, (Mr. Denne,) is of opinion, that few cathedrals were ornamented with fixed fonts, at a much earlier period than the date of one ſet up in the cathedral at Canterbury, in the year 1636; unleſs in inſtances where they had alſo parochial altars for the uſe of the lay-people of ſome contiguous diſtrict: which was the caſe at Saliſbury, and probably alſo at Wincheſter and Lincoln. Yet Edmund, archbiſhop of Canterbury, in the conſtitutions promulgated by him in the year 1236, directs that a ſtone font ſhould be provided in every baptiſmal church; which, according to Lynwood, was a church having the city connected with it. "In qualibet eccleſia baptiſmali, tali quæ habet populum, ſive cathedrali, ſive conventuali." In the hiſtory of Sherborne monaſtery, a contention is noticed between the monks and the pariſhioners, in which diſſenſion the former complained, that though there had been from the foundation of the monaſtery a font in the nave of the conventual church, where the children of the pariſh had uſually been baptized; yet the inhabitants had ſet up another in that part of the church in which they were accuſtomed to hear divine ſervice.

Fonts were generally formed of ſtone, yet ſome inſtances occur of their being made of lead; and Stavely mentions a moſt magnificent one of ſolid braſs, that was placed at St. Alban's. This, in which the children of the kings of Scotland uſed to be baptized, had on it an inſcription, indicating that ſir Richard Lea, knight, maſter of the pioneers, took and brought it home among the ſpoils, and preſented it to this church. The general adoption of ſtone for the compoſition of fonts, ſay Durandus and other Romiſh ritualiſts, was, becauſe, as water iſſued out of the rock, as a type of baptiſm, ſo Chriſt, who is the fountain of living water, is alſo a rock, and the chief corner ſtone of the ſpiritual church.

A deſcription and detail of the architecture, ſculpture, and deſigns, diſplayed in all the fonts ſubſiſting in this kingdom, would be an intereſting work. To attempt to claſs them under ſyſtem at firſt ſight appears impoſſible. The toute enſemble puts on ſuch a Protean ſhape, and aſſumes ſuch a confuſing variety, as ſeemingly to defy all attempt at arrangement. Upon a cloſer ſurvey, however, they appear to ſeparate, and fall within certain epochs: and although ſome anomalous caſes may occur, and ſome fanciful inſtances may be produced; yet when properly ranged they will be reducible perhaps to three periods, *viz.* Saxon, Anglo-Norman, and Engliſh: no monument of this kind appearing ſo decidedly Britiſh, as to be referable to that period.

After the converſion of the Saxons to Chriſtianity by the miſſionary, St. Auſtin, they appear to have had a cloſe connection and intercourſe with Rome. And in their eccleſiaſtical buildings and ornaments they would naturally imitate the practices of the church, from whence they had imbibed their faith; and indeed it is recorded that for a conſiderable period their architects and other artiſts were brought from Italy. Theſe would of courſe imitate ſuch ornaments as they had been accuſtomed to admire in the magnificent temples, and other ſtructures in that country. Thus ſome of the moſt ancient fonts are in their forms evidently taken from vaſes, urns, votive altars, &c. Some, for inſtance, are ſimply excavated ſtones, placed upon plain pedeſtals, conſiſting of one, two, or more ſteps; others altar ſhaped, and ornamented with pilaſters.

Under this early, or *firſt period*, may be claſſed the font at Wimpole in Cambridgeſhire, conſiſting of a ſimple ſtone of an hexagonal ſhape, having a circular cavity in the centre, and placed on a flat ſquare baſe. The one at Stukeley Bucks is a vaſe, in the ſhape of a truncated hollow cone, inverſely fixed upon two circular ſteps. Another of dark grey marble, in which, as Camden was informed, princes had been baptized, of a ſimilar ſhape, is at Preſhute in Wilts; the columns of which church are clearly aſſignable to a Saxon era. Rotherfield-Grays, Oxfordſhire, is of an oblong form, with a circular hollow, and has a pilaſter at each angle, and the baſe and upper part ſurrounded with ogee mouldings. The font in the upper church of Lewes in Suſſex is barrel-ſhaped, the convex part ornamented with fretwork, and round the top and bottom runs a faſcia, compoſed of rings and quatre-foils. Neſwick in Yorkſhire is a cylinder, ornamented with numerous ſlender pilaſters, ſurmounted with interlacing arches: and a ſimilar one may be ſeen at Ancaſter, in the county of Lincoln.

Next to theſe, in point of antiquity, appear to be thoſe of a quadrangular or circular form, placed upon a ſingle central ſhaft, encompaſſed with pillars; or having a ſmall column at each angle of the font, which they apparently ſupport as an entablature. Of the firſt kind is the font at Berkley in Glouceſterſhire, which has four maſſy round columns with ſimple capitals, ſtanding on a plain pedeſtal, and a ſcroll moulding round the lower edge of the font. Under this diviſion range the fonts at Boxbourne, Herts; Sudburn, Suffolk; Roydon, Eſſex; Hendon, Middleſex; and Albury and Stevenage, Herts. One at Iſley, Oxfordſhire, has the columns devoid both of baſe and capital, and ornamented with divers fanciful circumgyrations. Of the ſecond, or circular kind, are thoſe of Hempſtead and Ozleworth in Glouceſterſhire. Other inſtances occur, where the central ſhaft is wanting. The one at Bowes, in Yorkſhire, is a circular baſin, ſupported by three columns; one at Wheedon, Bucks, by two; and the one at Eaſby, in Yorkſhire, is round, and ſtands on a ſhaft, formed by a circular arcade. In point of time it is difficult to decide which of theſe two kinds juſtly claims precedence. But,

The next in antiquity ſeem to be thoſe decorated with hiſtorical or emblematical bas reliefs. At Everingham, in Yorkſhire, is a very antique font, ornamented with Saxon carving; and one at Alphiſton, in the county of Devon, is charged with interlaced arches and a faſcia, compriſing the figures of birds, beaſts, ſportſmen, &c. emblematic of hunting. One at Eaſtbourne, Suſſex, is ſtill more ſingular and rude in the deſigns; and a ſimilar one is in the church of Davent, Kent. The font of Burnham Depedale, in Norfolk, is deſerving of particular notice. The ſculpture is ſo mean, and the figures ſo rude, as clearly to evince it to be a work of remote antiquity: and notwithſtanding Mr. Pegge has aſſigned ſome reaſons in the Archæologia for referring both the church and font to a later than the Saxon or Daniſh periods, yet they are very far from being ſatiſfactory. The ſteeple, far more antiquated than the body of the church, is one of thoſe round towers ſuppoſed to have been erected by the Danes, which give almoſt an excluſive peculiarity of features to the eccleſiaſtical ſtructures in the counties of Norfolk and Suffolk. The rudeneſs of the figures, and the nature of the ſubject they were meant to repreſent, militate alſo againſt Mr. Pegge's conjecture. The font is of a quadrangular ſhape, ſupported by four cluſtered columns, each compoſed of three pillarets. Of the ſquare form reſting upon four pillars, devoid of the central ſhaft, the one in Sharnebourn church, in the county of Norfolk, preſents a curious inſtance. The body of the font reſts upon four maſſy cluſtered columns, the capitals ornamented with groteſque heads, and a fanciful border extends round the edge of the font. This, though rude, is a rich piece of ſculpture. The whole is placed againſt one of the pillars of the nave, for which poſition it was originally deſigned, one of the ſides having been left blank. The three others are ornamented with figures in baſſo relievo, repreſentative of agricultural ſubjects. The compartments are twelve, and the emblems were deſigned to depict the labours of huſbandry through the different months of the year. January repreſented by a figure ſeated with a drinking horn in his hand; February, by a figure ſitting in a quieſcent poſture, emblematical of the inactivity of that ſeaſon; March, by a huſbandman in the act of digging; April, by a man with a pruning-hook in one hand, and a branch in the other; May, by a female figure with ſtreaming hair, diſplaying a banner; June, by an uncouth figure holding a weeding implement; July, by a man mowing; Auguſt, by a perſon gathering and binding corn; September, by a man threſhing; October, by a perſon caſking liquor; November, by a man carrying wood; December, by a group feaſting. A font decorated with rude and emblematic ſculpture in Fincham church, Norfolk, which was miſunderſtood by the hiſtorian of that county, is by ſome ſuppoſed of equal antiquity. Such were, probably, many of the firſt fonts in the early dawn of Chriſtianity among the Saxons, while heatheniſm was ſtrongly mixed with Chriſtian rites; but as the genius of the goſpel was better underſtood, it would be natural to decorate their temples, and ornament their ſacred utenſils, with Chriſtian emblems. Such appear the fonts of Lincoln, Wincheſter and Eaſt Mean, in Hants. The latter two, which are very ſimilar, are probably as ancient as the time of Birtuus, the firſt biſhop of Wincheſter; and the emblems by which they are enriched are ſuppoſed alluſive to the converſion of the Weſt Saxons from idolatry. An engraving of the former has been given in that ſplendid work, the "Vetuſta Monumenta." The latter is a ſquare block of black marble, having a central excavation, and reſting on a ſhaft, formed of three ſingle ſtones, with a circular column at each angle of the font, devoid of baſes, and capitals compoſed of foliage. At two of the angles are two doves, repreſented as putting their beaks into bottles, ſurmounted by a croſs. Two faces of the ſquare are ornamented with arches, ſupported by alternate double and ſingle pillars, and the incumbent freize is charged with various birds and beaſts. On the alternate two are repreſented, in the rudeſt ſtyle of relief, on one the creation of man, the conformation of Adam, and Eve taken from his ſide, and the temptation by the ſerpent; on the other, their expulſion from paradiſe by an angel driving them, with an uplifted ſword, through the portal of a palace; and the other ſcene repreſents Adam with a ſpade, Eve with a diſtaff, and an infant placed ſtanding between them.

The next, in reſpect of time, are probably ſuch as are ornamented with figures of the apoſtles, as the one at Kiddington, in Oxfordſhire, removed from Iſlip, in the ſame county. This is ſaid to have been the identical font in which Edward the Confeſſor was baptized. The font at St. Peter's, Oxford, which was charged with figures of the twelve apoſtles, Hearne erroneouſly ſuppoſed coeval with the one at Wincheſter. One at Ambreſbury is a long hollow veſſel ſet upon a maſſy ſhaft, containing niches, which appear formerly to have contained figures. The ſecond period compriſes ſuch as are of divers agonal ſhapes, decorated with ſcriptural emblems and armorial bearings. This faſhion was probably introduced from Normandy ſoon after the conqueſt. The fonts at Bredon, Kirkby Belers, and Market Boſworth, in Leiceſterſhire, are of an hexagonal ſhape, and the ſides charged with ſhields of arms. Of a like deſcription Burbach, Great Shepey, and Ufford, in Suffolk; St. Oſyth, Eſſex; Maltravers and Winterbourne, Dorſet; and numerous others in various parts of the kingdom. About the time of Henry III. this mode of introducing heraldic devices, to emblazon the deeds of munificence or piety performed by great families, became extremely prevalent; and was not only made a ſubject for ſculpture, but alſo of painting, when what was at firſt in relievo and in miniature on fonts or monuments, was transferred on an extended ſcale to the windows of churches, and gave riſe and encouragement to the elegant art of ſtaining glaſs. To this period are aſſignable ſuch as are ornamented with armorial bearings, and thoſe alſo having borders of quatre-foils, initials, &c. ſupported in divers inſtances with figures of animals, couchant, rampant, and in other attitudes. To a ſucceeding period may probably be referred thoſe bearing the ſymbols of the evangeliſts, inſtruments of the paſſion, with the ſhafts ſupported by figures of the apoſtles, and other ſaints. Of this kind are Flixton, in Suffolk; St. Clement's, at Haſtings; and Sittingbourne, in Kent. The font at Luton, in Bedfordſhire, is of an octagonal ſhape, raiſed upon a flight of octangular ſteps. Over it is a canopy ſupported by eight columns, about twenty-five feet in height, forming a kind of piazza, under which might ſtand eight people. This may be conſidered a baptiſtery on a ſmall ſcale, and is the only thing of the ſort in the kingdom. In the centre of the roof is a lion O., and a griffin V., rampant.

The *laſt period* comprehends a portion of our hiſtory for about two centuries anterior to the reformation; and is the more remarkable, becauſe the change which occurred in the mode of ornamenting fonts is connected with that event, it having been one of the jeſuitical tricks made uſe of by the ſtrenuous abettors of the Romiſh tenets to ſupport their tottering faith againſt the tremendous blows it was then receiving from the formidable attacks of Lollardiſm. The controverted doctrine reſpecting the ſeven ſacraments, powerfully oppoſed as antiſcriptural, muſt be defended, and every art was had recourſe to likely to accompliſh the deſirable meaſure. Not only were they embodied, but ſo repreſented in painting and ſculpture. They were depicted on glaſs in the windows of churches, delineated in ſtone on the baptiſmal fonts; and the emblems of actual events and real perſonages of ſcripture were ſuperſeded by figures repreſentative of the ſuperſtitions and errors in the Romiſh church. No people better underſtood the mode of working upon the minds of men, and bringing adventitious objects to aſſiſt the powers of perſuaſion, than the prieſts in general of that communion. The effects produced upon the mind by objects repreſented ſtrongly to the ſight by the faſcinating arts of ſculpture and painting, they had well ſtudied for centuries, and now had recourſe to them for rivetting the doctrine, and fixing the vacillating minds of the multitude on the occaſion. Appeals were made to Rome for artiſts, uſages, &c., and no expence was ſpared to combine elegance of deſign with exquiſiteneſs of execution. The octagonal form was adopted, not only becauſe it exhibited ſufficient ſides for the requiſite exhibitions, but becauſe it was ſanctioned by a cuſtom of high antiquity. It is thus recommended in lines, written by St. Ambroſe, placed over the font of St. Tecla, at Milan, in Italy, prior to its having been adorned with modern magnificence.

“ Octachorum ſanctos templum ſurrexit in uſus,
Octagonus fons eſt munere dignus eo,
Hoc numero decuit ſacri baptiſmatis aulam
Surgere, quo populis veræ ſalus rediit
Luce reſurgentis Chriſti, qui clauſtra reſolvit
Mortis a tumulis ſuſciter examines.”

During the period in queſtion, ſome moſt coſtly ſtructures were erected. The florid Gothic, as it has been termed in architecture, was carried to its height; and the mode of enriching fonts with elegant ſculpture, as well as decorating various parts of the building, ſeemed to keep pace with each other. Numerous fonts erected at that time are objects of laudable curioſity, and worthy of peculiar inveſtigation, as ſerving to mark the progreſs and advancement in the art of ſculpture, and how much it appears to have derived improvement from the cultivation of the ſiſter art. To point out all, or to deſcribe even a few of thoſe worthy of notice, which fall under this diviſion, would extend this article too far. A deſcription of one ſtill in high preſervation at Walſingham abbey church, in the county of Norfolk, unnoticed by writers on this ſubject, may be acceptable; as it is, perhaps without exception, the fineſt and moſt perfect ſpecimen in the kingdom. The baſe is an octagon, decorated with roſes and quatre-foils; the plinth, of the ſame ſhape, has in it four ſteps, the fronts and ſides of which are enriched with divers ornaments. The octangular ſhaft is decorated with various tabernacle-work, and the pilaſters concentrating from niches with crochetted pinnacles, in which are placed ſtatues of the apoſtles. The lower border of the font alſo is ſtudded with emblematic heads and devices; and the eight ſides have the ſeven ſacraments, and the crucifixion, executed in bold relief. Among other fine ſpecimens of this kind may be briefly enumerated Eaſt Dereham, Norfolk; Melton, Suffolk; and Grantham, in Lincolnſhire. The covers ſeem generally to have been made to correſpond with the work exhibited in the font: the ſimpler fonts having plainer covers, and *vice verſâ*. Theſe generally conſiſting of wood were of a pyramidal ſhape, crowned with a croſs patee fitchee; and in ſome inſtances over it was placed the figure of a dove. In ſome caſes the covers were curiouſly carved, and decorated in the pointed ſtyle with rich tabernacle-work. Such is the one at Sudbury in Suffolk, made of oak, variouſly carved in the pointed ſtyle, the ſides adorned with the figures of four lambs, as agni dei, over which are the ſymbols of the evangeliſts; and between theſe, angels preſenting ſhields charged with different family arms. This is conjectured to be coëval with the time of Richard I. Mr. Vertue alſo mentions his having ſeen ſeveral fonts in Norfolk, which had for covers “ high pinnacled wooden ſpires,” richly ornamented with elaborate carvings.

It may at firſt ſeem paradoxical that fonts ſhould have gradually come into diſuſe, ſo far as reſpects the original purpoſe of them, as veſſels for containing the conſecrated water, from the time of the Reformation; eſpecially when, among the canons promulgated in 1571, one particularly directs the providing a *font*, and prohibits the ſubſtitution of a *baſin*. But the reaſon will be found in the variety of ſuperſtitions connected with the uſe of fonts previous to the time in queſtion; the effects of which remained long after, and are not even at the preſent day eradicated from the minds of the common people. In the ancient fonts there was a hole in the bottom of each, provided with a ſtopple, for letting out the water, after the ceremony was over; which was conveyed away under ground by means of a pipe, included in the ſhaft. This was done to prevent a ſuperſtitious uſe being made of ſuch conſecrated water: perſons frequently taking it to the houſes of thoſe afflicted with divers diſeaſes, in order to perform miraculous cures. Two others alſo are alluded to in one of the before-mentioned canons: “ whether any uſeth to *hallow* the font on Eaſter even? and, whether the water in the font be changed every month?” Upon the aboliſhing of the liturgy, and the ſubſtituting the directory in its ſtead, an order was iſſued by the parliament for the removal of all fonts out of the churches, and to adopt the uſe of baſins in their ſtead. Many were then ſold, turned into horſe-troughs, and deſecrated to other ordinary uſes; and though, at the Reſtoration, many were repurchaſed, and again ſet up in the reſpective churches, yet numbers never were replaced. From the coldneſs of our climate operating on that timidity of parents, ariſing from luxury, which obtained the optional privilege of aſperſion inſtead of immerſion, and gradually introduced the uſe of ſprinkling altogether in the baptiſmal ceremony, large fonts became unneceſſary, and baſins were found much more commodious: ſo that now, in moſt of our modern churches and chapels, the veſſel for this purpoſe conſiſts ſimply of a ſmall marble bowl, placed upon a ſlender column or ſtand of the ſame material; ſo that, in no diſtant period, fonts will become, not only reſpecting their age, and as ſpecimens of art, but alſo as to their deſignation and uſe, a ſubject of curious inquiry and antiquarian reſearch. Bingham's Origines Eccleſiaſticæ, or the Antiquities of the Chriſtian Church. Moſheim's Eccleſiaſtical Hiſtory. Durandus de Ritualibus. Various Papers in the Archæologia, publiſhed by the Society of Antiquaries, &c. &c. &c.

Font, in the *Art of Printing*, denotes a complete aſſortment of letters, accents, &c. uſed in printing. See Fount.

FONTABELLE, in *Geography*, a fort on the weſt coaſt of Barbadoes; 1 mile N.N.W. of Bridge-town.

FONTAINBLEAU, a ſmall town of France, in the department of the Seine and Marne, and chief place of a diſtrict; ſituated on the left bank of the Seine, 13 leagues ſouth of Paris. The place contains 7,429, and the canton 10,231 inhabitants, on a territory of 162½ kiliometres, in 6 communes. The royal palace in this town, which was the birth-place of Henry III., is one of the largeſt and moſt elegant ſtructures which belonged to the kings of France. It is an aſſemblage of four palaces, having five courts of different architecture, and containing about 900 apartments. Each palace has a garden. One of the galleries is 100 feet long, and covered with paintings. The adjacent country exhibits no pleaſant ſcene, when the trees have loſt their verdure. The palace is ſurrounded by a foreſt, containing about 25,000 Engliſh acres, and abounding with deer. The gardens are neat and extenſive; and beſides the grand fountain, which from the excellent quality of its water gave name to the place, there is a great number of others, which ſerve to adorn this royal reſidence. The town of Fontainbleau conſiſts of one principal ſtreet of conſiderable length, and ſeveral ſmaller ſtreets. The principal trade depends upon the palace, and on its ſituation in the high road from Paris to Lyons, and alſo on its manufacture of thread lace.

FONTAINE, John De La, in *Biography*, was born at Chateau-Thierry, in the year 1621. He received the uſual rudiments of learning at Rheims; and at the age of 19, he placed himſelf under the fathers of the oratory, in which ſituation he remained about a year and half. Soon after this, he was ſo much impreſſed with hearing one of the odes of Malherbe recited, that he began inſtantly to ſtudy that author, to commit his works to memory, and finally to imitate them. He entruſted to a relation his firſt efforts as a poet; but in connection with his poetical ſtudies, he did not fail to unite a ſteady attention to more ſerious authors. He ſoon became converſant with the works of Plato and Plutarch, and ſo thoroughly imbibed their moral and philoſophical maxims, as to intermix them in all that he compoſed. It is ſaid that he had little inclination for the matrimonial ſtate, but married to pleaſe his family; and being incapable of ſtrong attachment, he made little difficulty in quitting his wife. He went to Paris with the ducheſs of Bouillon, who excited him to write his "Tales." Here he found a relation in the ſervice of the ſuperintendant Fouquet, by whom he was patroniſed and penſioned; but on the fall of Fouquet, who had been the liberal friend to men of letters, Fontaine was almoſt the only perſon who publicly lamented his fate, which he did in a pathetic elegy. He next entered the ſervice of Henrietta of England, after whoſe death he found protectors in the princes of the blood, and other perſons of diſtinction. At Paris he had the cares of domeſtic life taken from him by Madame de la Sabliere, who took him into her houſe. Here he was on terms of ſtrict intimacy with all the principal wits and writers of the age, among whom was Boileau, Moliere, Racine, and Chapelle. By theſe, and by all who were acquainted with him, he was highly eſteemed. In his character he exhibited the ſimplicity of a child: he was mild, gentle, timid, credulous, ſincere, and void of envy and ambition. He was ſingularly abſent in the concerns of life, and readily ſubmitted himſelf to the guidance of others. He obtained the appellation of "le bon-homme." In company he was uſually ſilent, and ſeldom ſhone in ſociety, unleſs with a few intimate friends. La Fontaine was not in favour with Lewis XIV., and was almoſt the only conſiderable writer who did not partake of that prince's bounty. The king even heſitated to confirm his election to a ſeat in the French academy, and would probably never have given his conſent, but to compromiſe the matter in reſpect to Boileau, who was elected to pleaſe the ſovereign, though much againſt the wiſhes of the majority of the academy.

After the death of Mad. de la Sabliere, with whom he had lived 20 years, La Fontaine was invited to take up his abode in England; but the difficulty which he found in the attempt at acquiring the language made him abandon the deſign. In the year 1692 he was taken ſeriouſly ill: a prieſt was introduced to him for the purpoſe of aſcertaining his faith. The ſick man began the converſation: "I have," ſays he, "lately taken to read the New Teſtament. I aſſure you, it is a very good book; but there is one article to which I could not accede: it is that of the eternity of future puniſhments. I cannot comprehend how this eternity is compatible with the goodneſs of God." The prieſt, it is ſaid, explained the doctrine to the entire ſatisfaction of the poet, who, probably to free himſelf from the controverſy, acknowledged that he was perfectly ſatisfied. As an effect of his converſion, he threw into the fire a theatrical piece which he had begun, confeſſed his ſorrow for his offences againſt morality and decorum, and gave up the profits of a new edition of his tales, then printing in Holland. The fact being related to the young duke of Burgundy, he very conſiderately obſerved, that it was unreaſonable that he ſhould become poorer for having done his duty, and ſent him a purſe containing 50 louis d'or. La Fontaine ſurvived this illneſs, and paſſed about two years in the houſe of Mad. d'Hervart, who ſupplied the place of his former friend. He now undertook to tranſlate ſome pious hymns, but did not ſucceed in this new ſpecies of compoſition. He died at Paris, in the year 1695, at the age of 74; and when he was undreſſed for interment, a hair-cloth was found next his ſkin. The beſt editions of his "Tales" are thoſe of Amſterdam, 1685, and Paris, 1762. His "Fables" have paſſed through a vaſt number of impreſſions. Splendid editions of them with engravings, in 4 vols. folio, were publiſhed in 1755 and 1759. La Fontaine was author of many other works, as, "Les Amours de Pſyche," a romance; "Le Florentin," a comedy; "L'Eunuque," another comedy; "Anacreontiques;" "Lettres;" and "Poems." D'Alembert has given his literary character in the following words: "If among the celebrated writers of the age of Lewis XIV. La Fontaine is not the greateſt, he is at leaſt the moſt ſingularly original, the moſt an object of deſpair to imitators, and the writer whom it would coſt nature the moſt pains to reproduce." His verſes, though negligent, have the charms of nature, which none of his contemporaries could acquire. They appear to flow from his pen ſpontaneouſly, and abound in grace and delicacy. His manner of narration is enlivened with all the little touches which render deſcription animated and intereſting; and his reflections are juſt, natural, and appropriate. His memory was ſo highly reſpected by his country, that when his widow was moleſted for the payment of taxes that bore hard upon her, an order was given that the family of La Fontaine ſhould be for ever exempted from all public burthens: a privilege which has been granted to them ever ſince. Moreri.

Fontaine, Nicholas, a conſiderable French writer, the ſon of a ſcrivener, was born at Paris, in the year 1625. He loſt his father when he was twelve years of age, and was entruſted to the care of a relation, who was deſirous of bringing him into public life by placing him under the patronage of cardinal Richlieu. The youth did not reliſh the propoſal: he felt a ſtronger inclination for retirement and ſtudy, than for mixing in the buſtle of the world; and reſolved, if poſſible, to enter into the ſociety of the Jeſuits. At the age of 20 he accompliſhed his plan, and by a ſedulous attention to the ſtudies which were preſcribed to him, and by the excellence of his character and urbanity of his manners, he acquired the eſteem, friendſhip, and confidence of the moſt reſpectable members of the ſociety. He was, in a ſhort time, appointed one of the tutors to the young perſons ſent to the ſeminary, of which he was a member, for education. His leiſure hours, and all that he could redeem from ſleep, he devoted to theological ſtudies. When M. Arnauld was expelled from the Sorbonne, and withdrew into privacy, M. Fontaine, already attached to him by the cloſeſt ties of friendſhip, readily followed his fortunes, and thoſe of M. Nicole, for whom he acted as their ſecretary. He was alſo the friend and companion of M. Sacy, the diſciple and nephew of Arnauld, and accompanied him into places of concealment, where he took refuge from the perſecutions of the Jeſuits. In one of theſe they were diſcovered, and committed priſoners to the Baſtille, where they were confined two years. After their liberation in 1668 or 9, their intimacy became ſtronger than ever, and continued unbroken till the death of M. Sacy in 1684. From this time Fontaine was obliged frequently to change his place of retirement, until he removed to Melun, where he died in 1709, when he had completed the eighty-fourth year of his age. He was the author of numerous works, publiſhed chiefly without his name, and ſometimes with fictitious titles. The moſt important that are conſidered as belonging unqueſtionably to him are, "Illuſtrations of the New Teſtament," firſt publiſhed in 2 vols. 8vo., and afterwards in 2 vols. 4to.; "An Abridgment of St. Chryſoſtom on the Old and New Teſtament;" "The Lives of the Patriarchs, Prophets, and Saints," in ſeveral octavos. M. Fontaine was diſtinguiſhed for great integrity, for the ſimplicity and innocence of his manners, and for unaffected modeſty, humility, and piety. Moreri.

Fontaine, in *Geography*, a town of France, in the department of the Upper Rhine, and chief place of a canton, in the diſtrict of Befort. The place contains 261, and the canton 7,134 inhabitants, on a territory of 140 kiliometres, in 29 communes.—Alſo, a town of France, in the department of the Vendée; 6 miles N.E of Fontenay-le-Comte.—Alſo, a town of Canada, on the S.E. bank of the lake St. Pierre. N. lat. 46°. W. long. 72° 40′.

Fontaine *le Bourg*, a town of France, in the department of the Lower Seine; 9 miles N. of Rouen.

Fontaine *le Dun*, a town of France, in the department of the Lower Seine, and chief place of a canton, in the diſtrict of Yvetot; 12 miles S.W. of Dieppe. The place contains 382, and the canton 10,448 inhabitants, on a territory of 105 kiliometres, in 22 communes.

Fontaine *l'Eveque*, a town of France, in the department of Jemappe, and chief place of a canton, in the diſtrict of Charleroy; 3 miles W. of Charleroy. The place contains 2,468, and the canton 11,245 inhabitants, on a territory of 100 kiliometres, in 12 communes.

Fontaine *Francoiſe*, a town of France, in the department of the Côte-d'Or, and chief place of a canton, in the diſtrict of Dijon; 10 miles E. of Is ſur Tille. The place contains 1,050, and the canton 5,460 inhabitants, on a territory of 157½ kiliometres, in 14 communes.

Fontaine *Guerin*, a town of France, in the department of the Mayne and Loire; 13 miles E. of Angers.

Fontaine *ſous Jouy*, a town of France, in the department of the Eure; 60 miles N.E. of Evreux.

Fontaine *ſur Somme*, a town of France, in the department of the Somme; 5 miles S.E. of Abbeville.

Fontaine *de Vaucluſe*, a town of France, in the department of the Vaucluſe, formerly the reſidence of Petrarch and Laura; 15 miles E. of Avignon.

Fontaines, Peter Francis des, in *Biography*, a celebrated French critic, was born at Rouen in the year 1685, where his father was a counſellor of parliament. He received his education under the Jeſuits, and obtained admiſſion into that order; but at the age of thirty, diſliking the reſtraint attached to a clerical character, he quitted the ſociety, and at the ſame time a cure he poſſeſſed in Normandy. Having excited ſome attention by his critical writings at Paris, the Abbé Bignon, in 1724, committed to him the conducting a diſtinguiſhed periodical publication, entitled "La Journal des Sçavans." While peaceably enjoying the fame and emolument of his literary labours, his numerous enemies, whom he had excited by the ſevere ſtrictures on their works contained in that publication, determined on revenge; and they cruelly retaliated by accuſing him of having been guilty of an unnatural crime; which aſperſion on his character occaſioned his impriſonment. He however procured his liberty after fifteen days, and a juſtification of his conduct, in a letter from the magiſtrate, addreſſed to the Abbé Bignon, which tended to re-eſtabliſh him in his former credit. The Journal having been ſuppreſſed by authority, he obtained permiſſion to publiſh, in 1731, a ſimilar work, under the new title of "La Novelliſte du Parnaſſe, ou Reflexions ſur les ouvrages nouveaux." But this only proceeded to two volumes, when the imprimatur was alſo withdrawn, on account of the numerous and loud complaints of the various authors, lampooned, and held up to ridicule by the ſeverity of its criticiſm. In 1735 he again entered the theatre of literary diſſection, and by aſſurances of more candour, and leſs perſonality, he procured a licence for another periodical publication, entitled, "Obſervations ſur les ecrits modernes;" which, after running to the protracted length of thirty-three volumes, was by order of government ſilenced. But unterrified by menaces, and undiſmayed by diſaſters, in 1744 the critic appeared again in the paths of ſcience, and publiſhed his remarks in a weekly paper, called "Jugemens ſur les ouvrages nouveaux," which proceeded to the eleventh volume under his direction; and the laſt two, thirteen, and fourteen, of that work were performed by ſome other hand; he having been attacked with a diſorder in his cheſt, that occaſioned his death in 1745; on which occaſion his enemy, Piron, wrote this ſatirical epitaph,

"Sous ce tombeau git un auteur
Dont en deux mots, voici l'hiſtoire
Il etoit ignorant comme un predicateur,
Et malin comme un auditoire."

Beſides his avocations in the voluminous periodical publications, he found leiſure to execute a variety of other works, of which his biographer enumerates ſeventeen; ſome critical, ſome hiſtorical, and ſome tranſlations. He publiſhed a proſe tranſlation of Virgil with plates by Cochin in four volumes, 8vo., in which ſome critics have decided Virgil is either traveſtied or murdered in every line. In 1754 a tranſlation of Horace's odes appeared from his pen, and at different times from the ſame prolific ſource, ſacred poetry, in imitation of the Pſalms; Dictionnaire Neologique; a new Gulliver, in two volumes; a tranſlation of Swift's Gulliver's travels; and portions from his other works, and thoſe of Pope, Fielding, &c.

Feron, who has drawn up his character, obſerves, that he was born a ſentimental perſon, a philoſopher in conduct, as well as principle; exempt from ambition, and of a free and noble ſpirit, which would not ſtoop for titles or preferments. In common converſation he appeared only a common man; but when any thing out of the ordinary way occurred, he diſcovered great diſcernment, force of imagination, depth of humour, and brilliancy of wit. The Abbé de la Port publiſhed in 1757, "L'Eſprit de l'Abbé des Fontaines," with a life annexed; and a catalogue of his writings, and thoſe who wrote againſt him, in four volumes, 8vo. which ſee, and Nouveau Dictionnaire Hiſtorique.

FONTANA, Prospero. a painter of hiſtory, born at Bologna in 1512. Vaſari mentions him as having been employed in 1556 to finiſh works left incomplete by Innocenza da Imola at Bologna, and he appears more as the ſervant and aſſiſtant to others, than as the inventor of great works. He is introduced here principally, as having had the honour of uſhering into the world of art thoſe two brilliant luminaries Annibal and Ludovico Carracci. It is not known when he died.

Fontana, Lavinia, daughter of Proſpero, practiſed portrait painting with very conſiderable ſucceſs, under the patronage of Pope Gregory XIII. She died in 1602, at the age of 50.

Fontana, Dominic, an eminent architect, was born in 1543 at a village on the lake of Como. Having acquired the elements of geometry, he went to Rome, where his elder brother John was a ſtudent in architecture. Here he applied himſelf moſt diligently in ſtudying the works of antiquity, and at length was employed by cardinal Montalto, afterwards pope Sixtus V. Montalto had already begun to diſplay the magnificence of his character, by undertaking the conſtruction of the grand chapel of the manger in the church of St. Maria Maggiore. The pope, Gregory XIII. jealous of the munificence of his cardinal, took from him the means of his deſigns, and thus put a ſtop to the works. Fontana, with a ſpirit worthy of a great man, went on with the building at his own expence, which ſo gratified the cardinal, that when he was raiſed to the popedom, he created Fontana his architect. The chapel and palace were finiſhed in a ſplendid ſtyle, but this was a ſmall part of the vaſt deſigns projected by Sixtus. Beſides completing the dome of St. Peter's, he reſolved to contribute to its grandeur by conveying in front of its piazza the obeliſk of a ſingle piece of Egyptian granite, which had formerly decorated the circus of Nero. This deſign had been contemplated by ſome of the predeceſſors of Sixtus, but none had actually attempted it. Sixtus ſummoned the architects and engineers from all parts, to conſult on the beſt means of effecting the buſineſs. Fontana's plan obtained the preference, and he was able to perform in practice what he had advanced in theory. This was regarded as the moſt ſplendid exploit of the age, and rewards and honours the moſt magnificent were beſtowed upon Fontana and his heirs. He was afterwards employed in the elevation of other obeliſks, and in the embelliſhment of the principal ſtreets of Rome. He built the Vatican library, and began conſiderable additions to that palace, which were interrupted by the death of Sixtus. One of Fontana's great works, was the conducting water to Rome from the diſtance of fifteen miles, in a channel ſupported upon arcades. The ſucceſſor of Sixtus, Clement VIII., was prejudiced againſt the papal architect, and diſmiſſed him from his office, but his reputation cauſed him to be engaged by the viceroy of Naples as architect to the king. He accordingly removed to Naples in 1592. Here he undertook and executed many works of conſequence. His laſt efforts were directed to a new harbour for Naples, which he did not live to finiſh. He died at Naples in 1607 in his ſixty-fourth year. Gen. Biog.

Fontana *Fora*, in *Geography*, a town of Naples, in the province of Capitanata; 14 miles S.W. of Salpe.

FONTANAMORA, a town of France, in the department of Dora; 18 miles E.S.E. of Aoſta.

FONTANAROSSA, a town of Naples, in Principato Ultra; 14 miles N.W. of Conza.

FONTANEL, in *Anatomy*, called alſo bregma; the vacancy left between the two portions of the frontal and the parietal bones, before the oſſification of the ſkull is compleated. The parietes of the cranium are made up here by the dura mater. Two of theſe vacancies are found in the head; one in front and the other at the back part of the parietal bones. The former is the largeſt. They are gradually loſt as the bones approach each other. See Fons and Cranium.

FONTANELLA, in *Geography*, a town of Italy, in the department of the Upper Po; 8 miles N.E. of Crema.

Fontanélla, in *Surgery*, an iſſue. See Issue.

FONTANELLO, in *Geography*, a town of France, in the department of the Seſia; 7 miles E. of Creſcentino.

FONTANESIA, in *Botany*, ſo called by M. La Billardiere, in juſt commemoration of his amiable friend M. Renè Louiche Desfontaines, the able author of the *Flora Atlantica*, and of ſeveral learned botanical and phyſiological eſſays. The late M. L'Heritier had, with the ſame intent, publiſhed a *Louichea*, which proved to be the *Pteranthus* of Forſkall, *Camphoroſma Pteranthus* of Linnæus.—Billard. Syr. faſc. 1. 9. t. 1. Wild. Sp. Pl. v. 1. 52. Vahl. Enum. v. 1. 37. Mart. Mill. Dict. v. 2. Lamarck. Illuſtr. 77. t. 22.—Claſs and order, *Diandria Monogynia*. Nat. Ord. *Sepiariæ*, Linn. *Jaſmineæ*, Juſſ.

Gen. Ch. *Cal.* Perianth inferior, very ſmall, in four deep, ovate, equal, permanent, bluntiſh ſegments. *Cor.* of two, much larger, inverſely-heartſhaped, deeply cloven, obtuſe, concave petals, deciduous. *Stam.* Filaments two, inſerted into the baſe of each petal between its lobes, thread-ſhaped, longer than the petal; anthers roundiſh-oblong, with two furrows. *Piſt.* Germen ſuperior, ovate, compreſſed; ſtyle ſhort, compreſſed, permanent; ſtigmas two, acute, incurved. *Peric.* Capſule elliptical, emarginate, compreſſed, membranous, of two cells, not burſting; very rarely of three cells. *Seeds* ſolitary, oblong, pendulous.

Eſſ. Ch. Calyx in four deep ſegments. Petals two, deeply divided. Capſule ſuperior, membranous, not burſting, of two cells. Seeds ſolitary, pendulous.

Obſ. The character of this genus comes very near *Fraxinus*, to which Billardiere adverts, ſaying that it is diſtinguiſhed "by its fruit being of two cells;" but in that it actually agrees with *Fraxinus*, the latter differing only in the leafy elongation of its capſule. We do not mean that the two genera are not perfectly diſtinct. The petals indeed are not ſo indubitable a mark as could be wiſhed, being in all this tribe very uncertain, and according to Billardicre himſelf, occaſionally united into a tube in the plant under conſideration.

The only known ſpecies is

1. F. *phillyrioides*. Billard. as above.—A *ſhrub*, native of Syria, about twelve feet high, ſmooth, buſhy, and evergreen, but not remarkable for beauty, the flowers being ſmall, greeniſh and inconſpicuous. They are copiouſly produced in ſmall axillary cluſters. The ripe fruit looks ſomewhat like that of the Elm. This ſhrub ſtands our winters in the open ground, and is kept in ſome of the Engliſh gardens, but rather for curioſity than ornament. The *leaves* are oppoſite or ſcattered, ſtalked, ſimple, ovate, acute and entire, of rather a dull green.

FONTANGES, in *Geography*, a town of France, in the department of the Cantal; 10 miles N.W. of Murat.

FONTANINI, Giusto, in *Biography*, a learned Italian, was born in the duchy of Friuli in the year 1666. Having gone through his preparatory ſtudies, he was ordained prieſt at Venice in 1690. Here and at Padua he ſtudied very hard, improved himſelf in literature of various kinds; and in 1697 he was invited to Rome as librarian to cardinal Imperiali. From this period he became known and celebrated by many learned publications; and he acquired the notice and friendſhip of the moſt learned people of the age. He was patronized by pope Clement XI., who made him his own chamberlain, and gave him a penſion and preferment in the church. He died in the year 1736 in the ſeventieth year of his age. His principal work was a diſcourſe on Italian eloquence, entitled "Dell' eloquenza Italiana." This went through ſeveral editions during the author's life; but the beſt and moſt correct is that printed at Venice ſince his death in two volumes 4to., with notes &c. by Apoſtolo Zeno. Fontanini contended, in this work, that the Italians wrote in the French language before they uſed Italian, which gave much offence, and excited a warm controverſy among the literati of the country. Moreri.

FONTANKA, in *Geography*, a navigable river of Ruſſia, which goes from the Nevka, on the right of the Neva, flowing as a ſlow moraſs brook, firſt towards the ſouth, then weſtward parallel with the Neva, to the Cronſtadt gulf, into which, with the Neva, it formerly fell in two arms. In the former reigns it had been deepened and lined with ſides of timber; but gradually filled up again, and in ſummer was partially dry. By order of her late Majeſty it was dug afreſh, to a bed of one fathom in depth, and in breadth ten or twelve, and its ſides faced with hewn granite raiſed on piles to the height of a fathom above the water's level, with an iron baluſtrade; and without-ſide of this, a pavement five feet broad of granite flags, for the accommodation of foot-paſſengers. Its banks are now full of fine flowing Neva-water; it is navigable for barks of burden, and conſtitutes one of the chief ornaments of the imperial reſidence. The length of this river is nearly 3000 fathoms.

FONTARABIA, in Spaniſh *Fuenta Rabia*, and in Latin *Fons rapidus*, is a fortified town in the province of Biſcay and diſtrict of Giupuſcoa, and one of the keys of Spain. It is ſituated in a ſmall peninſula on the ſea-coaſt, and upon the left bank of the Bidaſſoa, and has the title of a city. It is ſmall, but well fortified both by nature and art. On the land ſide it is protected by high mountains, by the Sierras of Jaſquevel, and on the ſea-ſide it is defended by a good fortreſs.

Its harbour would be a good one, if the tide, which is generally very high there, did not leave it dry, when it retires. The town is built in the form of an amphitheatre, upon a hill which faces the ſea, and in the ſouth angle of the gulf of Gaſcony. It has a governor, a king's lieutenant, or major, an aide-major, and a garriſon, more or leſs numerous at different times. N. lat. 43° 23'. W. long. 1° 55'.

FONTELLO, a town of Portugal, in the province of Beira; 4 miles N.E. of Lamego.

FONTENAY, Peter Claude, in *Biography*, a French Jeſuit, was born at Paris in 1683, and entered on his noviciate in the order when he was fifteen years of age. Having compleated his initiatory ſtudies, he was employed ſome time to furniſh extracts and remarks on books relating to religion and eccleſiaſtical hiſtory in the "Journal de Trevoux." He was engaged for ſome years in collecting materials for writing a hiſtory of the popes, in which however he made but ſmall progreſs. His attention to eccleſiaſtical hiſtory did not prevent him from purſuing the lighter ſtudies of polite literature, in which he excelled, and as the reſult of theſe purſuits, he publiſhed various ſmall poems in the collections of the day. His talents and learning pointed him out as a fit perſon for rector of the Jeſuits'college at Orleans, where he continued till the year 1735, when he was recalled to Paris, and appointed to continue, Longueval's "Hiſtory of the Gallican church." Eight volumes of this work had been already publiſhed, and father Fontenay proceeded with it till the eleventh, when he was incapacitated for further progreſs in the undertaking by a paralytic ſtroke. He ſurvived the ſtroke but twelve months, and died at the college La Flêche in the year 1742, in the fifty-ſixth year of his age. Moreri.

Fontenay, in *Geography*, a town of France, in the department of the Two Sevres, and chief place of a canton in the diſtrict of Niort. The place contains 1,235, and the canton 6,183 inhabitants, on a territory of 142½ kiliometres, in 10 communes.

Fontenay-*le-Comte*, a town of France, and chief place of a diſtrict, and capital of the department of Vendée, ſituated in a fertile valley on the Vendée. The place contains 6,600, and the canton 15,003 inhabitants, on a territory of 147½ kiliometres, in 13 communes. The chief articles of commerce of the inhabitants are cloth, woollen ſtuffs, and cattle, of which they ſell a great number at the three annual fairs. N. lat. 46° 30'. W. long. 0° 24'.

FONTENELLE, Bernard le Bovier de, in *Biography*, a man of letters, was born at Rouen in 1657. He was educated among the Jeſuits, and became, at a very early age, diſtinguiſhed for the progreſs which he made in polite literature. He ſtudied the law as a profeſſion, but loſing his firſt cauſe in the courts, he renounced the bar, and devoted himſelf entirely to literature and philoſophy. In 1674 he viſited Paris, and became known as a poet; and in 1683 he publiſhed "Dialogues of the Dead," in two volumes. Theſe were well received, and proved a happy ſpecimen of his talent of combining morality and literature with the graces of elegant and ingenious writing. Three years afterwards he publiſhed his moſt popular work, entitled, "Entretiens ſur la Pluralitè des Mondes." In this little piece, which has been tranſlated into all languages, ſcience and philoſophy are united with vivacity, gallantry, and delicate humour. The next production of Fontenelle was "The Hiſtory of Oracles," which appeared in 1687, and which expoſed the author to the ſuſpicion of infidelity, becauſe he oppoſed certain dogmas held by the clergy as ſacred. He publiſhed, in the year 1688, "Paſtoral Poems, with a Diſcourſe on the Eclogue," and in this and the following year the operas of "Thetis and Peleus," and "Æneas and Lavinia," which met with a conſiderable ſhare of popularity. In 1690 he was admitted into the French academy; and in 1699 he was elected ſecretary of the academy, a poſt which he occupied forty-two years. In this ſituation he wrote a hiſtory of that body, of which he publiſhed a volume annually, containing extracts and analyſes of memoirs, and eulogies of deceaſed members. Fontenelle was author of many other pieces, of which the principal are, "L'Hiſtoire du theatre Francois juſqu' à Corneille;" "Reflexions ſur la Poetique du theatre, et du theatre Tragique;" "Elemens de Geometrie de l'Infini;" a tragedy, and ſome comedies. His conſtitution was originally and naturally delicate, yet he reached the great age of fourſcore years and ten, with no other infirmity than that of deafneſs. After this his ſight began to fail him; but he lived till he had nearly completed a century. A ſhort time before he expired, he was aſked by his phyſician if he felt any pain, "I only feel," he replied, "a difficulty of exiſting." He died January 9, 1757. Fontenelle, ſays his biographer, "as a poet, did not riſe beyond elegance and ingenuity: as a man of ſcience, he excelled more in elucidating the inventions of others, than in diſcovering new truths. In the commerce of life he was truly a philoſopher; ſtudious of his own happineſs, yet without ſacrificing the duties of a man of honour and virtue. In his converſation he was guarded; in his actions firm and decided. He often gave an honeſt vote in a minority at the academy, and was the only one who had the courage to vote againſt the excluſion of the abbe St. Pierre from its meetings, when he had been declared guilty of treating the memory of Louis XIV. with diſreſpect. He had many friends; and, in the latter part of his life, ſcarcely an enemy." The works of Fontenelle, with the exception of thoſe on geometry and phyſics, have been collected in eleven volumes, 12mo. under the title of "Œuvres Diverſes." Moreri.

Fontenelle, the moſt pleaſing and alluring writer on ſubjects of hiſtory, criticiſm, and philoſophy, was ſo totally inſenſible to muſic, that, like our Pope, he wondered how its votaries could be ſo delighted with it. Pope aſcribed all the pleaſure expreſſed by the admirers of the art to affectation; while Fontenelle, ignorant of its object, concerning which his ears afforded him no information, cried out, "Sonate, que veut tu?" and this humble queſtion has paſſed for a *bon mot* among ſcoffers ever ſince. The ſonata perſonified might have anſwered, "I would have you liſten with attention to the ſweetneſs of the harmony, the grace, ſpirit or pathos of the melody, and the ingenuity of the compoſition." But it is wonderful that ſo intelligent an author ſhould write dramas for muſic, without knowing what muſic meant; yet, when no more than twenty years of age, he produced Pſiche, and Bellerophon, two ſerious operas for the lyric theatre, and which were ſet by Lulli in 1681; Peleus and Thetis, another ſerious opera for what he could not underſtand; in 1689, Æneas and Lavinia; and in 1731, Endymion; and all theſe dramas were to be tranſlated into melody, a language of which he knew not the alphabet. He uſed to ſay that the ancient muſic of the Greeks could never be recovered, or ſimilar effects produced by the moderns, unleſs the poet and muſician were united in one and the ſame perſon, for he had read that Sophocles and Euripides ſet their own dramas to muſic. Metaſtaſio was more modeſt and more reaſonable; for, upon being aſked if he had ever ſet any of his own dramas to muſic, he anſwered in the negative, aſſigning as a reaſon, that muſic was now become ſo difficult and complicated a ſtudy, that a man of letters had not leiſure ſufficient for its cultivation; as it is neceſſary now not only for an opera compoſer to be poſſeſſed of genius, taſte, invention, and knowledge of counterpoint, but he ſhould know the peculiar caſt and power of different voices, the ſcale and genius of different inſtruments, and ſing in good taſte, though without a voice. Pope, whoſe auricular organs were too obtuſe to vibrate in uniſon with muſical tones, wrote a beautiful ode for muſic on St. Cecilia's Day, and Addiſon not only wrote an ode, but an opera for muſic, both as ignorant of its meaning as Fontenelle. Theſe admirable writers, who, on ſubjects within their competence, ſeem beings of a ſuperior order, only degrade themſelves to a level with the common maſs of mankind, in condemning what they neither feel nor underſtand. No one is aſhamed to own that he is near-ſighted; none will allow that their apathy and contempt for muſic ariſe from an imperfect organization. There is an ear for muſic, an eye for painting, and a voice for ſong, with which thoſe who hear, ſee, and talk well enough for the common purpoſes of life, are not gifted. Dr. Johnſon, who had no ear for muſic, and uſed to have ſome pleaſure in humbling thoſe whom he thought vain of their muſical talents, ſeeming to hang over the harpſichord as if he were liſtening to the ſounds, being told by the performer that he hoped he would grow fond of muſic at laſt, the great philologer ſaid, "Sir, I ſhall be glad to have a new ſenſe given me!" which was candidly aſcribing his contempt for muſic to its true cauſe. Fontenelle, whoſe ſtyle in his proſe writings was the moſt ingenious, elegant, playful, and correct, of any author who contributed to embelliſh the ſplendid and literary reign of Louis XIV., was nephew to the great Corneille.

FONTENOY, in *Geography*, a village of France, in the department of Jemappe, famous for a battle which was fought near it between the French and the allies, in May 1745; the allies and Engliſh were commanded by the duke of Cumberland, and the French by marſhal Saxe. The allied army left 12,000 on the field of battle, and the loſs of the French was not much leſs; 4 miles S.E of Tournay.—Alſo, a town of France, in the department of the Muerte; 4 miles N E. of Toul.—Alſo, a town of France, in the department of the Aiſne, on the Aiſne; 5 miles W. of Soiſſons.

FONTES, a town of France, in the department of the Herault; 13 miles N. E. of Beziers.

FONTEVRAUD, a town of France, in the department of the Mayne; famous for an abbey, in the church of which ſeveral kings and queens of England were buried; 6 miles E of Saumur.

FONTEVRAULT, in *Eccleſiaſtical Hiſtory*, an hermaphrodite order of monks and nuns, in which, contrary to others of a ſimilar complexion, the weaker ſex is allowed the pre-eminence. It was founded ſoon after the celebration of the council at Poictiers, in the year 1100, by Robert d'Arbriſſel; who was firſt archdeacon of Rennes, and then received a particular miſſion from pope Urban II. to become an itinerant preacher, for the better inſtruction of profeſſing Chriſtians. Having been very ſucceſsful, and perſuaded numbers, both men and women, to devote themſelves to a monaſtic life, he erected for their accommodation cells in the woods of Fontevrault, three leagues from Saumur, on the confines of Poictiers, in France. After lodging the women in ſeparate apartments, and ſubjected the men to the controul of the abbeſs, in honour of that portion of ſacred hiſtory written by St. John, in the 19th chapter of his goſpel; he placed the whole order under the rules of St. Benedict, only adding ſome particular conſtitutions; and appointed this houſe to preſide over the whole. Pope Paſchal approved of the inſtitution, and its privileges were confirmed and extended by ſucceeding pontiffs. Previous to the French revolution, there were about ſixty of theſe monaſteries in France. The nuns wear a black robe, with a white veil; and the monks are habited in black, like ſecular prieſts, with the addition of a camail on their caſſock.

FONTICULUS, in *Surgery*, an iſſue. See Issue.

FONTINALIA, or Fontanalia, in *Antiquity*, a religious feaſt, held among the Romans, in honour of the deities who preſided over fountains or ſprings. Varro obſerves, that it was the cuſtom to viſit the wells on thoſe days, and to caſt crowns into fountains. Scaliger, in his conjectures on Varro, takes this not to be a feaſt of fountains in general, as Feſtus inſinuates, but of the fountain which had a temple at Rome, near the Porta Capena, called alſo Porta Fontinalis; he adds, that it is of this fountain Cicero ſpeaks in his ſecond book De Legib. The fontinalia were held on the 13th of October.

FONTINALIS, in *Botany*, from *fons*, a fountain or rivulet, alluding to its place of growth. Water-moſs. Bauh. Hiſt. v. 3. 770. Dill. Muſc. 254. Linn. Gen. 562. Schreb. 761. Mart. Mill. Dict. v. 2. Sm. Fl. Brit. 1336. Hedw. Fund. v. 2. 96. t. 9. f. 53—55. Juſſ. 11. Claſs and order, *Cryptogamia Muſci*. Nat. Ord. *Muſci*.

Gen. Ch. Male in axillary ſcaly buds. Female lateral. *Sheath* of numerous, imbricated, cloſe ſcales. *Capſule* oblong, ſmooth, on a ſhort briſtle-like fruit-ſtalk, enveloped in the ſheath. *Veil* awl-ſhaped, deciduous. *Lid* awl-ſhaped. *Fringe* double; the *outermoſt* of ſixteen teeth, broadeſt at their baſe, at length recurved, brittle and deciduous; the *inner* conical, moſtly red, beautifully reticulated, having ſixteen upright briſtles, and numerous tranſverſe fibres, deciduous.

Eſſ. Ch. Capſule oblong, lateral, encloſed in a ſcaly ſheath. Outer fringe of ſixteen teeth, dilated at the baſe; inner reticulated.

One of the moſt natural genera of Moſſes, though only four ſpecies are known. The character derived from the red reticulated inner fringe, is no leſs ſtriking than certain; but the fragility of the fringes altogether renders a careful examination neceſſary, when the lid is juſt ready to fall. All the ſpecies are of a dark hue, and grow on rocks, ſtones or poſts in freſh water, floating with the current, their ſtems being much branched, and tufted.

1. F. *antipyretica*. Great Water-moſs.—Leaves pointed, folded ſo as to form a keel, diſpoſed in three ranks. Scales of the ſheath obtuſe. Lid awl-ſhaped.—Linn. Sp. Pl. 1571. Sm. Fl. Brit. 1336. Engl. Bot. t. 359. Hedw. Sp. Muſc. 298. Hudſ. 467. Turn. Muſc. Hib. 199. (F. triangularis major complicata, e foliorum alis capſulifera; Dill. Muſc. 254. t. 33. f. 1.)—Frequent about mill pools, and in ſlow deep waters, growing far below the ſurface, and rarely producing fruit. The *roots* are ſtrong and perennial. *Stems* wiry, often a foot long, irregularly branched, leafy. *Leaves* of a deep tranſparent green, ſcarcely ſhining, often encruſted with calcareous earth, depoſited by the water, in the manner of *Chara vulgaris* and *hiſpida*; ſee Chara. *Capſules* ſcattered along the main ſtem, nearly ſeſſile, elliptical, cloſely covered with the imbricated ſcales of the ſheath, except the lid, which is awl-ſhaped, ſhort, prominent, covered with a veil rather exceeding its own length. The ſtructure of the fringe is not ſhewn in *Engl. Bot.* but may be ſeen in Hedwig's *Fundamenta* as above. Linnæus relates, in his *Flora Suecica*, that the Swedes "ſtuff in this moſs between their chimneys and wooden walls, to guard the latter from fire." Hence he has given it the name of *antipyretica*, and hence ſome have ſuppoſed it incombuſtible, for which there is no foundation, except perhaps when it is thickly encruſted all over with earth. Its uſe can be accounted for ſufficiently, by its being a bad conductor of heat, and excluding the paſſage of air.

2. F. *ſquamoſa*. Shining Scaly Water-moſs.—Leaves imbricated, lanceolate, pointed, concave. Scales of the ſheath blunt, as well as of the lid.—Linn. Sp. Pl. 1571. Sm. Fl. Brit. 1337. Engl. Bot. t. 1861. Hedw. Sp. Muſc. 299. Crypt. v. 3. 32. t. 12. Hudſ. 467. Turn. Muſc. Hib. 199. (F. ſquamoſa tenuis ſericea atro-virens; Dill. Muſc. 258. t. 33. f. 3.)—Found in alpine rivulets, in Wales, Scotland, Ireland, and the north of England. Smaller than the preceding, as well as more ſhining, with a yellowiſh caſt. *Leaves* taper-pointed, uſually in three rows, but not folded, though furniſhed with a plait in their lower part which looks like a rib. *Capſule* projecting a little beyond the ſheath, with a blunt conical lid.

3. F. *capillacea*. Briſtly Water-moſs.—Leaves linear-briſtle-ſhaped, ſpreading. Sheaths and fruitſtalks elongated, thread-ſhaped; the ſcales acute, reaching beyond the capſule.—Dickſ. Crypt. faſc. 2. 1. Sm. Fl. Brit. 1337. With. 789. Hull. 275. (F. capillacea, calycibus ſtyli inſtar cuſpidatis; Dill. Muſc. 260. t. 33. f. 5.)—Native of the alpine rivulets of Scotland, where it was diſcovered by Mr. Dickſon. The celebrated John Bartram ſent it to Dillenius from Pennſylvania. This is of a dull olive green, ſcarcely ſhining, and is known by its long *leaves* with capillary points, which ſpread nearly equally in all directions. The long *fruitſtalks*, inveſted with the cloſe ſlender *ſheaths*, are alſo remarkable, and readily diſtinguiſh it from both the foregoing.

4. F. *falcata*. Sickle-leaved Water-moſs.—Leaves ovate-lanceolate, taper-pointed, in three rows, curved to one ſide. Fruitſtalks elongated, half naked.—Hedw. Sp. Muſc. 299. Crypt. v. 3. 57. t. 24. Swartz. Muſc. Suec. 72. (F. capillacea; Linn. Fl. Suec. 379. Ehrh. Crypt. 205.)—Found in mountainous rivulets in Sweden. Ehrhart gathered it near Upſal. Much leſs ſlender than the laſt, from which it is eſſentially diſtinguiſhed by the ſickle-ſhaped leaves, curved all one way, and the nakedneſs of the upper part of the *fruitſtalks*, whoſe ſheaths ſeldom reach further than their middle. Linnæus miſtook this for the plant of Dillenius, quoted under our laſt ſpecies, on which, without ſeeing a ſpecimen, he had previouſly founded his own F. *ſquamoſa*. He tells us in the *Flora Suecica*, ed. 2, he had not the plant at hand when he wrote that book, but adopted it from Olaus Celſius.

The F. *pennata* of Linnæus is *Neckera pennata*, Hedw. Crypt. v. 3. 47. t. 19, a moſt elegant moſs, erroneouſly ſuppoſed to have been found in England.

Concerning F. *minor*, Linn. Sp. Pl. 1571, there has been much doubt and controverſy. The plant of Dillenius and of Britiſh writers, from which the Linnæan ſpecific character, of the terminal fructification, was taken, is *Trichoſtomum fontinalioides* of Hedwig, and of *Fl. Brit.* 1248. This is what grows at Oxford and in the Thames, and is figured in *Engl. Bot.* t. 557. But the herbarium of Linnæus contains a ſpecimen, gathered at Upſal, marked by him *minor*, which is certainly different, though probably only a variety of F. *antipyretica*. This is what he deſcribed in the ſecond edition of *Species Plantarum*, "leaves folded ſo as to form a keel, two together on the thicker branches." There are no capſules on the ſpecimen, but ſome appearance of axillary male flowers. As the acute and active cryptogamiſts of Sweden have not ſince detected this plant at Upſal, we muſt conclude it to be an evaneſcent variety of the firſt ſpecies. The Swiſs botaniſts have been no leſs puzzled than Linnæus about F. *minor*. What Favrod and others have taken for ſuch, and which they contend is Haller's *Hypnum*, n. 1795, appears to us not different from *Hypnum ruſcifolium*, Fl. Brit. 1292. Poſſibly, from his quotation of Dillenius, Haller might mean our *Trichoſtomum fontinalioides*, but on this little dependance can be placed, as under his very next ſpecies, n. 1796, which is *Anictangium aquaticum* of Hedwig, *Hypnum aquaticum* Jacq. Auſtr. t. 290, (as the late Mr. Davall firſt ſuſpected), Haller quotes the ſynonym which belongs to *Fontinalis ſquamoſa*, a widely different moſs. The ſynonyms of this eminent writer indeed require much correction, even in his *Nomenclator*, where he is ſuppoſed to give only the moſt obvious and indubitable. S.

FONTINELLE, in *Geography*, a town of Walachia, on the Danube; 18 miles E. of Nicopoli.

FONTIVEROS, or Hontiveros, a town of Spain, in Old Caſtile; 10 miles N.N.W. of Avila.

FOOD. For the ſubſtances capable of affording nutriment to man, ſee Digestion; and for information relative to the quality and quantity of thoſe ſubſtances to be taken with a view to the prevention and cure of diſeaſes, ſee Diet.

END OF VOLUME XIV.

Strahan and Preſton,
New-Street Square, London.